

THE MICROCOSM:

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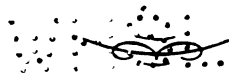
Substantial Philosophy.

DEVOTED TO THE DISCOVERIES, THEORIES, AND INVESTIGATIONS OF
MODERN SCIENCE. AND THEIR BEARINGS UPON THE
RELIGIOUS THOUGHT OF THE AGE.

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THE MONKEY AND THE MAN.

BY J. W. LOWBER, M.A., PH. D.

It is evident that the theory of Mr. Darwin directly contradicts the Bible doctrine of creation. It also supersedes the necessity of Christianity; for, if man never fell, there cannot, of course, be any necessity of a Redeemer. Religion means to rebind, and there cannot be any rebinding until there is first an unbinding. The position that makes the first man the lowest type of savage cannot be harmonized with the fall of man. The following facts are, to my mind, conclusive evidence against the Darwinian hypothesis:

1. We discover in nature a general plan; for there is a distinction of classes, genera and species. If the theory of Mr. Darwin were true, we would expect just the opposite; for if fortuity, and not intelligence, is the guiding principle, we would naturally expect to find animals with all manner of excesses and deficiencies. Some might have eyes where the ears are; the ears in front, and the nose behind. A horse might have the horns of a cow, and a cow the head of a rhinoceros. All thoughtful persons must admit that the order and adaptation found in the natural universe cannot be the result of anything less than intelligence.

2. Geology has revealed to us the fact that some of the highest and most complicated vegetable and animal organizations were introduced suddenly upon the scene, and were not the result of development. Huge ferns and pines were suddenly introduced, with not even mosses between them and seaweeds. Sharks and ganoids, more than twenty feet in length, and of the very highest type of fish structure, commenced the Devonian Age. Gigantic reptiles, sixty and seventy feet long, introduced the Reptilian Age. The Age of Mammals began with the great Mastodons, compared with which the animals of our day are mere pigmies. Prof. Dana claims that in some parts of the world the ox was introduced before the monkey.

3. No scientist has ever been able to present even one example of the production of one species by another. If such has ever been the case, it is reasonable to suppose that it would have been found out by somebody. Instead of this being the case, we have an insuperable bar to it set up by Nature itself. Against the transmutation of species, the God of nature has established the impassable bar of sterility.

4. The first man was a miracle, whether made out of a monkey, or out of red earth; for men are not made that way at the present time. The theory of development is mainly designed to banish the *supernatural* from the Universe; but this it cannot do, for we are unable to account for the *natural* without admitting the agency of the *supernatural*.

5. The habits and physical structure of the monkey differ so greatly from the same in man, that it would have required a miracle to develop the one into the other. The gorilla, an ugly and a ferocious beast, with its brutish face, no more resembles man than does the

grim visage of a grizzly bear. The gorilla is man's bitterest foe. It acts on the offensive, and attacks man as soon as it has an opportunity. It is said that its jaws are such that it can easily crush the barrel of a gun between its teeth.

6. We observe an intellectual and a moral difference between the monkey and the man, which renders the development theory impossible. Prof. Huxley says that every bone of *man* can be distinguished from the corresponding bone in the gorilla. All the mental faculties of man can as easily be distinguished from the same faculties in the highest ape. Man is a being of progress. The monkey, by its non-progressive character, is eternally bound to the brute creation. It looks no higher than the earth; but man looks to the heavens. Man is a religious being, and is destined to a higher state than this world; but the monkey is entirely of this world, and it has no aspirations beyond this sublunary sphere.

LOUISVILLE, Ky.

TYMPANIC VIBRATION.

BY PROF. G. R. HAND.

Substantialism is thundering at the gates of Popular Science, and demanding a re-examination of the facts and proofs of the undulatory theory of sound. Tympanic vibration opens the portals of her secret chambers, and extends a cordial welcome to her auditorium.

We enter for a few moments, and take hasty cognizance of the beauties and inconsistencies that press themselves upon our consideration, as the ear-drum labors with herculean efforts to convey intelligent sounds to the auditory nerve, according to the popular theory. Now hold your breath, and pause, and look, and listen, as you mentally interrogate Dame Nature at every point.

You see that little drum skin posted at the vestibule to introduce the visitors into the *sanctum sanctorum*. It is required to bend its flexibilities and complacently bow each visitor into the audience-room, though they come thick and fast as hail upon the unprotected window.

Hark! The solemn notes from the lowest audible pitch of organ-pipe gravely demand admittance, and the muscular elasticity of our little sentinel is taxed to its minimum capacity to admit the troopers, with a genuflection, or audiflection, for each sound-pulse, at the rate of not less than sixteen per second.

Simultaneous with these, a troop more numerous, and more active and persistent, demand an audience, as notes of a higher pitch, borne upon miniature sound-pulses, demand an introduction. Our little sentinel is now compelled to fly around and bow, say 440 times in a second, while these are entering. You say this requires activity! Yes, it does. But remember, that while bowing 440 times per second, he is at the same time bending at the rate of sixteen times per second.

But this is not all. The sounds of a full

orchestra strike upon the ear at the same time, and the notes of various pitch, running through several octaves, are distinctly, audibly heard in beautiful harmony, as anthems swell majestically upon the ear. But every note requires a different rate of vibration, and yet all at the same time, until perhaps a score of different rates of vibration are manipulated at the same time!

Now we begin to feel a kind of melancholy sympathy for our little sentinel, who is compelled to practise upon possible impossibilities, in the vain attempt to stretch, and contract, and bend, and perform hundreds of gyrations per second, and at scores of different rates of velocity, all at the same time. And our fears for the tenacity of our little membrane seem struggling to wake up a kind of latent skepticism. Almost any other member of the body would go to pieces or paralyze under the pressure of the unequal struggle against such an incessant and multitudinous bombardment.

But the wave theory of sound compels submission to these absurdities and impossibilities; and while that bears away, our little sentinel must continue in this abject slavery.

It is not out of order to question the right of assumption, or the authority, of sending out these vocal and instrumental emanations in cavalry squadrons, mounted upon atmospheric waves or sound-pulses, to besiege our auricular organs in such a barbarous mode of attack. We go to head-quarters with a remonstrance, and call for an investigation.

Thousands are assembled in a large hall. Hundreds of instruments of various kinds are playing in full orchestra. Thousands of voices are filling the air with all the notes within the compass of the human voice, from the lowest bass, up to the highest pitch of alto, tenor, or soprano.

We put on our philosophic glasses and see the sound-waves in endless variety, emanating from these thousands of sonorous sources, in all directions, from every center, at different amplitudes and wave-lengths, meeting each other, crossing each other, at right angles, acute angles, obtuse angles, horizontally, vertically, and obliquely, impinging upon each other, dashing, surging, retreating, by impulse and reaction, like a thousand wild animals turned loose in a menagerie, and yet amidst all this jarring and confusion, each storm-tossed wave going with accuracy and unerring certainty, unchanged and pure, straight from its source, to every point where an ear might be, and unloading its sonorous cargo all in good condition.

Amidst all this equestrian agility of marching and countermarching of aerial cavalry, our credulity is taxed almost to an eruptive tension to trust the results of such a fantastic tournament.

If science desires to rejoice in unexceptional garments, she had better look to her wardrobe, and repair these rents, or else replace her tattered duds with more reliable and scientific vestments.

RED BLUFF, Cal.

THE NEBULAR HYPOTHESIS.

BY PROF. W. D. STRONG.

I would not dare to lift my pen against your very able and interesting contributor, Prof. I.

L. Kephart, but a remark made by him in the January number of the MICROCOSM leads me to reflections that I need only mention in this article.

In the Professor's article, "The Origin of Life," we find the following: "According to the nebular hypothesis, which is the very basis of the materialistic evolution theory, all matter once existed in a gaseous state," etc. We do not wish to take exceptions to this quotation, but are undecided as to whether Prof. K. gave a thrust at the nebular hypothesis, or whether his sole purpose was to point out one of the many inconsistencies in the modern theory of evolution or materialism. Inasmuch as he quotes Prof. Huxley's views with reference to the impossibility of life-germs existing at such a period of the earth's existence.

We can see no grounds for doubt as to whether germs of life could or could not exist, when the degree of heat was so intense as to convert the hardest granite rock into an almost inconceivably attenuated vapor or gas. Having satisfied our minds with this view of the matter, and believing that animate or inanimate matter cannot give or impart that which it does not possess, we are forced to the conclusion that life must be a product of the Omnipotent Father, and could not possibly have been spontaneously generated, nor have created itself, but must be independent of, superior to, and above all the grosser elements.

As we understand materialism, the Laplace theory may be entertained with little fear of its leading one to believe in designless evolution, to detract from God's omnipotence, or supplant the accepted theory of His creative power, with the materialist's self-existing forces of nature, chemical affinity, or what not; but, on the other hand, may be looked upon as a theory wholly in harmony with our present views of *Substantialism*.

Should we adopt the editor's views of the "creation theory," we may still regard the nebular hypothesis as being unobjectionable, or, to say the least, quite tenable.

If our power of conception is sufficiently strong to enable us to conceive of God's having an "exterior nature," it would seem to be still easier to imagine the infinitesimal, incorporeal, but substantial particles, much more attenuated than the most rarefied gases, coming together at the command of the Almighty, and assuming a spheroidal appearance, as put forth by Laplace.

Most theories or isms grant that the universe was once in a state of chaos, whatever its origin or source of existence; and, anterior to the most attenuated form of their *real existence*, many will sustain the theory that the whole universe was a nonentity, as far as its material parts are concerned. Again, we must concede that the worlds *do now exist*, and are somewhat symmetrical in their formation. Hence, whatever process may have taken place, or whatever power may have been brought to bear, we can conceive of no theory that is more consistent with reason than the nebular hypothesis, and none that seems to harmonize more nearly with our views of Dr. Hall's *Substantialism*.

We are not criticising Prof. Kephart's article, but if this should be the means of calling forth his views with reference to the "Origin of the Solar System," although it may be in the form of a reprimand, our efforts shall not have been in vain.

TECUMSEH, Neb.

IMMORTALITY.—THE FULFILLMENT OF PROPHECY.

BY PROF. J. R. SUTHERLAND.

"For we have not here an abiding city, but we wait after the city which is to come." (Heb. 13: 14. Rev. ver. 7.)

This scripture, teaching of something *sought*, because of a similar something which must be abandoned, though special in its reference to a people, is but the Holy Spirit's statement of a general fact—the inherent, intuitive desire for immortality in the whole human family.

"A solemn murmur in the soul
Tells of the world to be—
As travelers hear the billows roll
Before they reach the sea."

It matters not what may have been "The Origin" of our race. The questions which most have attracted attention in all the ages are, "Shall we live again?" and "Where are we going?"

The learned and the unlettered, the philosopher and the fool, the prince and the peasant, have all, alike, realized the imperfect and transitory condition of this life, and to a greater or less extent directed attention to that "Abiding City," "The Life unending."

This desire, this anticipation, everything in the life of man and the history of our race is prophetic of "The Eternal Age." The progress of civilization, arts, inventions, improvements in the manner of living, government, and education, both of the moral and intellectual man, in individuals and in the race, prove man to be a progressive being; and the tireless energy with which he pushes on in his wonderful achievements, as unquestionably shows that his progress can only be limited because of material barriers.

But the conceptions and aspirations of man overleap even these barriers, and reach out with strong and unutterable yearnings to an unbounded life and domain of thought and action.

"The clouds foretell a shower." How is it that men divine the face of the heavens, and yet fail to discern and rightly interpret these signs of their destiny?

Shall we question the fulfillment of this prophecy? It is analogous to, and as certain of fulfillment as, any other prediction of Nature.

The prophets spake as the Spirit gave them utterance. Nature can but speak in strict obedience to her laws, can therefore prophecy no lies, and thus far in all the ages has never failed of the fulfillment of her predictions.

When, then, the inward nature of all humanity lifts up its voice and unhesitatingly declares, "I cannot die," when the anticipated "Life beyond" is the burden and the song of the soul, he who doubts is damned.

But does Nature fulfill her predictions? In every geological age the productions and life-forms of the age to follow were prophesied in their distinct, fundamental features in advance. Before the Devonian Age, the vertebrated animals were prophesied in the sea squirt and other (Pteraspis, Cephalaspis) imperfectly developed vertebrates. In fulfillment of this, whole tribes, genera and distinct species of fishes, filled the waters of the Devonian Age.

In the Carboniferous Age, a few species of swimming reptiles (Amphibians, Grandiceps,

etc.) appeared as certain precursors of the Age of Reptiles, in which Age the whole earth was overrun by monster species of these animals.

Early in the Reptilian Age, a few species of Marsupials (Dromatherium and Myrmicobries) appear as forerunners of the Age of Mammals, when we again see this prophecy fulfilled, and the earth populated with giant elephants, immense mammoths, mastodons, and other species of prodigious mammals.

During all these ages the appearance of Man was predicted by the successive introduction of higher orders of animals, each order being marked by outcropping features, left imperfect and undeveloped, yet pointing with unerring certainty to a fuller and more perfect development beyond, as the earth was gradually being fitted up for the prophesied Man.

Thus it is seen how "Coming events cast their shadows before," and that "Man cannot cover what God would reveal."

Having reached now, through a line of un-failing prophecies, this "Last Age," and finding still within ourselves an "Inner Man," as yet not fully developed, but reaching out in prophetic longings for and to a more perfect "Life Beyond," in which the pent-up soul's desires may be fully realized, we ask: Why should this, the greatest and grandest prophecy of all the ages, be left unconsummated?

The foot-prints of the ages all tend onward and upward. The march of Time is Eternity-ward, and with these certain landmarks of the past and the present before us, where, I ask, is the intelligent student of nature, who may honestly be so skeptical as not to believe with full assurance in the fulfillment of the great spiritual prophecy?

We meet, however, this objection from the Materialist. Man is animal, and if he may claim immortality, why not they, for likewise are they endowed with life and mentality?

They are not endowed with this prophetic desire for the "Life beyond."

This life fills the sum of all their desires, and beyond it they have not the slightest shadow of a conception.

Again, the animal makes no mental development beyond a certain limit, but is born and dies with all it ever possesses.

This sameness of mental faculties, passing from parent to progeny, age after age, proves their vital and mental force to be common rather than distinct and individual, which when liberated from the material body, like any general force, loses its individuality and becomes absorbed into the universal reservoir of such forces.

Molecular force is as distinctly individual as animal life and mentality while the molecule exists, but loses its individuality when the molecule is destroyed.

Neither indestructibility nor eternity of existence is immortality, as has been shown by many.

Immortality includes both these, with the full possession of the faculties in a happy state, which could not be possible except a separate individual existence be maintained.

To enable the physical man to retain and to maintain his individuality, he is endowed with the power of constant differentiation of the faculties. This power of differentiation in the soul, alone, preserves its individuality, lifts man above the brute, and enables him to avail himself of immortality. A drop of water upon the needle's point is individual; shaken into

the ocean, it loses its individuality ; but give it the power to change to oil, to cork, or rubber, and it preserves its individuality in the midst of the ocean. This opens a wide field, but I pass on.

Is this prediction fulfilled in time? These demands of our nature are not here met. This restless universal progress, this marvelous development, does, and must here end.

Frail flesh grows old and drops from the stage with but an inkling of the mighty projects of the mind accomplished.

The material for constructing the wonderful inventions of men are sadly wanting. Our soil is wasting away. Earth is losing its freshness and its strength, while man rises in numbers and the scale of being.

We see all things of this world fast culminating and ending, while this prophecy of endless life and progress in that *Spiritual Age* remains unfulfilled.

What of it? Does this prove that it never will be fulfilled?

Then nature comes short of her promises, and even the infallibility of the infidel's god, the last resort of the unbeliever, is overthrown and there is *nothing* true.

No philosopher dare take this position. We *must* look for "The City to come," and to it the divine finger of prophecy points with as unerring certainty in nature as in Revelation.

ELLSWORTH, Ill.

THE MORAL FACULTY.

BY REV. D. OGLESBY.

There are five senses or faculties, or mediums, through and by which the real, essential man has access and holds communion with the physical world. Dwelling in a "house of clay," an "earthly house," a "tabernacle," the "inner man" has no other access to this world but through the avenues of the bodily senses. If an eye is lost, one avenue is closed; if the ear is deaf, another is closed, and we can conceive of every avenue being closed, and the real man still occupying the "earthly house," yet having no connection with the physical world.

The moral faculty is the *one* sense that connects man with the spirit world, or rather with the "Father of Spirits," his Creator.

Paul says the natural man perceiveth not the things of God, for they are spiritually discerned. The idea aimed to be conveyed was, that the intellectual man perceiveth not the things of God.

Job said: "By searching, we cannot find out the Almighty." "Man, by wisdom, knew not God." (Paul.) The channel through which the man gains knowledge of the material world is not the road that leads up to the spiritual world and to God.

Your "lady lieutenant," Mrs. Organ, was right in making a distinction between the moral faculty and conscience. Conscience is the voice of the moral faculty. But, as a man may have eyes, and not see, or ears, and not hear, he may have a dead moral faculty, or a vitiated, diseased moral faculty; so that, as the Scriptures express it, the conscience may be an "evil conscience," or a conscience "seared" as with a hot iron. It is the business of the moral faculty to approve the right and condemn the wrong. The conscience always coincides with the judgment. If the man believes an act is

right, the conscience approves it; if the man believes an act wrong, conscience condemns it. This will always be the case, unless, for some cause, the moral faculty has been damaged or destroyed. Of this we will say more in another place. Paul tells us that when he persecuted the Church, he did it in all "good conscience." He meant that his conscience approved. But he ever after his conversion counted himself "the chief of sinners," because he "persecuted the Church." The trouble was, his judgment was wrong. He ought to have known better.

The men who ran the Inquisition and tortured the Church of God were as conscientious, while standing by the rack, and turning the wheels that dislocated the joints and tore the victims into pieces, as any of us are when saying our prayers. The groans, cries, tears, and agony of their victims was music in their ears, because they thought that they were doing "God service." That they ought to have known better seems evident to us at this late day, and yet we are surrounded by men every day, some of whom are Christians, that, if they had lived in that day, would have gloried in the Inquisition. Man, being accountable to God not only for what he does know, but for what he might and should know, the Infinite, All-wise Judge Eternal will know how much allowance to make for a deficient moral faculty and for unavoidable ignorance. It is all-important that the judgment be correct. For this purpose God gave to the world a revelation of His will. If man could have known certainly and undeviatingly what was right and what was wrong in every relation of life, toward his God and his fellow-man, there would scarcely have been any need of a revelation. Right and wrong, good and evil, are eternal principles in and of themselves. It does not make a thing right or good because the Bible approves it, but the Bible approves it because it is right and good. It does not make an act wrong and sinful because the Bible condemns it, but the Bible condemns it because it is an evil in and of itself. There is a sense of right and wrong, of justice and injustice, to some extent among all nations. And there are no more conscientious men and women on earth than are found in heathen lands. It is not the business of the Bible to create a conscience so much as to direct it aright. This can only be done by correcting the judgment. While it is true in the main that the "moral quality of an action is found in the intention," yet a bad act, performed in consequence of willful ignorance, must always be an exception to this definition. It is every one's duty to form a correct judgment so far as they have the ability, gauged by the standard of God's Word. Conscience is no guide in and of itself. The revealed Will of God, as found in His Holy Word, is the only standard of right and wrong, of good and evil. This applies, of course, only to those in Christian lands, who have access to that Word. Hence, ignorance of God's will, where it may be known, involves guilt. PREJUDICE is the great Chinese wall that stands across the road of all true reform. Men form their judgments from erroneous premises. They freeze up in the old moss-grown ruts and tread-mill paths, and when, occasionally, one steps out and calls in question the old, musty opinions of the world, he is denounced as a "crank," a "lunatic," or a "fool." The vast herd of mankind are like a flock of sheep—where the leader goes, they will follow. Take a stand for true principle, bring

in as proof the clearest logic, the strongest reasoning, the demonstration of truth, even a "Thus saith the Lord," and, with a "satisfied grin" and a shrug of the shoulders, they say: "Well, I'll tell you what I think about it," and, lo! it is what the books, or my church, or my creed, or my favorite leader thinks. It is so easy to have some one think for you; it is no trouble at all; it requires no effort. Just jump into the current, and float along like drift-wood. And no class is exempt. The philosopher, as well as the barbarian, is under its control. The learned and the unlearned, the rich and the poor, the wise, as well as the fool, are bound by it. Every age, sex, and condition pay tribute to it. It enters the sanctuary, stands in the pulpit, sits in the pews, and mingles its hideous form in the devotions of the saints. The world, in every department, in its estimation, has "gone to seed." Nothing more is desirable, or can be learned, in Politics, Science, or Religion. "Whatever is, is right," and conscience approves.

Then again, multitudes in our world, descending through a long line of depravity, inherit a feeble and dwarfed moral faculty. And their entire environment through life makes their conscience resemble John Randolph's land up on the Roanoke. He said it was naturally very poor, and greatly reduced by cultivation. Few men have any higher standard of right and wrong than civil law. Whatever the law allows, in their estimation, is right. And this pernicious principle, being acted out in the higher circles of Society, in both Church and State, demoralizes all, both high and low. The tendency is, to recognize no higher law than human, thus closing up the only avenue that leads up to God.

A NEW ATTEMPT TO SOLVE AN OLD PROBLEM.

BY JUDGE G. C. LANPHERE.

Believers in God usually ascribe to Him three great leading attributes, or qualities,—namely, infinite power, infinite wisdom, and perfect goodness.

As the Creator and Preserver of this vast universe, He cannot be lacking in either of these qualities.

In a former paper I have attempted to prove that foreknowledge in God is perfectly consistent with the freedom of man's will—with what success I leave the reader to judge; that to foreknow how an individual will act in the future is not to control his conduct, or in any manner limit the freedom of his will; and that it can make no difference, so far as the effect on the individual is concerned, whether that foreknowledge is possessed by a human being, or by the Almighty.

Now, if God's attributes are as above stated, then there arises the greatest of all human problems,—namely, how God can be infinitely good, wise, and powerful, and yet create beings who He knows will sin and suffer eternally.

The mind is shocked by the thought, and asks, why God, being absolute in power and perfect in goodness, does not stay His hand, forbear to create, and so save the miserable wretch from the awful doom? As intelligent beings, it becomes us to reconcile, if possible, these difficulties, and to show that God's acts are consistent with our highest sense of justice

and mercy; in other words, "To justify the ways of God to man." I think this can be done, though I may utterly fail in the attempt. In discussing this question, I shall not speak as a Christian, but as a Theist, as a believer in God.

As the basis of my argument, I assume *the freedom of the will*, and such freedom implies that every man makes his own state or condition of mind. Circumstances and inherited qualities exert a great influence over him, but not a controlling one. If they did, there would be no freedom and no moral responsibility. When we concede freedom of the will, we concede that, so far as his mind is concerned, man is free—is master of himself and of his ultimate destiny. Neither God nor man, without the consent of the individual, can enslave the mind. And it is of the mind only that happiness or misery can be predicated. Surrounding objects, through the senses, may affect the mind, but the mind is the seat of happiness or misery—is the man.

An infinite Being, the Father of us all, endowed with the qualities I have named, must desire the happiness of His children; but He must respect man's freedom, and hence cannot force happiness upon him. He must leave the individual free to choose and make his own happiness and heaven. Heaven, whether here or hereafter, is supposed to be a place of happiness, of peace, of rest. But what is heaven to one man is anything but heaven to another. "What is one man's meat is another man's poison." Every man makes his own heaven. This is implied in the freedom of the will. My heaven might be hell to you; yours torture to me.

Beyond question, there is a kind of heaven or happiness in the indulgence of any vice, and in the commission of any and all crimes. "Revenge is sweet" to the revengeful man, and so is theft and murder and all other crimes to some persons. It is their delight, their heaven; and a kind Father, while bringing to bear every influence to deter and restrain from evil, will permit each person to make his own bed, and to enjoy all the happiness possible in the path he has chosen. The fact that the indulgence of vice and crime is followed, sooner or later, by punishment, or pain, or suffering, or humiliation, does not alter the case. It is heaven of a certain kind in the act; it is present happiness, and if the foolish one thinks of retribution, the present pleasure outweighs the unhappiness caused by the fear of the future. If this were not so, vice and crime would cease. Every man makes his own heaven, and this is the key to the problem. To force happiness of whatever kind upon man would be to unman him, to make of him a machine. A just Being will so order that every one shall know in due time what are the consequences of both wrong and right doing, and then leave each free to choose his own happiness or heaven.

We can have, if we will, true happiness, or we can have the happiness arising from the indulgence of vice and crime. And this, judging the future by the past—the future life by the present life—*will ever be the case*. An infinitely wise Being does not change; hence, He will deal with us in the future life as in the present. When men cease to sin, cease to love and practise vice, and come to love and do the right, then they will enjoy the happiness that flows from well doing.

A sophistical writer, Mr. W. H. T. Mallock.

asks: "Is life worth living?" I answer: "Yes;" and that is the voice and the verdict of humanity, and of the whole animal creation as well. All seem to enjoy life, and all do what they can to prolong it. It is true, there are times in the lives of many human beings, possibly in the lives of all, when life is felt to be a curse—when men would gladly "shuffle off" not alone this "mortal coil," but existence itself. But the feeling in every case is temporary, and soon passes away. It is the exception, not the rule. With all, from the cradle to the grave, there is more pleasure than pain, more happiness than misery, more enjoyment than suffering. The more violent and absorbing the pain or the anguish, the sooner it exhausts itself, and peace is restored. "Sorrow is for the night; joy cometh in the morning." Count up the hours of pain and anguish, and set off against them the hours of enjoyment, of ease, of rest and peace, and the latter will outnumber the former a thousand-fold. Life is worth living. It is a blessing to all; it brings heaven of one kind or another to all of God's creatures; and hence His ways are justified.

GALESBURG, Ill.

"EVEN AS HE IS PURE."

BY DR. C. H. BALSBAUGH.

Profession is not possession, and pretension is not reality. The sons of Sceva may be capital exorcists, but not Christians. They have their counterparts to-day. "Great swelling words" are not words of God; broad phylacteries are not broad enough to cover shame; and doing and daring in the name of Jesus is not always prompted by the life of Jesus. He was "meek and lowly in heart," "holy, harmless, undefiled, separate from sinners." He "came not to be ministered unto, but to minister, and gave his life a ransom for many." "When He was reviled He reviled not again; when He suffered He threatened not, but committed Himself to Him that judgeth righteously." This is the Christ of God, and this the ideal of all Christians. To aim lower is to spurn the cross. Perfection is not here, but the desire, and endeavor, and tendency are. "It doth not yet appear what we shall be," but when "He appears" "the second time without sin unto salvation," "we shall see Him as He is, and be like Him." "And every man that hath *this hope in Him PURIFIETH HIMSELF even as HE IS PURE.*"

My dear fellow-pilgrim, your sorrows, and struggles, and self-loathings, and fears, and hopes, and light, and darkness in the upward path are as familiar to me as my own personality. I am one of the paradoxical progressives that get all true life out of death,—who live in the exact ratio of their dying, and *vice versa*. We are not delivered from evil in a day,—not at a bound do we leap into "all the fullness of the Godhead." We are enjoined to pray for our *daily* bread, and in conjunction with this for "*deliverance from evil.*" To God belong the everlasting years, and He takes millenniums to fulfill His first promise to fallen humanity. When Eve gave birth to Cain she fancied the Serpent-bruiser had come; but instead of the Messiah he proved a fratricide. The common version gives a false impression as to Eve's expectation in her initial maternity. It reads in the translation, "I have gotten a

man from the Lord," but in the original, thus: I have gotten the man, the *Lord*, IAHVEH. That is, I have gotten the promised One, the Restorer, Jehovah-Jesus. But she died without seeing Him, let us hope not without feeling Him. For generations, and centuries, and millenniums, prophets, and saints, and sin-burdened souls waited, but saw Him not, and yet saw Him. "Abraham saw His day, and was glad;" "Isaiah beheld His glory," Moses "saw His back parts," and many others by inspiration looked through the half-transparent veil, and enjoyed fore-glimpses of Iahveh, the Absolute I AM, the Creator, Redeemer, and finally and forever Incarnate God. With fleshly eyes He was seen only thirty-three years. Then many saw and saw Him not. He was better known, more clearly seen by many of His progenitors than by His contemporaries. Not at once, not with a thought, or a single word, or volition, was the Incarnation effected. The promise required a historical development, and so did the Christ Himself. The world had to be trained for His coming, and trained for His apprehension after He was here. Few know Him yet. When Paul wrote to the Philippians he had not yet apprehended. So it is now. The question is, *do we know Him at all* in the sense of a personal identity, or only as a historical personage to wrangle about as we would about any other misconceived fact? Are we forgetting past crudities, and inconsistencies, and conscientious absurdities, and reaching into fuller appropriations of God manifest in the flesh? Heads full of all Christian lore, and the eloquence of all the Ciceros of earth, and all the Gabriels and Michaels of Heaven, will not make us Christians. "I am come that ye might have LIFE, and that ye might have it more abundantly." Here we have the whole object of the Divine Incarnation. But the Cross lies on the Manger, and the Manger hangs on the Cross. These two are complemental. Such an Incoming is nothing, worse than nothing, without such an Outgoing. First the Babe, then the Example, then the Atonement. The first throb of life in the vestal ovum must be Divine-human, and so also the last pulsation on the Cross. This is the only way of purifying human nature, making it the temple of the Holy Ghost.

First the blade, then the ear, and lastly the ripe corn. First the embryo, then the infant, then the child, then the youth, then manhood. First milk, then strong meat. First the dawn, then sunrise, then meridian. "The path of the just is as the shining light, that shineth more and more unto the perfect day." Prov. 4:18. "God is Light." Jesus "was the true Light, which lighteth every man that cometh into the world." "*Purifieth himself, even as HE is pure.*" *Purifieth*. Ever present tense, always in process of sanctification, constantly "changed into the same image from glory to glory." 2 Cor. 3:18. This is progression worthy of the name. Our mundane life is too short, too crowded with tremendous problems, too vast and solemn in its issues, to be frittered away on vanities that feed only the elements introduced by sin. God incarnate is the one ruling idea of the Bible. To know no creed but the Bible is to "know nothing but Jesus Christ and Him Crucified." The crushing of the Serpent's head, and the bruising of the Victor's heel, go together. He is "the Way, the Truth, the Life," "the same yesterday, to-day, and forever." If we have entered into the

awful realities of sin and holiness as revealed in the crucifixion of Incarnate Deity, we will have no trouble with ideas of progress that take away the flesh from the inexorable restrictions of the cross. The dreadful stringency of the life of God in the flesh is the great stumbling block, not only to the world, but to Christendom. If we have entered in earnest on the solemn, arduous work of "purifying ourselves as He is pure," our affections worldward will be too dead—"crucified with Christ"—to hanker after sweets that are delectable to the flesh only when God is absent. The cross does not price its pleasures by carnal arithmetic. "Yea, doubtless, I count all things but loss for the excellency of the knowledge of Christ Jesus MY LORD, FOR WHOM I have suffered the loss of all things, and do count them but refuse THAT I MAY WIN CHRIST."

This looks very like doing all things "for Jesus' sake," and as if Christianity was a veritable Divine inbeing and an all-inclusive fact. This is the Divine mathematics of salvation, counting all things as vile dross for so exalted and blessed a consciousness—knowing Christ as we know our own being. This is the philosophy and method of "purifying ourselves as He is pure." To use things and ourselves for a purpose not intended by God is to break up normal relations, which is death. The outward gets all its value in its symbolism and instrumentality. Formality is not so much observance of forms not literally enjoined in Scripture, as the unspiritual observance of those that are. To do aught not "for Jesus' sake" is to contravene the intent of the Divine Incarnation. To "have the mind of Christ," and in exact proportion as we have it, are we "perfect even as our Father in Heaven is perfect." The Word made flesh is the Christian's environment, and harmony with this arrangement is life. The Christian, mark, the *Christed* soul, sees out of the new being inaugurated by God becoming man. "Blessed are the pure in heart, for they shall see God," here, and now, and ever, more and more, as the likeness to Him becomes more constitutional and perfect. This is the *sine qua non* of salvation. Failing in this, with all gifts, and powers, and sacrifices, and achievements, we are as sounding brass, or a tinkling cymbal. Corruption and damnation are synonyms. So are purification and salvation. By their fruits ye shall know them. The flesh enslaving God will express God, and not its perverted disposition and propensities. A lamb makes no wolf tracks. The fleece may be assumed. Look at the footprint. That reveals the innermost. "He that saith he abideth in Him ought himself also so to walk EVEN AS HE WALKED." So to walk, is to get nearer and liker God at every step. This is Christian progress. Nothing else is. This is to "purify ourselves even as He is pure;" this opens more and more the Beatific Vision—"they shall see God;" this brings "the peace which passeth all understanding," the very "peace of God," the ineffable serenity and rest of Jehovah; this is the sublime achievement of the Divine Incarnation; this is the satisfaction of the God-man as the fruit of the travail of His immaculate, sin-atoning soul. "He gave Himself for us, that He might redeem us from all iniquity, and PURIFY UNTO HIMSELF a peculiar people." This is peculiar enough, far too peculiar for the vast majority, even of Christendom. "Purify us UNTO HIMSELF." For this purpose "He gave Himself." Ecce Homo, Ecce Deus. These words of inspiration

tell us *what God is*, and the necessity and possibility and manner of being "pure even as He is pure." The crucifixion-phrases of the sacred record are the Diamond Texts of the Bible. All Christians should search them out and commit them to memory, and, what is more, learn them by heart. This should be the staple of our preaching and writing, the sum of our thinking, feeling, living. The work of redemption requires the utmost strain of both Divinity and humanity. "The Kingdom of Heaven suffereth violence, and the violent take it by force." It demands "all the heart, all the mind, all the soul, all the strength." And the combination of all these, in their utmost tension, the Bible calls LOVE. No room in this all-inclusive obligation and consecration for "the lust of the flesh, the lust of the eyes, and the pride of life." This truth is to be the object and subject of our faith, and "he that believeth not," *as Christ believed*, "will be damned." A whole Christ for us, a whole Christ in us, and a whole self for Christ. God gives Himself to Christians with a reality and fullness never known by drones and sluggards and hybrids. If we would reign *with* Christ, we must let Him reign *in* and *over* us. "Pure as He is pure" means the repetition of His Incarnation in us. What to such a soul is much that is now current as advanced theology? What care the Emmamuels for liberty and knowledge, that bring neither God-consciousness, nor purity, nor peace? What have the God-lovers to do with the flesh but to crucify it, and, by the cross, lift it into a higher sphere and into a Diviner function? This is the truth: God came into the flesh to teach mankind, and this is the truth few have learned. To realize this is to press through the strait gate, and enter on the narrow way. We need a fresh emphasis through the Holy Ghost to restate and re-impress the nature and laws of the Kingdom of God, and thunder forth the awful *Metanoia* that makes us Christ-minded and Christ-showing. *Metanoia* is the great root-word, mis-translated *repent*, in Matt. 3: 2, and carries with it the whole heart of God, as Father, Saviour, Judge; and the whole heart of man as sinner, and his whole capacity as redeemed. It means "purifying ourselves as He is pure," "walking as He walked," BEING as HE IS. This is "the high Calling of God in Christ Jesus." Are we "pressing toward the mark for the prize?"

"Oh, the depth!" we may well exclaim with Paul. "How unsearchable," "past finding out," "passeth knowledge," "God manifest in the flesh." "Without controversy, great is the mystery of Godliness." This is the principle and the fact of being "pure even as He is pure." "It doth not yet appear *what* we shall be." *Locality* is secondary, but not unimportant. The great Sacerdotal prayer is: "I will that they whom Thou hast given Me, BE WITH ME WHERE I AM; that they may behold My glory." This is both state and place. But the *Me* and *I* constitute the essence of Heaven, here and hereafter. "We know that when He shall appear, we shall be LIKE HIM, for we shall see Him as He is." "Beloved, now are we the sons of God." "Therefore the world knoweth us not, because it knew Him not." "Be ye holy, for I am holy." "Without holiness, no man shall see the Lord." This is "the middle wall of partition," this is the "great gulf fixed." "Awake! awake! Put on thy strength, O Zion; put on thy beautiful gar-

ments, O Jerusalem, the Holy City, for henceforth there shall no more come unto thee the uncircumcised and the unclean." "*Shake thyself from the dust; arise and sit down, O Jerusalem; loose thyself from the bands of thy neck, O captive daughter of Zion.*" (Isaiah 52: 1, 2.) Let us link this urgent, solemn injunction, so manifestly and sadly appropriate to our times, with Rev. 21: 27: "There shall in no wise enter into it ANYTHING THAT DEFILETH, neither what soever worketh abomination, or maketh a lie." The walls are jasper, the foundations garnished with all manner of precious stones, the gates of pearl, the streets of gold, as it were transparent glass, the Holy Lord God Almighty and the Lamb are the light and glory thereof. Need any one be surprised at the inexorable conditions of admission? Be not deceived: God is verily not mocked. Unless we "purify ourselves even as He is pure," Heaven is not for us.

UNION DEPOSIT, Pa.

INERTIA.

BY REV. T. NIELD.

Matter cannot move except in response to received force. This inability to move itself is called its inertia. But while matter itself is inert, there is a central force whose centripetal action is all-present, and, unless overruled by some greater force, it is all-controlling in the realm of matter. This force is the anchor that holds the material universe to its moorings; and what we term inertia is the obedience of matter to this force. And hence, in considering the subject of the inertia of matter, we merely consider the modes of gravital action. Suppose we have an ivory ball suspended by a thread. We raise it to one side horizontally and then let go our hold. At once it descends in response to the pull of gravity. At first its motion is slow; but its speed accelerates as it descends, until it reaches the nadir point, after which it ascends in the opposite direction with diminishing speed, until it stops slightly short of the horizontal line. Both in descending and ascending it illustrates the law of inertia. In descending it goes *with* gravity, and so *obeys* force. In ascending, it goes *against* gravity, and *resists* force. We readily see why it should go with gravity, but not so readily why it goes against it. This we may illustrate as follows: Suppose a locomotive at rest on a track. Steam is turned on. By degrees the massive structure yields to the force thus applied, and moves. As the force increases the mass of matter increases its speed. With still increased and continuously applied force, the moving body becomes so highly charged that it acquires a tremendous momentum, which is concentrated force, and which force must expend itself *in some way*. It is somewhat like this with the descending ball. From the moment it is set free from the overruling force that holds it in the horizontal position, it yields to the gravital pull, which continues and keeps growing stronger, until the accumulation of force in the ball becomes too great to expend itself in descent to the center of gravity, the excess consumed in ascent being the degree of momentum, or accumulated force. Thus its inertia, or inability to move itself, subjects it to the action of gravity.

The inertia of matter may be further illus-

trated by adding another ball. As before, the ball is held at the horizontal point. Upon being released it sweeps downward and strikes the other ball, the tendency being to drive that toward the point itself would have reached if unobstructed. Here it may be stated as a law of inertia that the tendency of the second ball to ascend, as well as its resistance upon being struck, is as its elasticity and the gravital pull that holds it in repose, the former being its capacity to receive the superfluous force discharged by the first ball. If the second ball equals the first in gravital attraction and elasticity, it will, when struck, fly off as far as the first would have done, minus the force consumed in transmission. If the gravital pull be greater than the accumulated force of the first ball, the second will not move forward when struck, for the obvious reason that a less force cannot overcome a greater. The striking ball must expend its force either in reaction or indentation. If it be itself elastic, the expenditure will be in reaction; if non-elastic, it will be in indentation.

If the second ball be non-elastic, it will be driven before the first—both balls being equal in gravity—until momentum is counterbalanced by the pull that held the struck ball in gravital repose, for the reason that the second ball does not receive into itself the force of the first, but the striking ball has to consume its own force, while their equality of weight makes them equal in power of displacement, which means that the first equals the second, plus momentum.

Suppose the balls are alike in weight, and both alike elastic. Then the one ball will give and the other receive the momentive force; and were no force consumed in the act of transmission, the struck ball would swing as far as would the striker had it gone forward unimpeded. But both balls become indented, the indentations springing back again. This is the play of their elasticity. In the act of indentation the striker charges the other ball with its own momentum, and the reaction of the two indentations results in the gravital repose of the striker. It has given up its force, and yields inertly to gravity, while the ball struck goes forward because that is the direction of the received force. The transmitted force, however, will not carry the receiver as far as the first ball would have gone, because some of the force was consumed in transmission. If any one of our readers be indisposed to take any account of reactive force, let him try the following experiment. Let him suspend a block of wood, as near his own size and weight as may be, and wrap a quilt or two around it. Let him descend in a swing from a horizontal line and strike the block of wood with his back, and report results. If *all* the momentive force passes from his body to the block of wood, there will be no force left to expend itself upon his body. But if he feels any peculiar sensation in the region of his spinal column, he may safely conclude that it is the effect of an expenditure of reactive or, as he might prefer to say, of collusive force. It is obvious that the force of which he is so acutely sensible did not pass into the block of wood.

Now comes the question, *How* is force transferred from one body to another? If a suspended ivory ball strike another of soft putty, its force will be absorbed in the putty, because the resistance of the putty is less than the gravital pull that holds it in position. Yet its

gradual and accumulating resistance becomes greater than the displacing capacity of the applied force. In other words, the momentive force becomes so distributed that at no moment does it exceed the static gravity of the putty ball.

In the transfer of force there must be both action and reaction. When a locomotive, rushing at a great speed, strikes another standing still on the track, there is a terrific crash, because there is action without reaction. The momentive force took a considerable time to accumulate, and cannot be transferred immediately and by direct impact to push the standing locomotive ahead. Were there a reservoir in the elasticity of the material to receive and store up the surplus force as a reserve, to be expended in reaction, there would be no crash. For instance: Had there been sufficient spring-power in the standing locomotive to receive all the momentive force of the other, the first would have given up its force, and the second have received it. But the springs that were driven forward in receiving the force, would start back, and, in doing so, stop the other locomotive, and push forward their own.

Another law in the transfer of force may be given. The more speedy the action and reaction, the more complete will be the transfer. It is a law of motion—the greater the force, the greater the speed. On the other hand, the longer the time taken in which to employ force, the more attenuated or weakened the force becomes; hence, the less the speed. From this it follows that the more speedily the transfer takes place the larger will be the percentage of force transferred: because for so much less time will the resistance of gravity have to be overcome.

Thus far we have considered inertia as manifesting itself under concussion. Now we come to consider it as manifested under friction. When a boy, we saw a man dig three holes, about eight inches in diameter and eight feet apart, in each of which he set up a stick, and placed jack-knives, money, etc., on the top. For a penny a boy had three chances to throw a stick at any of the three that were standing. If he could knock one down, he might have all the articles that dropped outside the hole beneath. Boy after boy came, and the sticks were often knocked down, but few were the prizes won. The boys almost invariably struck with all possible force, and, unless they struck the articles themselves, there would be no prize. But some sly fellow would come, measure the distance with his eye, throw very deliberately, and, with the slowest motion possible, be careful to strike his stick slantwise with a passing motion. Sure as he struck in that way, he got a prize, for the stick would carry its contents a distance as it fell, so that they dropped outside the hole.

Here again is illustrated the inertia of matter. The articles on the sticks could not move except as they were moved. Now for the explanation of this phase of inertia:

A concentrated force cannot be transferred from one body to another in, so to speak, *diluted* time. In concussion force is most concentrated, while in friction its transfer is slow. Hence, the stick, when struck suddenly, flies off under the concentrated force of the blow with such rapidity that there is not sufficient time for such a transfer of force through friction—which is the slowest medium of transfer—as will overcome the gravital repose of the

knife. On the other hand, the force is most diffused when most indirectly applied. Hence, the slow and slanting blow knocked down the stick with a slower motion, thus giving a longer time for the frictional transfer of the concussive force. Hence, the force was transferred so that the knife followed the stick. Here it may be added that so long as the transferred concussive force acting on the knife exceeded that of gravity, so long would the stick carry forward the knife; but, as the slanting position of the stick in falling lessened its capacity for the transfer of force, until that force should be less than the direct pull of gravity, the knife would fall.

In conclusion, we see that matter cannot move itself, and that it is subject to gravity. Take away gravity from moving matter, and the *helm* of motion is gone. Take away gravity from static matter, and it is mobile as the atmosphere. Nay, take away gravity, and there is no static matter. Therefore, we conclude that *Inertia* is the tendency of matter to obey the law of gravity.

ELMIRA, Mich.

MAN A CO-OPERATOR WITH THE INFINITE.

BY PROF. I. L. KEPHART, A. M.

When we contemplate the capabilities and the possibilities of man, we are overwhelmed with a sense both of their vastness and their insignificance. His achievements in the fields of discovery and invention have been wonderful. He has "harnessed the lightning;" utilized steam; tunneled the mountains; cabled the ocean, and so elevated himself, intellectually, socially, and morally, that already glimpses of the dawning millennium begin to appear. An intelligent realization of these facts awakens feelings of exultation, and causes to burst forth the exclamation: How great is man! Surely there is scarcely a limit to his powers, or a boundary to his capabilities!

But a more close observation of the facts in the case soon brings us to the limit of the possibilities of the "lord of creation." In reality, man, of himself, produces nothing. He finds himself everywhere surrounded, bound in and bound down by an infinite, exhaustless, ever-acting Agency; and all his achievements in invention and production are but so many successful efforts in the direction of discovering the manner in which this Infinite Agency acts, and then co-operating with it.

In the material world, man simply takes some of the products of that Agency, expends some effort upon those products, and, by co-operating with it, produces new effects. The farmer prepares the soil, selects the seed, and sows it. There his powers reach their limit. With all his boasted skill, he cannot make a single grain of wheat to grow. If he be a good chemist, he can chemically analyze the wheat-grain, determine all its original elements, and the proportion in which they are combined; he can even produce a grain of wheat by chemically combining the original elements that compose such a grain; but he cannot chemically produce a grain of wheat that *will grow*. Here his wisdom and power reach their limit. To do that, he must co-operate with the Infinite—he must take what the Infinite has already produced, and, having discovered the way in which that Agency acts in order to produce

wheat that will grow, he must expend his effort exactly along that line—must till, sow, and wait the co-operation of the Infinite Agency.

So with all man's boasted achievements: he has simply, in each and every particular, ascertained how the Infinite acts, and co-operated with that Agency. He has not, by any means, "harnessed the lightning and pressed it into his service;" he has only discovered the way the lightning goes—the manner in which it acts—and learned to act with it. So in utilizing steam, and wind, and gravity, and every other natural agency, man has only ascertained how the Infinite acts, and then turned in and co-operated with this Infinite Energy that is ever acting, and is all around us. A new invention is only the discovery of some hitherto undiscovered manner in which this Agency acts, or some new method for co-operating with the already-discovered ways in which it acts. Even the most atheistic will readily admit the truth and reasonableness of these statements. When Sir Humphry Davy discovered the safety-lamp, he only hit upon a method by which to move safely along with the Infinite through volumes of a highly combustible and very explosive gas and at the same time carry a burning lamp in his hand. When Jenner discovered vaccination, he only learned how to fit man up so that he can, with safety, move along with the Infinite through one of His established order of things.

But the Infinite acts not only in the material, but in the social and moral realms also. And this Infinite Agency is so reliable and so unchangeable that, having once discovered the manner in which it acts in any particular matter, we can rest assured that it will always act exactly in that way. "I AM THE LORD; I CHANGE NOT." Sunshine and showers never freeze up the rivers, and frost and snow never produce grass and flowers. In matters that pertain to human life and health, this Agency always acts in a certain way. Man, by discovering this way and harmonizing his behavior with it, avoids disease and secures health and long life; but, by willfully or ignorantly antagonizing this Agency in this matter—by violating the laws of health—he inflicts upon himself disease and premature death. No one would expect his watch to keep good time if he were to pour tar or vinegar among its wheels. How much less should any one expect to enjoy good health, and have a clear, bright mind, if he stupefies his brain with tobacco or opium, or coagulates it with alcohol?

In human society this Infinite Agency so acts that honesty, purity, temperance, kindness, and benevolence promote and secure the greatest possible social enjoyment. This has been thoroughly demonstrated by human experience, and the community and the State can no more reasonably expect to prosper and be happy regardless of the observance of these conditions than can a man expect to enjoy good health after swallowing arsenic into his stomach. The desired results can only be secured by co-operating with the Infinite. We must discover the way the Infinite acts to produce such results, and then act with it. When we would send news to a distant friend by the aid of lightning we must carefully act in harmony with the manner in which the lightning acts. We must accommodate our ways to its ways; then we succeed!

This rule holds good also in the moral and

spiritual realm. The Infinite acts in a certain way, and all who would secure the best possible results in matters that pertain to their moral and spiritual nature, must, in these matters, harmonize their thoughts, their desires, their deeds, with the wise and holy order of things established by the Infinite. He who would escape the lashings of a guilty conscience, must avoid the committing of crime; or having done wickedly, must repent and secure forgiveness, and become reconciled to the Infinite's wise and holy way of doing things. He who would in all respects the most successfully complete his high and holy mission, and accomplish the great life task, must, with all his powers, become a co-operator with the Infinite—must acquaint himself with the manner in which the Infinite acts, and then act in that way. The farmer who most carefully acquaints himself with the way in which the Infinite acts in producing wheat, and then diligently acts in that way, is most successful in raising good crops. So he who most perfectly acquaints himself with the way in which the Infinite acts in matters pertaining to spiritual enjoyment, soul-elevation, and usefulness in the world, and then acts in that way, will best succeed in attaining to those desirable results. To do this he must, with the diligent discoverer and inventor, labor to acquaint himself with the way in which the Infinite acts in the moral and spiritual realm. He must study the volume of nature and the volume of revelation, and the more honestly and earnestly he does this, the more successfully will he become acquainted with the ways of the Infinite (the will of God concerning him), and the more perfectly will he succeed in co-operating with the Infinite.

If the above propositions are true (and surely they are), then the more intimately man becomes acquainted with the ways in which the Infinite acts, and the more diligently he co-operates with the Infinite, the more completely will he be successful in accomplishing life's highest mission, and in securing for himself its greatest good. That man can accomplish much in this direction is a fact that has been demonstrated by the lives of the men and women who have done the most in the way of lifting humanity into a higher plane socially, intellectually, and morally. These have also unequivocally declared that their success in co-operating with the Infinite was owing to the fact that they were enlightened by "THE TRUE LIGHT, which lighteth every man that cometh into the world," and because they experienced that newness of life which in Scripture phrase is denominated being "born from above." And what is this spiritual enlightenment and this being "born from above" but becoming more personally and more intimately acquainted with the Infinite's way of acting in things that pertain to man's moral nature? To me it seems to sustain the same relation to the soul-life (and is just as reasonable and philosophical) that discovery and invention sustain to agriculture, chemistry, and mechanics.

From the above considerations we can see the important position occupied by every worker, every inventor, every teacher. All are co-operating with the Infinite—the common laborer as well as the skilled mechanic, inventor, or chemist—all these, in so far as their efforts are productive of good results, are co-operating with the Divine Energy that sustains all things. We see also what an impor-

tant work is being accomplished by all those who are exposing false theories and systems, whether in the physical, social, or moral realm. They are noble workers, engaged in tearing down obstacles which stand in the way of man's co-operating with his Creator—obstacles which prevent him from attaining to his greatest good.

We see also the importance of our seeking earnestly for, and being satisfied with nothing but *the truth*. The truth is everything; theories are nothing. Every honest investigator and lover of his race rejoices at the overthrow of his pet theory, whenever he clearly sees that his theory was wrong and the truth has been discovered. No matter how much such overthrow and discovery may affect his popularity adversely, he rejoices because *the truth* in that matter has been brought to light.

One of the most hopeful signs of the times is the fact that as men advance in intelligence they become less and less inclined to reverence theories, and more and more inclined to seek after, reverence, and adore *the truth*. Man is now, more clearly than ever before, recognizing the fact that all his best interests for time and for eternity lie in the direction of his intelligently acquainting himself with the way in which the Infinite acts, and then co-operating with that Divine Being. And man is now, more really and more intelligently than ever before, recognizing the fact that in all matters that pertain to his social, moral, and spiritual nature, the highest and most reliable source of information to which he has access is found in the recorded teachings of Jesus the Christ; that in these matters He is really "the Way, the Truth, and the Life;" and that the more faithfully he follows His teachings, the more successfully does he become a co-operator with the Infinite in all matters that pertain to his social, moral, and spiritual elevation and happiness.

WORLD WITHOUT END.

BY REV. J. I. SWANDER, A. M.

While the shallow sophistry of modern materialism denies the existence of incorporeal substance in the universe, the unsatisfactory inductions of separatism ignore the essential relations between the respective parts thereof. Machine philosophy looks upon each order of existing entities, and each individual in its order, as having a complete meaning and mission in the limited circle of its own being. The mineral, vegetable, animal, and human kingdoms are kept as far apart as if they had never been designed to serve the purpose of one stupendous whole. True, it is tacitly admitted that the vegetable subsists upon the mineral; that the animal feeds upon the vegetable; that the human, by reason of superior power, is "lord of the fowl and the brute;" and that the Church, or Kingdom of God, gathers up, in some sense, an element from the human race; but it is not yet generally felt and acknowledged that through the whole organic concatenation of graded orders there is a unity of design which gives each order a meaning beyond itself, culminating in that one world without end—the Kingdom which ruleth over all, and ultimately receiveth into itself the glory of all.

Worlds with ends have their ends beyond

themselves. World without end has its eternal purpose, illimitable being, and endless duration in itself, in the sphere of the infinite, and in the realm of the absolute. Whatever the endless absolute does for the subservient and relative, is done always according to the law of internal and eternal necessity, which is the highest form of freedom. Thus all things are from God and for Him, who is the personal source and center, as well as the circumference of world without end.

At the head of this ascending series in Creation, and next to the Supreme, in such relation as to be overlapped by the image and overshadowed by the power of the Highest, is the human kingdom, whose peculiar mission is to gather up the meaning of all below, and pour it back, through the devotions of the heart, the intelligence of the intellect, and the acts of the will, into the lap of its Infinite Source. Thus, not man through nature, but nature through man looks up toward nature's God. But unaided nature—or that which means the same thing in this connection—unaided science—while looking up, cannot see very far nor very clearly until the tabernacle of God is pitched with men, and the telescopic powers of divine revelation have brought the object of human search within the range of human vision. This much is now generally admitted by the more advanced theology, if not by the fixed and finished orthodoxy of the age: but neither of them have yet come to that commanding summit of Mount Zion, from whose religio-scientific lookout the many worlds with ends may be seen and known in their mediate or immediate relations to the world without end.

The only proper stand-point for both science and religion is the christologic principle as enshrined in the theanthropic person of Emmanuel. From this common and commanding point of view Jehovah may look down, and man may look up with mutual admiration. No man hath seen God at any time, except as the latter has become visible through the revelation of Himself in the only begotten Son, who is in the bosom of the Father; and it is equally true that God hath seen no man at any time, except as He has viewed him from the grand, central observatory of the Incarnation. God can look upon His works with complacency only as He sees them in their completeness. Man without Christ would be as incomplete as nature without man. As man is the crown of nature, Christ is the crown of man. All sound christological thinking must come finally to hold the Incarnation as essential to the actualization of that eternal and supreme thought in the mind of Jehovah, which finds its full expression in the fact and form of the Universe. Under any other view, creation can be regarded as only the first few spans of a bridge extending from a finite shore toward the unknown and unknowable center of some infinite ocean until it comes to the—*the jumping-off place*.

Jesus Christ is not only the beginning and ending, but also the center of God's creation; and a proper recognition of this cardinal, christocentric fact is the beginning of all true investigation into whatever is knowable of God, man, and nature; and nothing is truly known or knowable of either, except as each is searched and seen in proper relation to each other. Much of the manifest failure in the world's most vigorous philosophical thinking, as well as the blundering mistakes of its most sturdy blows at error, may be attributed to the

false stand-point and starting-point of men, who in all ages have stepped forward to champion their own subjective apprehensions of the truth. Those apprehensions were generally found to be narrow or one-sided, if not absolutely false. Demonstrations of anatomy, conducted, not without brains, but in ignorance of the heart, and its functions in the system. No wonder that the world's cyclopedia of the sciences seems more like travesty than truth. How could it be otherwise? The truth half known is an error, and the truth half told is a falsehood. The wave-theory of sound in science, and the wave-theory of the Gospel in religion, complement each other in containing just truth enough to make them both "respectable" and dangerous.—Little ass-tronomic side-shows, which, even when in perihelion, are darkened with the dust of confusion.

Let us turn over a few leaves and scan a few pages of history. Platonism acknowledged the being of a personal God, and proclaimed the eternal existence of amorphous matter, and, after floundering through the most earnest ages and stages of its inquiry for truth, confessed its utter helplessness by a dedication of its idolatrous temples "*To the unknown God.*" Cartesianism started with its *Cogito. Ergo Sum.* and landed either in the idealism of Fiecht, or, falling in the line of the atomistic theory of Democritus, reports itself as present in the crowded school of modern materialism. The most vigorous theological thinkers in the philosophical dynasty of Descartes, proceeding by the *inductive method* of Bacon, were either caught and carried along by the pantheistic current in one direction, or landed high and dry by the tidal-wave of metaphysical reasoning upon the barren rock of supralapsarian abstractions, where their ends may now be found in a pair of beautiful blue stockings. The present, therefore, is an age of philosophic eclecticism and scientific anarchy. During this interregnum, the scientific cabinet is full of amusing curiosities, and the world equally full of morbid spectators. Agnosticism appears before the impatient audience with the declaration that nothing is knowable, and while it elucidates nothing but the consistency of its own profession, it elicits rounds of applause by demonstrating conclusively that it knows nothing. The counterpart of the popular programme is equally rich in all the elements of stage thunder; evolution starts with the eternity of matter, and ends the evening exhibition with a few feeble rays of molecular moonshine.

This condition of things proves that the deepest necessity of the world requires a theology and philosophy of flesh and blood. That requirement was responded to by the Incarnation of Infinite Wisdom and Love. To this end was Emmanuel born, that he might bear witness to the truth. His testimony was given, not in the way of affirming the correctness of some abstract and theoretic statement, but by manifesting himself as the personal embodiment of THE TRUTH, and the key to the proper apprehension of all relative truths, whether in religion or science. This, then, we repeat, is the proper point of observation, especially for our unprecedented age of devotional and intellectual activity. It should be chosen for its commanding eminence, and occupied for its universal centrality. From this point the Christian philosopher, making use of all the helps afforded in Revelation and Nature, exercising

the functions of both faith and reason, may sweep the entire religio-scientific field of known and knowable truth, and demonstrate to all the world that God's great handiwork is not a mere stupendous pile of jumbled irrelativities, but the well-designed expression of ONE eternal thought, in which and subordinate to which all other thoughts, as well as all expressions thereof, are for each, and each for all, and all for Him who is over all, God blessed for evermore—world without end.

The above advocacy of the *one* cardinal point in the religio-scientific compass implies, of course, that the Incarnation be accepted and held in its proper and permanent sense. The old heresies of Gnosticism, Ebionism, Eutychianism, and Nestorianism must be guarded against as ever seeking to repeat themselves in the onward march of the most earnest christological inquiry. To be of any assistance in explaining the meaning of nature, in studying the dignity and destiny of man, in searching to find out God, and, in short, to serve as the anthropological key to the problem of the Universe, the Incarnation must be apprehended as a fact of concrete and substantial force in the history of the world's life. The Son of God did not merely enshrine Himself in a human soul, and encamp for a few years in the body of a man, but assumed, for all eternity, the living law of humanity in its generic sense, so that he became the second Adam, the head of creation. "in whom are gathered together in *one* all things in Christ, both which are in Heaven and which are on earth." The foregoing also presumes the truth of a postulate not generally accepted by the most popular theological thinking of the world, viz.: *The Incarnation would have become a reality in the history of the world, even if man had not sinned.*

This central thread, upon which an attempt is now being made to string the paragraphs of this paper, is not offered to the intelligent readers of the MICROCOSM as something newly spun. It has been affirmed by some of the profoundest thinkers in the past, and has more recently received additional emphasis from many of the most advanced theologians in Europe, and especially in Germany, among whom may be mentioned Dr. J. H. A. Ebrard, Dr. J. J. Van Oosterzee, Bishop Martensen, Dr. Liebner, and Dr. J. A. Dorner. Neither would we have the impression go abroad that we are entirely ignorant of the difficulties which confront this theory in the questionable light of some of our present prevailing exegesis. The Holy Scriptures are generally approached and interpreted from either the harmortological or soteriological standpoint, rather than from the proper theanthropological point of view. This, we think, is a mistake. The entrance of sin into the world laid upon Immanuel only the additional necessity of humiliation, sorrow, and pain; or, in the language of Dr. Liebner: "Sin served only to bring in this modification, which, indeed, reaches far and deep, that now Christ appears *also* as a Redeemer and Sacrifice." Creation, not the perversion thereof, drew after it the complementive act and fact of the Incarnation. To make sin the sole occasion for uniting the Divine with the human in the bonds of everlasting wedlock is to exalt the devil above measure, and concede to the prince of darkness a power to switch the express train of Jehovah's eternal and comprehensive purpose upon an infralapsarian side-track, even though it may not

limit the supreme sovereignty of world without end.

The relation of this necessary and central position of the Incarnation to The Substantial Philosophy is just now a question of considerable interest to those who are disposed to do a little thinking upon their own responsibility. Substantialism, as we apprehend it, teaches that there is an incorporeal Universe, with its parts designedly and organically linked together, starting with the holy incense of odor, ascending the rising scale of a regular gradation, through gravity, magnetism, sound, heat, life, soul, mind, and spirit, up to God, the Fountain of all, and personal center of world without end. Whatever defects this new system of philosophy may involve, it certainly has its head turned in the right direction, and its founder cannot be very far, scientifically, from the Kingdom of God. May it continue to move onward and upward until its outstretched hand shall grasp the most central key of "knowledge in the mystery of Christ, which in other ages was not made known unto the sons of men." Standing thus in the Grand Central Temple of Truth, illumined by the effulgence of Him who is the light thereof, and in whom are hid all the treasures of wisdom and knowledge, The Substantial Philosophy must continue to manifest itself as superior to all other systems of human thought. The horizon is already tinged with the prophecies of Truth's illustrious day. When that auspicious morning dawns, look out for the first flashes of millennial light and glory. The flash of materialism profiteth nothing; it is the spirit of Substantialism that quickeneth. Lift up your heads, ye heavenly gates! ye everlasting doors, give way! that the universal waves of adoration may roll back to Him who sent His Son to become "the first born of every creature," and bring many adopted sons to His "glory in the Church, by Christ Jesus," throughout all ages, world without end.

FREMONT, O.

THE DEATH OF A DAY.

BY PROF. ISAAC N. VAIL.

'Twas a rapturous scene,
And I gazed with delight
On the pink-tinted sheen
O'er the brow of the night—
O'er the skies' blushing west,
That no skilled hand could trace—
O'er the high welkin dressed
With ineffable grace.

And I heard something say
In the calm, quiet air,
"Tis the death of a day,
And his watchers are there."
'Tis the proud form of Time
Moving downward to die,
With his honors sublime
Floating back on the sky.

"The streamers that spread
O'er the brow of the deep,
Are his glances that fade
As he sinks to his sleep.
And the bright firmament,
Is his pure soul afloat,
Where his glories are blest
As his spirit goes out."

He was kissed by the cloud
In its liv'ry of light,
And the winds sang aloud
O'er his beautiful flight,
And the strain was so sweet
He was joyous to die,
In his pure winding-sheet—
The emerald sky.

"We lay thee to rest
In thy cherub-made tomb,
And the smiles of the west
O'er thy ashes shall bloom.
The sweet-curtained morn
To thy glory be wed;
And a new day be born
To the beautiful dead."

The spirits came down
As the old Day retired,
And the smiles of the west
As he smiled and expired.
And the dark shadows fell
O'er the waste of the deep,
And the breeze tolled the knell
Of a day gone to sleep.

At the night's solemn bid
The *pall-bearers* came,
And the moon closed the lid
On the last look of flame.
All the marshaling skies
In the transit arrayed,
Were dipped in the dyes
As the *cortege* was made.

Then away moves the train,
With a slow, silent tread,
Toward the star-checked main,
With its glorious dead.
Oh, the beautiful death!
What a lesson portrayed
To this vanishing breath;
To this lingering shade!

To be watched by the skies
As we linger in state;
To be wrapped in their dyes,
As the angels await;
To be borne from the earth
In such beauty away,
To the wonderful birth
Of a lovelier day;

To be sung by the stars,
As they gaze on the sod;
To be fanned by the breeze
In the Garden of God.
Oh! these are but dreams
Of that Heavenly air,
But a glimpse of the streams
That are glittering there.

BARNESVILLE, Ohio.

MESMERISM, SPIRITUALISM, SWEDEN- BORGIANISM.

BY REV. JOHN COLLINS.

It is a well known fact that Spiritualists claim Swedenborgians; indeed, each claim the other, as we see below, for both claim to hold intercourse with spirits and the spirit world. We give the following as the highest authority: 1st. Prof. Bush, Swedenborgian, declares "persons in the *mesmeric* trance frequently

made the same report that Swedenborg does." "I saw my own thoughts read out to me. I beheld even my own bodily sensations transferred to another person. The laws of Swedenborg, in regard to intercourse between spirits, are the same as in mesmeric manifestations." I hesitate not to affirm that if the latter (Mesmer) be true, the former (Sweden) must be also. I know that I have not been deceived; I know the conceptions of my mind have been reproduced in another mind, by coming into communication with the mesmerized subject. I know, too, that this is the very result which one is taught to expect from what Swedenborg has revealed."

2d. MESMER LED HIM TO SWEDENBORG. "I scruple not to say that in all human probability, I should never have come to the position which I now occupy (Swedenborg Editor) had it not been for the overwhelming evidences of truth from this source—*mesmerism*."

3d. MESMERISM PROPAGATES SWEDENBORGIANISM. "If I know a single fact in science, in Geology, Chemistry and Optics, I know the truth of Mesmerism; I utter it, too, as my unwavering judgment, it has done more to beget a conviction of the claims of Swedenborg than perhaps any other human agency."—*Statements of Reason*, page 13.

4th. Prof. Grimes says "Rev. Geo. Bush, a Swedenborgian, was struck by the resemblance of Davis' (Clairvoyant Spiritist) manifestations to those of Swedenborg." "He published a book (*Mesmer and Swedenborg*) in which he undertook to prove that mesmerism harmonized with, and corroborates Swedenborgianism and that Davis' (spirit) case was perfectly truthful and reliable."

"The materials from which spiritualists have made their wonders, manifestations, and miracles are, excepting the jugglery, stolen from Mesmerism, while the spiritual machinery is mostly filched from stores of Swedenborg."

"The terms 'medium,' 'spiritual spheres,' 'communications,' the idea of spiritual societies, gradual progression from lower to higher spheres, the resemblance of spiritual to terrestrial characters and manners, are all from Swedenborg."

"Davis or his prompters were guilty of gross plagiarism by taking part of their pretended revelations from the writings of Swedenborg."

"Prof. Bush, instead of pointing out the fraud, explained it away by assuming that the departed spirit of Swedenborg had spoken by the mouth of Davis, the sentiments and nearly the same language that Swedenborg had written while alive. Prof. B. sanctioned the pretended revelations, advertised Davis' forthcoming work, and prepared the people to receive it with wonder. He was the first author who advocated the genuineness of modern Spiritualism."—*Mysteries of Human Nature*, page 361-377.

5th. Dr. Ellis, a new churchman, in his "appeal to Spiritualists," says, "consider the claims of the Swedish Seer, and compare those with the modern Seers and mediums and judge for yourselves. For over twenty-seven years he claims to have open intercourse with the spirit world; to see and converse with spirits and angels face to face." "Although a century before modern spiritualism, there is scarcely a phase of it which is not noticed and described in his writings, and of much of it the underlying philosophy of it is given. No intelligent spiritualist should, or can for a moment, justly

harbor objections, without first reading his writings, for to do so would be to condemn his own faith."—"Skepticism, call to the New Jerusalem Ch. 21."

6th. Prof. J. B. Dods, says, "the productions of Clairvoyants and mediums show that they live only by feeding upon the crumbs that fall from Swedenborg's table." "Human Magnetism warrants the conclusion that Swedenborg is but one link in the bright and endless chain of divine revelation."—*Lectures, and Letter to Prof. Bush*, page 128-248.

7th. Shakers are spiritualists, and testify that they regard the spiritualist movement as a preparation of the people to receive their doctrines. They hold Swedenborg to be the Angel of Spiritualism mentioned in Rev. 18.—*McClintock & Strong Cyclopedia*, vol. 9.

8th. William White, Biographer of Swedenborg, says "the relation of Swedenborgianism to Spiritualism is a story for a humorist. Years ago, when familiarity with spirits was rare, Swedenborgians used to snap up and treasure every scrap of supernatural intelligence. Many of the early Swedenborgians had wonderful private experiences to relate. Spirits rapped in Noble's Study. Clowes professed himself an amanuensis of Angels."

"But it so happened that Clairvoyants and Mediums, while they confirmed in general Swedenborg's other-world revelations, they contradicted him in many particulars."

"This was intolerable! Contradict our heavenly messenger!! At once the old line of argument was abandoned! Nothing now was wickeder than converse with spirits; it is forbidden by the word."

"True, Swedenborg did talk with spirits. He held a special license from the Lord. He warned us of its perils; and his example is no pretext for us (Evans, a Swedenborgian, says he had no monopoly). In return, the Spiritualists rank Swedenborg among the chief mediums, and question and adopt his testimony at discretion; but this only adds fire to the jealousy of the Swedenborgians, and fiercer and thicker fall their blows. 'Would it not,' says E. S., 'be more generous in our Swedenborgian friends to brave the perils of an investigation to settle this matter?'—*Planchette, Despair of Science*, by E. S., page 323.

My attention was called to this subject. I looked the matter up, and report the same to the readers of THE MICROCOSM.
FERRY VILLAGE, ME.

JOHN COLLINS.

CREATION AND SUBSTANTIALISM.

BY REV. F. HAMLIN.

Whence came this material world upon which I look? These heavens, upon which Abram and David and the Wise Men gazed, and these fields, which Ruth and Joseph and the Shepherds beheld? Whence came they? Surely not from nothing, for evidently the production of something presupposes the existence of something from which it originates. As reasonably talk of making a garment without using material, or of producing water by commingling of gases which do not exist. Nor can we believe that the world is materialized spirit, for they are essentially and utterly different. Whence, then, came this world, studded with beauty

and controlled by Law? We believe that God possessed from all eternity, not only an omnipresent spirit or intellectual power that grasped infinity extending through all time and space, but that he possessed a body equally omnipotent, constituted of the eternal but immaterial elements and forces of nature, such as gravity, electricity, heat, light, magnetism (all entities, as appears from the fact that they produce results), and that these forces and elements were the original things from which, by condensation or otherwise, matter was made or produced. This appears reasonable, not alone from Wilford Hall's reply to Clark Braden, in which he at once refutes the charge of Pantheism, and argues, from the continual emission of gravital rays by material bodies, for the material body itself being condensed gravity (see MICROCOSM, January, 1884, p. 165), but also from his clear elaboration, in the same article, of the thought that it is at once rational and scientific that immaterial substances can be transformed into material bodies by condensation or synthesis. I call attention, at this point, to the fact that if gravity, electricity, etc., or the force-element from which they are transformed, were from eternity the environment or body of Jehovah, we might expect to find them immutable in all ages and all places; and conversely, if these immaterial entities are proven by man to be unchangeable in essence, in so far that fact lends strength to the theory that they were from eternity God's environment. Now, Joseph Cooke tells us that "all these natural forces have been the same in all ages, so far as science can determine, and they are the same as far as we know in all parts of space." Indeed, matter is the nest in which the incorporeal elements nestle, and its motion is the occasion of their manifestation, rather than, as some would have us believe, the cause and origin of their being. If Dr. Strong, of New Jersey, had, before he wrote his "Irenics," recognized this fact, that there is in this world an *unchangeable tertium quid*, or *intermediate substance* between mind and matter, it would have made his remarks on "ruach," "basar," and "nephesh" more satisfactory and invulnerable, where he speaks of "the principle of life." Suffice it to say here, that their normal immutability stamps these immaterial substances as fit garments for Him who is ever "the same" and "changeth not."

But what is the testimony of the Scriptures on this subject? Do they teach that God spake the world from *naught*, or do they assure us that they were produced from some previously existing substance? We say fearlessly, not only that the Scriptures do not oppose, but that the philosophy of Scripture points clearly and unmistakably to the truth of the Substantial Philosophy of Creation. They teach that "The things which are made were not made of things that do appear," but that "Of Him" (i. e., out of Him, says the Greek) are all things—i. e., from the field of unseen, yet real, entities came all things; i. e., from the essential environment of God. The Hebrew words most frequently translated "create" and "make" in the Old Testament Scriptures, as also their Greek equivalents in the New, furnish no hint of an origin from *nothing*, but rather presuppose substance already existing, from which visible things were made. The following are some of the principal words used, and their significations:

Bara, used in Genesis 1: 1. To cut, to cut out, to carve, to form, produce, create, bring

forth, fashion, make. It should be noted that in the radical letters *Br* inheres everywhere in the Hebrew Scriptures, the idea or notion of *break, cutting out, separating*. The same word used in Joshua 17: 18: "It is a wood, thou shalt cut it down." Query: *Do we form, produce, fashion, cut out, and separate FROM NOTHING?* Now notice some passages of Scripture in which this verb "*bara*" occurs, and we will find ourselves driven to the Substantial Theory of Creation! Gen. 1: 7: "God created man in his own image." But *how* was he created? *Was the dust of the earth and the in-breathing of God NOTHING?* Isaiah 65: 18: "Behold I create Jerusalem a rejoicing." How? by speaking her such from nothing, or was it by shaping and pruning that which already existed? Was not this creation rather a *separation from something than an origination from nothing*? Isaiah 45: 7: "I form the light and create darkness." Does God speak darkness into being from nothing? Is it not the normal condition of space until He orders light to shine? But notice, here is evidently *creation by withdrawal*, i. e., by taking away the light. Just so God "creates a clean heart," not by originating it from nothing, but by taking from the heart that which renders it unclean. *It is creation by withdrawal*. So doubtless matter was created by God withdrawing or cutting off his own tenuous essence from a portion of its environment, and rendering that portion so abandoned more gross.

Another word, perhaps more frequently used in the Old Testament than the above, is "*Asah*." It signifies to do, make, form, construct, prepare, build, to make ready, to produce out of one's self, to yield. Here is no hint of creation from nothing, but everywhere the thought of pre-existing substance shines through the translations. And in this, as in the previous word, the primary idea lies, as the orthography of the word teaches, in *forming, shaping, or cutting that which already exists*. Now in this way God "*made the earth and the heaven*," and (*asah*) made Adam "a helpmeet." Thus Adam and Eve "*sewed fig-leaves together, and (asah) made themselves aprons*." There is as clear philological evidence that Noah spake the ark window into being from nothing, as that God thus made the world; for the inspired writer uses precisely the same verb in both cases. If asked to distinguish between "*bara*," translated "create," and "*asah*," "make," when they stand in juxtaposition, I answer by quoting and explaining Genesis 2: 8: "In it he had rested from all his work which God created and made." At first sight these words may appear to suggest instantaneous creation from nothing, and subsequent gradual formation and arrangement; but accepting the last verb in the passage, not as a *gerund*, but literally as an infinitive of purpose, it suggests the ground-laying and the finishing. The verb "*create*" refers to the *material gathering*, and the verb "*make*" to the architectural arrangement of the structure. In the exegesis of this passage I am sustained by no less a scholar than Dr. Taylor Lewis. Thus it appears that the closest attention to the original Hebrew, not only reveals no objections to the Substantial Theory of Creation, but it fully indicates its claims to truthfulness. Would time and space permit we could show that the same conclusions characterize the examination of the original New Testament Scriptures. Thus it appears that truth is ever the same, whether blazing from

the angles of logical premises, or flashing from the facets of philological investigation. Now in concluding this article let me call attention to the fact that the *Substantial Philosophy of the origination of the material from the essential environment of Jehovah, throws a flood of light upon the nature and destiny of the human body.* I see more clearly in the light of this truth.

1. *How Christ was the "express image of His Father's person."* His outer garment was of the same kind as his Father's, though thicker, and perhaps better adapted to His chilly earthly surroundings.

2. *We see more clearly how under supernatural influence the bodies of Jesus and Stephen could temporarily attenuate or sublime until glory blazed through them.*

3. *We see more clearly how in heaven "we shall be like Him,"* physically or bodily, for a tenuous, translucent, immaterial nature is the normal pose of what is now my gross bodily environment.

PEEKSKILL, N. Y.

PROF. TYNDALL SILENCED.

Our subscribers who have read the April number of the preceding volume of the *MICROCOSM* will recollect the exhortation Prof. Mayer, of Hoboken, N. J., received at the hands of Prof. Rogers for ingloriously showing the white feather on the *Sound* question, after recognizing his correspondent by answering his first letter. An almost exact duplicate of that result is given below, between Prof. Drake, of this city, and Prof. John Tyndall, F.R.S., of London, England, who, in the manner of his friend of Stevens Institute, after writing one brief note, deemed discretion the better part of valor, and concluded it safest for his scientific reputation to "sing dumb." Here is the correspondence, and no one can fail to see the scientific cowardice on the part of the great English physicist, after writing one letter, refusing positively to answer the most courteous inquiries of a professor he had first consented to recognize by correspondence. Let no one hereafter burlesque the term *courage* by applying it to Prof. Tyndall:

New York, Jan. 22d, 1884.

PROF. TYNDALL:

DEAR SIR,—I take the liberty of sending to you a copy of *WILFORD'S MICROCOSM* for December, containing a Report from Capt. Carter, of the Pennsylvania Military Academy, on the results of experiments made by him, showing that the tuning-fork will continue to sound audibly when its prongs are not traveling at a velocity of more than about one inch in two years. This is a startling announcement to our schools and teachers, since the text-books had taught us that the prong must advance "*swiftly*" in order to condense the air and send off sound-waves. We naturally ask, how can the present theory of sound be correct if Capt. Carter's Report be true, or anywhere near true? I write in the interests of education and of many teachers, to ask you if this calculation, as to the exceeding slow motion of the prong while the fork is still sounding, be correct, and, if it be so, whether or not it will prove any serious objection to the wave-theory of sound as now universally taught? By answering my inquiry, you will greatly oblige many besides

Your obedient servant,

E. J. DRAKE.

*Royal Institution of Great Britain, }
Feb. 6th, 1884.*

DEAR SIR,—You may go to rest with the assurance that the wave-theory of sound is perfectly secure.

Yours truly,

JOHN TYNDALL.

[PROF. DRAKE'S SECOND LETTER.]

New York, Feb. 22d, 1884.

DEAR PROF. TYNDALL,—I am glad to receive your brief note of the 6th inst., which shows that you regard the subject of my communication at least worthy of your courtesy; but I regret exceedingly that you forgot the more important part of my inquiry—namely, whether or not the Report of Capt. Carter, as to the exceedingly slow motion of a tuning-fork's prong while still sounding be correct, instead of its "*swiftly* advancing," as the text-books on sound teach? His "Report" is pronounced ridiculously incorrect by teachers of physics here, and it was agreed at a teachers' institute to submit the matter to you, as a simple question of fact as to the correctness or incorrectness of that calculation.

I am much obliged for your opinion that the wave-theory of sound is "perfectly secure," which is quite a relief to the minds of those to whom I have shown your letter; but we all wish to look at the matter intelligently for ourselves, and to be able to give reasons to our classes for the correctness of the theory we teach. Hence our earnest desire that you, as the highest authority we know of, should decide the question as to the correctness of that Report, and if incorrect, how far it comes short of the truth. Lest you did not get the *MICROCOSM* I sent (as you do not acknowledge its receipt), I inclose the Report referred to with this letter.

Very truly yours,

E. J. DRAKE.

[PROF. DRAKE'S THIRD LETTER.]

New York, April 24th, 1884.

PROF. TYNDALL:

DEAR SIR,—More than two months ago (Feb. 22d) I replied to your brief note in answer to my first communication. It took less than a month, after first writing you, to receive that note, and I felt encouraged from its courtesy, though brief, that in another month I would be able to relieve the minds of teachers and students here on the important questions propounded in my first inquiry, and repeated in my second. It is a matter of regret to us all, that up to this writing, after more than two months have elapsed, no reply has been received. It places me in a very awkward position with my associates, as I had assured them that Prof. Tyndall was not afraid to vindicate and maintain his published teachings on the theory of sound, when his opinion should be respectfully solicited upon a serious difficulty standing in the way of said theory. Other teachers who had read the recent arguments in the *MICROCOSM* against the current theory of sound as laid down in your work on that subject, spoke disparagingly of your ability or willingness to face these difficulties, intimating publicly, as well as privately, that you knew better than to agitate the question, and that I might depend upon it your policy was *silence*, and only *silence*. I could not then believe such to be possible in one so eminent and useful as

you had become in the cause of scientific research. I could but believe that your object in all your investigations was *truth*, and that alone, and that your reasons for not having condescended noticed this attack upon the sound theory was owing to the fact that your attention had not been directly and properly called to the serious character of the assault. This argument of myself and others of your friends is now entirely set aside, as I did appeal to you respectfully and earnestly, stating a most serious objection to the theory, if the facts and figures as alleged were correct. The courtesy of this appeal you admitted by your brief and respectful note, though at the same time entirely omitting any answer or even reference to my inquiry.

Now, Professor, are we to understand, by your silence concerning my last letter, that you refuse positively to enter into any discussion of the arguments now so vigorously urged against the wave-theory of sound—a theory of which, *par excellence*, you are the leading exponent of the world? If you will say this to me frankly, I will trouble you no further; though, if you say it without giving your reasons for it, it will leave the teachers in this country free to infer that you are actually afraid to touch the question with your pen lest you involve your scientific reputation in disaster.

As a warm friend and admirer (and I speak for hundreds of teachers who feel the same), I am seriously concerned about your future status as a great scientist, should it be demonstrated, as now seems imminent, that a fear of scientific defeat is the real cause of your refusal to answer my inquiries. Defeat can be easily forgiven by the generous investigator and teacher, but scientific *cowardice* never. I await patiently another month, or even longer, for a frank response to this urgent repetition of my former request before taking official action upon the matter among the teachers interested. I will only add that I see in the MICROCOSM for this month, a copy of which I send you, a correspondence between an associate of mine, Prof. Rogers, and your co-laborer in the science of acoustics, Prof. Alfred M. Mayer, of Hoboken, N. J., in which the latter wrote one brief note, about as evasive as yours, and then refused further response after the most urgent solicitation. I trust I am not to meet with similar ill-fortune with the scientist whose name heretofore has been the synonym of courage wherever the English language is spoken.

Your sincere friend,
E. J. DRAKE.

[PROF. DRAKE'S LAST LETTER.]

New York, June 11, 1884.

PROF. TYNDALL:

DEAR SIR,—Having finally waited six weeks longer, and receiving no reply to my letter of the 24th of April, I am now forced to the conclusion that you dare not venture any answer to my letters involving the possible correctness or incorrectness of the present theory of acoustics. This disclosure, after all that has been said and believed on this side of the Atlantic about your courage as a valorous defender of your scientific views, strikes your friends dumb with chagrin and amazement. We have nothing more that we can say in defense of your prowess as a scientific investigator, and are compelled to let your case go by default. You

have not only nonsuited yourself, but you have placed your attorneys before the teachers of this city in a most humiliating predicament. On receipt of your short reply to my first letter we took it for granted that you would, on a further presentation of our case, help us out, since you had in that note positively declared the wave-theory of sound "perfectly secure." Can you wonder at our mortification, after all the kindly urging of my letters, that you persistently continue to refuse saying another word? Surely nothing but a conviction on your part that the wave-theory of sound is *unsound* could thus have caused a courageous scientist to weaken in the presence of a single mathematical and mechanical difficulty, like that involved in Capt. Carter's tuning-fork experiment. After due consultation with those associated with me, I now deliberately record our united conviction that Prof. Tyndall's only reason for refusing to answer my courteous inquiries is that he is afraid to commit himself lest his scientific reputation should suffer damage, and that he was *insincere* in his assurance that the wave-theory of sound was "perfectly secure." We now unitedly declare it as our belief that he knows the theory of sound, as expounded in his published *Lectures*, to be erroneous, and for this reason alone, that he dares not to risk his reputation as a physicist in attempting its defense. From this time on we shall feel justified, both in our relations to pupils and to one another as teachers, to proclaim the wave-theory of sound as an untenable scientific doctrine, and to publish it throughout the colleges of the land that Prof. Tyndall has practically confessed it by his persistent and stubborn silence after having written one letter on the subject. As a matter of simple justice, therefore, to the young scientific students of this country and Great Britain, and alone in the interests of the cause of true science, I feel it my duty to give these letters to THE MICROCOSM for publication. Respectfully,

E. J. DRAKE.

PROF. FAILYER'S FAILURE.

BY CAPT. R. KELSO CARTER.

"*Looseness in Reasoning*" is the title of a hastily written article in a small paper called *The Industrialist*, edited and published by the officers of the Kansas State Agricultural College, located at Manhattan. The article itself is about the best illustration of its title that could well be found. A few extracts will suffice to show its intent. The writer, Prof. Geo. H. Failyer, says:

1. "It is often wondered [*the professor of grammar might correct this; but alas! that study is not taught in the K. S. A. C.*] why there are always plenty of men of good business tact and fair intelligence and discernment who are captivated by all sorts of improbable claims for some supposed new discovery."

Let me suggest that the world has often been astonished and confounded to find how many men, of the most distinguished ability, have resolutely set themselves against the great and genuine discoveries of all ages, until their very names have been forgotten in the later fame of the discoverer. Copernicus, Galileo, Columbus, Morse, Whitney, and hundreds of others, are "cases in point."

2. "Those who are well informed on general subjects are very frequently found sustaining views which are noted only for their crudeness and lack of agreement with facts."

We will soon see how exceedingly "crude" are the ideas of Prof. Failyer upon the subject he principally discusses.

3. "We often find persons who are severely logical, but whose conclusions are very untrustworthy—due to their reasoning from false premises. Others are equally unreliable because of false reasoning." * * * * * "A publication called the MICROCOSM contains many articles from the pens of professors in colleges and universities, which illustrate the matter under consideration. Did they occupy the chairs of language or literature, it would not seem so strange that this kind of errors should occasionally creep into their writings; but when professors of mathematics and physics discuss subjects involving the principles of the one, and the calculations of the other, and show nothing more than a superficial acquaintance with either, there seems no possible palliation." (That is, a man may be excused if he slips up in a department whose "chair" he does not "occupy.")

4. "An illustration of this crudeness of thought is found in an article upon sound, from the pen of the professor of mathematics in a noted State military academy. He estimates the great force that a locust must exert in setting into vibration the four cubic miles of air through which he may be heard, by calculating the mass of this air; and then, since the velocity of sound is over eleven hundred feet per second—due, of course, entirely to the elasticity of the air—he determines what expenditure of energy must be required to propel this mass of air—that of four cubic miles—through space with a velocity equal to that of the propagation of sound," etc.

I will briefly show, in answer to No. 2, that Professor Failyer presents "views" of my article on sound entirely wanting in "agreement with facts;" in answer to No. 3, that he "reasons from false premises," and comes under his own condemnation for essaying to write in a department whose "chair" he does not "occupy;" and in answer to No. 4, that he has been guilty of exceedingly "loose" reading, has displayed inexcusable ignorance of the "elementary text-books," and has directly misstated the facts concerning my locust argument.

Under No. 2, it is easy to see that the Professor was guilty of unpardonable "looseness" of reading. He missed the "facts" in my argument altogether, and omitted to mention one of them. He therefore presents a view of my locust which I never intended, never wrote, and which he never read. All this, either because he failed to grasp the "facts," or was guilty of "loose reasoning." At the close of my article in the March MICROCOSM I took the trouble to recapitulate these facts, and to arrange them consecutively and briefly, but this was of no use to a man who reasons as "loosely" as the Professor. He took the fact that I calculated the actual weight of four cubic miles of air, and the fact that sound travels at a rate of 1100 feet per second, and left the other six facts entirely out of account. I cannot take space for lengthy quotations, so I simply refer the reader to the March MICROCOSM.

3. The Professor is guilty of "reasoning from false premises." He starts with the idea that I tried to prove that the locust actually "propels the air through space 1100 feet per second," whereas I did nothing of the kind. He then argues that, as this velocity is "*due entirely to the elasticity of the air*," my conclusion is illogical. But he never made a more absurdly wild statement in his life. His parenthetical premise, that the velocity is "*due entirely to elasticity*," is not true at all; hence his own reasoning is from false premises, and consequently fallacious. Again, he states that professors of literature might be excused from occasional blunders in mathematics, while he—not a professor of mathematics himself—blunders fearfully in failing utterly to see the real bearing and plain sense of the mathematical portion of my article. Possibly, however, he may be without excuse here, for he may, like myself, have filled the chairs of both natural and mathematical science.

4. The "loose reasoning" has already been shown. The "elementary text-books" referred to by the Professor may seem to remind him that velocity is not "*due entirely to elasticity*." I cannot stop here to teach natural philosophy, so will simply leave the Professor to his "text-books." But now let me seriously show the transparent misstatement of my argument and the exceedingly "loose reasoning" employed. Prof. Failyer makes it appear that it is infinitely absurd for me to teach that a locust propels air at a rate of 1100 feet per second. On its face this is true, of course, but a truth used falsely becomes false. If he read the article carefully, he knew very well (unless he is *non compos mentis*) that I meant the reader to see this very absurdity, but that I used this absurdity against the wave theory, connecting the two together by irresistible "facts." These connecting facts he utterly ignores, and devotes his time to the preposterousness of the velocity question. All right, Professor! But remember that some one has said: "Half a truth becomes a lie," and state the rest of the argument.

One thing I emphasized repeatedly, and that was that the locust did not move any particle of the air any great distance: but only at the rate specified. On page 227 I wrote: "*Now, it is not of the slightest consequence what the extent of this motion may be*," meaning plainly how infinitely small it may be. Again: "Do not forget that the distance traversed by the air wave or air particles is entirely immaterial. If the air moves at a given velocity, it exerts a certain pressure, entirely irrespective of the distance through which it moves. Let any one deny this who can." Further down I find: "Not to move 1100 feet, but at that rate of motion;" and, finally, in the recapitulation: "*This volume of air is moved to and fro at a rate of 1100 feet a second. It is of no consequence how far the air particles actually move.*"

Yet this "loose" reasoner actually says I argued that the locust "propels the entire mass of air in four cubic miles through space," etc. On the contrary, I said the "air-wave or air particles," and repeatedly emphasized the possible narrow extent of the vibration. I would not be surprised if the Professor cannot see the difference now between the two. But let me invite his careful attention to the facts I did present.

1. "A locust can be heard throughout four cubic miles of air."

2. "Every particle of this air is absolutely and positively forced to make a small excursion to and fro," etc., at a rate of 1100 feet per second.

3. "This motion is caused solely by the locust."

4. "This amount of air weighs 24,000,000 tons.

5. "It is of no consequence how far (how minutely) the air particles actually move."

6. "The force exerted by the locust must equal the resistance of the air."

7. "This resistance (to a rate of 1100 feet) equals 78,400,000 tons."

8. "Nothing gives what it does not possess."

I then said that I was ready to attack No. 2 myself, as, of course, I deny in toto the motion of the air particles; and I defied any man to damage the remaining seven. Can Professor Failyer attack them?

It must be plain to the intelligent reader that the velocity of 1100 feet has nothing to do with the force of the argument. "A miss is as good as a mile," and when the *reductio ad absurdum* is used its total extent on the other side of absurdity is of no consequence. I mean by this, that he can quarrel with the 1100 feet to his heart's content, accept Wilford Hall's information about the actual velocity of the locust's legs, and calculate the resistance of the air to that velocity. It is perfectly plain that if the air particles move at all, it is at some velocity. Everybody, until the *Problem of Human Life* appeared, believed the velocity to be the same as that of the air-wave. But if they fall back from that ground, there is no resting-place except upon the actual velocity of the generating instrument. But the constantly diminishing or changing velocity of even the same sounding instrument, here presents a bog deep enough to engulf the whole Kansas State Agricultural College, not to mention the fact that any velocity within reason still leaves the locust an infinitely absurd task to perform, if there be any truth in the wave-theory.*

* NOTE.—It is easily demonstrable that the travel or "oscillation" of the air-particles to and fro, which Prof. Tyndall says takes place "as each sound-wave passes," must occur at the actual velocity of the sound-wave itself—1120 feet per second. For example: Suppose this amplitude of oscillation to be only the infinitesimal width of a single molecule of air (it must be that much, or it is nonsense to talk about "oscillation to and fro," "amplitude," etc.), it follows that while the pulse is passing forward the width of this molecule, the molecule itself must also perform its "oscillation" forward the same width, and in the same time, as it surely does not wait to "oscillate" till after the pulse or wave passes, nor begin to oscillate before the pulse arrives! This so-called "oscillation of the air-particles to and fro," therefore, must have the same velocity, since such oscillation is what constitutes the sound-pulse, according to the wave-theory, and hence, positively, the speed of the oscillation of each and every air-particle passed by the wave must be exactly equal to the speed of the wave itself, or to the velocity of sound. Can anything be plainer and more self-evident than this? Hence Capt. Carter's original calculation stands inviolate, that every particle of the air permeated by the sound of the locust (four cubic miles, weighing more than 20,000,000 tons) must be started from a state of rest into motion, a distance equal to the "to-and-fro" oscillation of the wave-theory, and at a demonstrated velocity of the sound-pulse itself—namely, 1120 feet in a second. His calculation, therefore, of the inconceivable displacement-force exerted by the locust necessary to start four cubic miles of air at that velocity, however small the distance traveled, stands, and defies the mathematics of the world to overturn it.—EDITOR.

Finally, the true explanation of such loose reasoning as that of the Kansas professor lies in a totally different cause from any assigned by him. Let him note this carefully. He is familiar with the wave-theory in all its old aspects. But a new theory arises which antagonizes it. He does not read this new theory, and utterly neglects to try its crucial experiments. He is thus densely oblivious to its real force, and is specially vulnerable on his own ground in regard to his lines of defense. Although familiar with the old theory, he is totally unaware of its bearings with relation to the new, for, not having read and grasped the new, he cannot possibly know where his own weak points lie. Braddock's soldiers were perfectly familiar with the art of fighting the veterans of Europe, but that very knowledge was the chief cause of their ignorance in their unequal contest with the savages. Our Professor may know the wave theory, but he certainly is sublimely in the dark on the question of "Substantialism." Consequently, he walks blindly into ambush, fires at imaginary foes, and must therefore encounter only disaster and defeat. If he will read carefully the article on the Bell in Lake Geneva, in the April number of the MICROCOSM, and other discussions of the locust problem, he will find the special stress laid upon the simple question of inertia, if his mind be not too inert to grasp the distinction; and a glance at the review of the various experiments, presented in the June number, will give him abundant "facts" from which to take a fresh start and endeavor to retrieve his failure.

PA. MIL. ACADEMY, CHESTER.

A FACT WORTH CONSIDERING.

[The following letter from Prof. R. L. Abernethy, A. M., for forty years professor of physical science, and now president of Rutherford College, North Carolina, will speak for itself to those professors and critics who ask if any of the colleges are coming over to the Substantial Philosophy? Shouldn't wonder if Substantialism would come to be "respectable" after a while. Who knows? The Copernican System of Astronomy was not sufficiently "respectable" for any college to teach it till about one hundred years after the death of its founder! We have, therefore, no reason to complain of the progress the Substantial Philosophy has made in the brief space of four years. EDITOR:]

A. WILFORD HALL, Ph. D.,

Editor of THE MICROCOSM:

During my vacation hours, being confined at home on account of the illness of a dear daughter, I have been devoting my spare moments to the examination of the old and new theories of philosophy, but giving very special attention to the wave-theory of sound, which I have been teaching for near half a century.

I have for a number of years been denominated a philosopher, and, in fact, without any feeling of egotism, I thought I was one.

But how it happened that I had overlooked the glaring absurdities of the old wave-theory of sound, I cannot now comprehend. I suppose, however, that like hundreds of other professors and teachers, I took for granted what I should have closely examined.

I am candid in admitting that my own explanations to students were not satisfactory to

my own mind. Yet I consoled myself by saying, "The books say it is so."

I am now as thoroughly satisfied of the *Substantial* Theory as I am of the reality of life itself; and in my lectures to my senior class, during the past year, I have been giving it as I now understand it.

I give you and your readers, in conclusion, only *one* of the grounds of my dissatisfaction with the wave-theory. It is this: If the sensation which we denominate sound depends upon the simple vibrations of air that reach the auditory nerve, how is it that we readily distinguish one sounding body from another? According to the wave-theory, when the wave-lengths are about four feet four inches, it is plain that a sounding body, struck 400 yards from my ear, would produce about 277 different air-waves before the sensation of sound could be experienced in my brain; and when it does reach the nerve leading to the brain, it is only a simple wave of air 276 wave-lengths from the body struck, being itself the 278th effect of a simple mechanical cause; and yet it enables me to distinguish the crack of a rifle from the sound of a musket; the bark of a dog from the voice of a man; the lowing of a cow from the neighing of a horse, etc.

Now I leave to any man of ordinary intelligence to say whether or not it is rational to conclude that *the same mechanical cause could possibly produce such different effects.*

For one to know the kind of body or substance from which the waves proceed, if they are waves, it does seem necessary that some *element, essence, or substance* from the sounding body itself, as you insist, should accompany the sound-waves to the ear. How the simple striking of a layer of mixed oxygen and nitrogen, coming precisely with the same force and in the same manner from different bodies upon my auditory nerve, can enable me to distinguish distant objects from each other, is a mystery which I wish scientists to explain. Surely substantial pulses, analogous to odorous emanations, are much more rational and satisfactory as a solution of this problem.

R. L. ABERNETHY.

[In a private letter, President Abernethy says]:

"MY DEAR DR. HALL,—I am greatly delighted with the views and teachings of THE MICROCOSM. I am sure that *Substantialism* is the true doctrine; and in my lectures to the senior classes in this college I have departed from the doctrine of the wave-theory of sound, and have been incorporating the Substantial Theory. I find that the new theory takes with all young gentlemen and ladies who *think*. ***

Yours truly,

R. L. ABERNETHY.

WHAT SHALL WE EAT?

BY MRS. M. S. ORGAN, M. D.

A few weeks since an article appeared in the New York *Sun*, entitled "White vs. Graham Flour," in which the writer made so many false quotations and pseudo-scientific statements, that duty to human interest demands a rejoinder.

The question of diet is one which so vitally concerns the physical, mental, and moral elevation of the race, that it will be apropos to devote a few columns of the MICROCOSM to its

discussion; or rather to make a few scientific statements as a rejoinder to the article referred to, which will be suggestive and incite to further inquiry.

People in general accept the traditional lore of their ancestors as to what kinds of food and their dietetic preparations are wholesome, without thought or question. In everything pertaining to health, that which affects the physical economy is alone considered. Only a faint glimmering is beginning to dawn upon humanity of the fact that the healthful action of the mind, the clearness of its perceptions, the strength and vigor of its faculties, the truth or falsity of the thought it evolves, depend as much upon the quality and quantity of food consumed as do the health and vigor of the body. Many an individual of high moral and spiritual attainments has been tortured with the throes of despair, feeling that God's displeasure was upon him, when the direct and potent cause of all his anguish of soul was an irritated stomach, made so through the outrage perpetrated upon it by unwholesome food or an excessive quantity.

But to the discussion of the points brought forward in the article in question. The writer quotes the following as the expressed convictions of Dr. Graham, "given on page 55 of his book." (Definite, isn't it?) "Coarse wheaten bread may do very well for those who are troubled with constipation, by mechanically irritating and exciting the stomach and bowels; yet for that very reason it is wholly unfit and improper for those who are afflicted with chronic diarrhea. Another objection is, that although the bran may serve, like other mechanical excitants, for a while to relieve constipation, yet it soon wears out the excitability of the organs, and leaves them more inactive than before."

This quotation is not found on page 55 of "his book" (Dr. Graham's Science of Human Life), but on page 526, and is given, not as statements of Dr. Graham, but as objections which are urged by others, and which he most conclusively refutes and demonstrates to have no foundation in physiology, hygiene, or experience. Space forbids giving his entire argument, but I will quote sufficient to show that the writer, with evident design, stated an unmitigated falsehood. Referring to these objections, Dr. Graham says: "Here again is a false statement urged by inexcusable ignorance; for it is not true that the bran acts in the manner supposed by this objection. It is true, however, that the pernicious habits of some persons who use coarse wheaten bread, entirely counteract its beneficial effects, by their want of exercise, by extreme inertness, over-eating, etc., bring on constipation in spite of the natural fitness of the bread to prevent this result. Coarse wheaten bread, under a proper general regimen, is a sure cure for chronic constipation and chronic diarrhea, for they both spring from the same root. I have seen cases of chronic diarrhea of the most obstinate character, and which had baffled the highest medical skill for more than twenty years, yielding entirely under a proper general regimen, in which this bread was the almost exclusive article of diet, and not a particle of medicine used. The mucilage of the bran is perhaps the best substance in the vegetable kingdom that can be applied to the stomach and bowels."

Dr. Graham by the closest reasoning, by analogy, and by a collection of scientific facts

and experiments, proves most conclusively that a proportion of innutritious matter in our food is just as essential to the health and functional activity of the alimentary organs, as nutritious matter is to the sustenance of the body; and that nature has wisely provided for this physiological demand by combining a certain amount of innutritious matter with the nutritious, in all substances which constitute food; and that if the digestive organs were designed to receive nothing but nutritive material, they would have been constructed very differently from what they are. He shows how Magendie and other distinguished physiologists experimented on animals, to test the comparative value of food from which all innutritious matter had been artificially removed; and that the result in all cases was that the animals died in a few weeks. But when bran, or even sawdust was added to the nutritive aliment, they would live and thrive; thus incontrovertibly establishing the fact that bulk or innutritious matter is just as essential for health and life as nutriment.

But this scientific (?) writer for the *Sun* ignores the wisdom of nature; thinks her designs can be very essentially improved upon. He says: "If all inert (innutritious) matter were removed from the food, there would be no dyspepsia; nothing should ever enter the stomach that is not soluble by its fluids."

This statement was doubtless made in the interest of some firm that makes a specialty of manufacturing an alimentary product from which all innutritious matter has been removed. The writer is either totally ignorant of physiological science, or else he imagines the people to be.

If all innutritious or non-soluble matter must be removed from food to make it digestible, then every alimentary product which nature has provided will have to be subjected to a chemical process, or at least mechanical appliances, to render it a wholesome article of diet. The skins of beans, peas, green corn, rice, plums, cherries, currants—the skins and seeds of all small fruits, the cellular tissue of all kinds of meat—are both insoluble and innutritious. All cereals contain from twenty-five to thirty-five per cent of innutritious matter, vegetables from twenty-five to sixty-five, and some, such as turnips and cabbage, as much as ninety; flesh meat averages about sixty-five per cent. So, according to this scientific teaching, human beings will be afflicted with dyspepsia in all its complicated forms, and with many other diseases as secondary results, so long as they continue to use food which contains the elements as nature combined them.

The writer refers to chemistry as authority on the subject. But chemistry of itself cannot decide what is food and what is not; it can tell us just what forms of inorganic matter result from an analysis of dead animal matter, but it cannot tell us what forms combine to compose the living organs; for vitality transcends all inorganic affinities, and possesses the absolute power of transmuting even those substances which are regarded by chemists as ultimate elements. The most skillful chemist in the world could not tell, *a priori*, whether animal, vegetable, or mineral substance was best fitted to meet the alimentary wants of the body, nor what elements are nutritious and what innutritious, nor distinguish between food and the most deadly poison. All this must be learned through physiological science and experience.

One of the strongest objections urged by the writer against the use of Graham flour is, that it contains insects and other impurities, which adhere to the exterior of the grain. Is it possible that he is not cognizant of the palpable fact that all these foreign substances and impurities are pulverized as finely as the particles of flour in the process of milling—that the bolting-cloth does not, by any means, separate them? The only way to procure pure flour, either bolted or unbolted, is by having the grain thoroughly cleansed by scouring and other mechanical appliances, or, what is better than all other means combined, a thorough washing. And the latter Dr. Graham most strongly insisted upon.

This writer states that the process of milling has been materially improved since the days of Graham. I am very glad to attest the truth of this assertion, as it is about the only truth contained in his article. I am also glad to add what is equally true and important, that the people have advanced so much in intelligence as regards a genuine article of Graham flour, that they will no longer use the abominable stuff which was formerly palmed off upon them, such as an inferior and unwholesome article of white flour, mixed with impure bran, or unbolted flour, ground in the same manner as that intended for bolting—both fit only for the stomach of herbivorous animals. To properly make Graham flour requires the very best wheat, thoroughly cleansed, and cut as finely as possible, instead of being mashed or rolled, as for bolting. There are many mills in the United States where a specialty is made of grinding Graham flour in this manner.

While I am not a Grahamite, or any other kind of an ite,—for I claim enough individuality to accept only what appeals to my reason as evidence, unbiased by the weight of authority,—yet I recognize Dr. Graham as one of the most original and profound exponents of human life, in its physical and mental aspects, the world has ever produced. Such an incisive logician and original thinker nature does not produce more than once in a century. And yet no one was ever more maligned or misunderstood by the world in general. The prevalent opinion is that he was a fanatic, and taught the idea that the only physical salvation for the human race was the use of coarse, unbolted wheaten flour, and the coarser the better. Yet he most positively and explicitly states, and reiterates the principle, that good and properly prepared unbolted wheaten bread is only one of the many requisites for health and longevity—that a proper quantity of food, proper exercise, rest, personal cleanliness, sunshine, fresh air, correct physical environments, and harmonious mental conditions, are just as essential for health, vigor, and symmetrical development.

NEWBURGH, N. Y.

☞ Owing to the necessity this month (it being the first number of the new volume) of repeating a few business items at the close, we are obliged to postpone our promised "*Microcosmic Debris*" department till next month. The reader will carefully note the business items referred to, for the various inducements held out to subscribers to this magazine, and remember that for three new subscribers (☞) this entire volume will be sent free.

WILFORD'S MICROCOSM.

23 Park Row, New York, August, 1884.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE SUBSTANTIAL PHILOSOPHY.

ITS GENERAL FORMULA AND GROUNDS OF BELIEF.

The many articles which have appeared during the past three volumes of THE MICROCOSM upon the subject of *Substantialism*, from our own pen and from those of our contributors, presenting the New Philosophy in its varied relations to science and religion, have caused it to be thought advisable to give in this first number of Volume Four a brief and condensed epitome of its teaching as at present formulated and as now understood by its founder and its ablest exponents who have written upon the subject. We therefore proceed to do so.

1. The Substantial Philosophy teaches that everything in the universe, visible or invisible, tangible or intangible, corporeal or incorporeal, of which the mind can form a positive concept, is *substance* or *entity*, in some form or degree of grossness or attenuation.

2. It teaches that the substances of the universe, as above expressed, are naturally and rationally divisible into two main departments, namely, *material* and *immaterial*, which means nearly the same thing as *corporeal* and *incorporeal*; and that while all *matter* is *substance* or *substantial*, it by no means follows that all *substance* is *matter* or *material*. The term *matter*, as thus viewed, only embraces a small portion of the substances of the universe, namely, those substances which are ponderable or otherwise susceptible of chemical or mechanical test, or such as are absolutely limited by material conditions. The term *substance*, on the other hand, not only embraces all material things, however gross or tenuous, but it includes all immaterial things, or such imponderable entities as are not confined by material limits or conditions, and hence, such entities as cannot be proved to exist by any chemical or mechanical test.

3. *Substance* in its immaterial classification includes every *force* of Nature or in Nature, physical, vital, mental, or spiritual, and includes every form of energy which in any way can produce a manifestation or motion of a sensuous body. Hence the physical forces which manifest themselves to our sensuous observation, such as gravity, light, heat, sound, electricity, magnetism, etc., are as really substantial or entitative as is the air we breathe, the water we drink, or the food we eat.

4. So also, according to Substantialism, is it with the vital, mental, and spiritual forces, which are manifested in the vegetable and animal kingdoms, and which actuate all living and thinking organic beings. They are as really substantial as are the beings and organisms themselves thus actuated and moved. The vital and mental forces in an animate being, which must exist in order to move it, are as veritable, substantial entities as are the water, fire and steam in the locomotive which move the engine and cause it to perform its work. It is as impossible, according to the Substantial Philosophy, for the intelligent mind to conceive of a living animal moving and doing work by means of a vital force within it that is not a real substance, as to conceive of an engine moving and doing work by the force of steam, while such steam is not a substantial entity, but a mere molecular motion among the particles of the water.

5. To teach, as do the received theories of science and philosophy, that the physical forces of Nature, such as light, heat, sound, magnetism, gravity, electricity, etc., are but *modes of motion* among material particles, and not themselves substantial entities, is as irrational and unsatisfactory to the mind of an intelligent substantialist as to teach that the invisible spring in the clock-case is only a mode of motion of the clock-wheels which it drives. Substantialism therefore repudiates this notion that any force of Nature is but a mode of motion; and hence it claims as among its fundamental principles and original discoveries that *sound*, as well as light and heat, instead of being a mode of motion, is a *real immaterial* but *substantial emanation* from the sources whence it radiates; and that but for trying to make light and heat *material emanations*, as did Newton and others in his day, instead of making them what they really are—*immaterial entities*—the true Substantial Philosophy might have been inaugurated a hundred years ago.

6. The present advanced phase of materialistic science assures us that *matter*, in some form, is all there is in the universe of a substantial nature; that what we call vital, mental, or spiritual *force*, by which the motions of our bodies are caused and controlled, is but the molecular motion of the material brain-and-nerve-particles of the living organism; and that, consequently, as soon as the body dies, and these material particles cease to vibrate, the life, soul, mind, or spirit necessarily ceases to exist, since motion, *per se*, is confessedly nothing entitative, being merely a *phenomenon of matter*. This conclusion the materialist logically reaches from the principles of physical science as taught in all colleges either religious or secular, since sound, light, heat, etc., according to such teaching, are but various modes of motion of the material particles of some medium by which they are respectively conducted. Hence the materialist logically reasons: if Christian scientists can justly and correctly teach that these natural forces which produce phenomenal manifestations all around us are but molecular motions which necessarily cease to exist when the moving molecules come to rest, there is no rational ground to believe that the forces which cause mental and vital manifestations in us are anything more than the mere molecular motions in the organism, and which cease at the death of the body; and consequently that the idea of a conscious existence of the soul, life, mind, or spirit, which are nothing substantial, after death, is a vagary of religious fancy.

7. Seeing the resistless logic of this terrible argument of the materialist against the very foundation of the Christian hope, and being appalled at the helplessness and apparent unconscious indifference of the learned clergy to the inevitable inroads which such an argument must necessarily make upon all the claims of religion or supernatural revelation, the founder of the Substantial Philosophy resolved to break its force by the only conceivable method—namely, by attacking and, if possible, overturning this mode-of-motion citadel as universally taught in physical science, and thus demonstrating every force in Nature to be a real substantial entity. As a telling mode of attack that he thought could not be gainsaid or resisted, he selected *sound* as *par excellence* the representative “mode of motion” in physics,

so regarded by all science in all ages, and out of which all the other so-called modes of motion had developed; and he reasonably assumed, if it could be broken down as a mode of motion by overturning the wave-theory, there would nothing else be left for *sound* to be but an immaterial, substantial emanation from the sounding body—a substance which travels by a law of conduction through various media analogous to substantial but immaterial currents of electricity. In this way he expected (as has since turned out to be the case) to make the *sound* controversy, including the truth or falsity of the undulatory theory, the real battle-ground of the Substantial Philosophy.

8. To accomplish this purpose he devoted to the investigation of the sound theory his best energies, first in the *Problem of Human Life*, and has since continued to do the same during the first three volumes of *THE MICROCOSM*. To his surprise, however, and to his great disappointment as well as that of his friends, the eminent clergymen of this country, almost to a man, at first peremptorily ignored this only method of escape from the otherwise unanswerable assault of the materialistic philosophy. A few professors of physics and a number of clergymen, however, to their praise be it said, soon saw the inestimable value and advantage of this revolutionary departure from the beaten path of science, and gladly received the Substantial Philosophy as the final and long-sought antidote that would neutralize the poison of materialism; and we rejoice that at the present time thousands are falling into the ranks of the Substantial army, among both the clergy and the college professors, till all opposition to its onward progress, it may now be safely believed, must sooner or later give way.

9. From the considerations here enumerated, it has become the settled teaching of the Substantial Philosophy, and the scientific faith of its adherents, that sound, instead of being air-waves, water-waves, iron-waves, or waves or molecular motions of any conducting medium whatever, is a veritable substantial form or department of force; that all the physical forces, as they manifest themselves to our conscious or sensuous observation, such as light, heat, electricity, gravity, magnetism, etc., are but different forms or transformations of the one universal force-element of Nature, and that this original or primordial force-element, from and out of which all the manifested forms of force come or are generated by the various methods ordained to those ends, derives its active power alone from the vital, mental, and spiritual fountain of all force in the universe,—namely, the personal, uncreated, and self-existent God, from whom all things, visible and invisible, material and immaterial, have proceeded. Our Philosophy teaches that but for this eternal, uncreated, central, and inexhaustible fountain of force and energy, no present form of manifested force could move itself or any material body, or produce any effect or manifestation whatever. Neither light nor heat could radiate or reflect; the sun could not shine; gravitation could not attract, and hence rain could not fall; electricity could not travel, nor could sound be conducted or heard; magnetism would never leave the magnetic poles, and all Nature's realm would be dead, still, cold, barren, and silent.

10. The Substantial Philosophy further teaches that all life, mind, instinct, and spirit-conscious-

ness of the animate creation are but still more refined forms of the force-emanations from out that same universal and substantial fountain of energy, life, mind, and spirit, and that the individual life-germs of all animate beings are but atoms, so to speak, from out the same vital fountain.

11. It also teaches that every living creature, from the highest to the lowest, is a *dual organism*; that every animal not only possesses a physical or corporeal body, but that it possesses also within and pervading this physical structure another and incorporeal organism, the exact though invisible counterpart of the physical; and that this immaterial structure is as really a substantial entity as is the fleshly body itself which it pervades. This philosophy assures us that the incorporeal organism is the essential and much the more real part of every animate being, and that it is by and through this interior counterpart that the physical structure of every animal receives from its progenitors and transmits to its offspring its own specific form and characteristics; by which also it grows and assimilates its food; and by which alone, as an outline pattern within the physical structure, the bioplasts are enabled to work in the repair of wounds or the reproduction of lost limbs, or by which to develop the specific embryonic organism from the ovule (physically alike in all animals), till the material structure of the being is complete at maturity. Without the essential reality and substantiality of this incorporeal organism there could be no rational basis for heredity or likeness of offspring to parents; nor could there be any good reason why the ovule of the cow, for example, might not develop into a sheep, or that of the deer into a goat. This is fully and elaborately elucidated in our original treatise on the subject—*The Problem of Human Life*.

12. As one of the irresistible grounds of belief in the duality of all living organisms, and proofs that inherited characters and qualities are transmitted from parents to offspring entirely through the *incorporeal structure*, we refer to the fact that *the offspring of all species of animal, high and low, partake equally of the peculiar characteristics of both father and mother, while more than one thousand times as much of the physical or material organism of the child is derived from the mother as from the father!* No scientific explanation of this hitherto unrecognized state of facts can be suggested but the one which Substantialism offers, namely, that the *incorporeal life-germ*, which constitutes and makes up specific identity, comes equally from both parents. This original and unanswerable argument for the existence of a substantial incorporeal organism in all animate beings was first given to the world, with many similar considerations, in the *Problem of Human Life*. We do not name this fact in a spirit of boasting, but simply to call attention to the value of that book and of its original discussions, which confessedly laid the foundation for the Substantial Philosophy since developed therefrom, thus demonstrating that but a small portion of the real entities of the universe exists on the material plane or comes within our present imperfectly developed sensuous observation.

13. As the corporeal or physical half of this dual organism, in every animate being, contains many prominent and essential divisions or features of structure, all going to constitute

and make up the one material body, so also the incorporeal organism is constituted of different parts or essential divisions of that immaterial substance, all going to make up the one incorporeal counterpart. As in the higher orders of organic beings, it takes the brain, heart, lungs, muscles, bones, etc., to constitute the physical body, so also it takes the life, mind, soul, and spirit—as well as attributes of each—particularly in man, the highest, to make up this one immaterial or incorporeal organic entity.

14. The Substantial Philosophy further teaches that the vital and mental energy of the worm, by which it is enabled to seek its food and avoid danger, though of a less number of parts, corresponding to its physical structure, is as much a real, substantial entity or incorporeal organism as is the vital and mental *ego* of a Newton or a Humbolt. And while our Philosophy admits, in accordance with the demands of true science, that no substantial entity in the universe can be annihilated, it teaches that all forms of force, even including the vital and mental, may, if so ordained and required in the economy of Nature, return after their manifestation or use, and be reabsorbed into the universal force-element or fountain whence they came, as a cloud of vapor that has fallen in rain-drops to irrigate the soil, may return by percolation through the ground to the river, and thence to the sea, to lose its identity, but not its substance, in the original fountain whence it came; though, in all this process of change and utility, not one atom of its essence has been lost or ceases to exist. In like manner also, as here enumerated, the physical forms of force, such as light, heat, sound, electricity, gravity, magnetism, etc., though generated by methods and processes ordained, or residing in matter as a fixed adjunct, are neither created out of nothing by any process of generation, nor do they cease to exist, though they seem to, when they cease to manifest themselves. So far from annihilation, Substantialism assures us, as just hinted, that any one of these forms of force, as soon as its manifestation ceases, falls back into the force-element whence it was transformed, thus again constituting it a part of the general fountain, there to remain to be manifested when required, according to the established order of God's natural laws.

15. This new Philosophy further teaches that man, being at the head of the animal kingdom, and endowed with a rational, moral, and spiritual nature, and with the power of inquiring into the cause of his own origin as well as of the origin of Nature herself, and with the faculty of contemplating this present existence as but the ephemeral prelude to the real life to which the present prophetically points—in a word, having the seeds of immortality and perpetual consciousness sown in his nature, and the idea of a personal God as the Creator of the universe ineradicably constituting a part of his own *ego*, he must have been originally designed by the intelligent first cause, for another and a higher sphere of being for which the present life, as a mere schooling, was intended to prepare him; and that death, to such a being, is but the exchange of earthly and material environments and conditions of existence for those which are immaterial, spiritual, and eternal. Hence the Substantial Philosophy assures us that not only will man, in the coming state, possess a real, substantial body, but that his entire immaterial environments, in-

cluding clothing, residence, etc., will be as substantial and real as they are here.

16. But it is as clearly taught by the same Philosophy that the lower orders of animate being, though endowed with wondrous mental and instinctive powers, yet, since they can have no thought concerning their origin nor any conception of a life beyond the present, and having no idea of a God, of spiritual existence, of perpetual being, or of the signification of death, of life, or even of self-contemplation, the present sphere of existence, in the wise economy of Nature, would therefore seem to be all that either wisdom or goodness would demand for such creatures. Hence the Substantial Philosophy tells us that the vital and mental powers of all animate creation below the human plane serve their intended uses during the brief lifetime of their recipients, and that when one of the lower animals dies, the substantial forces, vital and mental, which constituted its immaterial being here, pass out into the universal fountain of vitality and mentality whence they came, as already explained, without an atom of such animate force being lost or annihilated. The lower animal, therefore, unlike man, simply parts with its individual identity, because, unlike man, it had never conceived of it, nor of its own existence as an ego, and therefore, having no desire for its perpetuation, the being would not be wronged or in any way the loser by the termination of such individual entity.

17. Finally Substantialism teaches, as a part of its new philosophy, that all these substantial forces in Nature, as well as the force-element out of which they are variously transformed, have necessarily existed with God in some form from eternity, as a portion of His exterior nature or being, not only as the instrumentality with which He as an infinite Spiritual Personality operates and creates, but as constituting the substantial element out of which He spoke the Universe into existence. Our Philosophy teaches that it no more detracts from the glory, dignity, or perfection of Deity as a personal and infinite Creator, to suppose the immaterial physical force-element to constitute a part of His essential being from eternity, and out of which all physical bodies were created, than to assume, as we must do in reason, that the substantial vital and mental force-element was with God from eternity as a portion of His own essential being and out of which all mind and life and spirit of the animate universe were originally transformed. This is taught, therefore, in the Substantial Philosophy as a rational and consistent basis for belief in creation out of *something* that had an existence from eternity, and consequently, that such a substantial entity as a part of God's essential being, must have been also self-existent. This view is accepted by the adherents of the new philosophy as preferable to the inconceivable supposition that God created all things out of *nothing*, which was formerly believed and taught by eminent divines, as the best conception they could then form of creation in harmony with the glory and dignity of infinite wisdom and power, and without being compelled to accept the eternity of matter. But those eminent men had not then the data to aid their conceptions which the Substantial Philosophy has since brought to light, and which now clearly shows that a real omnipresent and substantial *something* may have existed with God from eternity, out of which to create

matter and all material as well as immaterial forms of being. Thus we have a thinkable rather than an unthinkable basis for our conception, and which we may safely hold as an article of our philosophical and religious faith while neither involving pantheism on the one hand nor the eternity of matter on the other, neither in any way conflicting with any theological tenet that is plainly taught in the Scriptures of truth.

We may thus fairly claim in the Substantial Philosophy a religio-philosophical formula of belief that is as broad as Nature and as deep as scientific truth itself, and upon which all thinking Christian men, or even those who make no church profession, may unite without in any way compromising church-fellowship, or instigating a conflict of theological or sectarian ideas, or, in fact, even raising the question of scriptural exegesis. There has been in the minds of many profound Christian thinkers a well-founded doubt as to the possible construction of any purely theological or exegetical formula of belief sufficiently broad and philosophical to meet the intellectual demands and exigencies of advanced scientific investigators. It has been supposed, not without reason, that although most of the more reflective men of that class have a dim belief in a future life, yet, on account of their methods of thinking and investigating, they have unfortunately so outgrown purely church dogmas that little hope exists of their ever accepting Christianity as a system of religious belief, *unless some radical system of rational philosophical thought should intervene to pave the way for such acceptance.* May not Substantialism, which appeals equally to the Christian philosopher and the scientific investigator, be that very providential intervention by which logical thinkers of every intellectual pursuit may come ultimately into the one fold, with one Shepherd, and thus find themselves at last in the effulgence of "the true light which lighteth every man that cometh into the world"?

As proof of its effective adaptiveness to this pressing need, we know positively of many who had become confirmed in their doubts of a hereafter for humanity who have, with joy inexpressible, accepted the Substantial Philosophy as a sufficient solution of this essential phase of the problem; while hundreds, yes, thousands, of the most intelligent and earnest clergymen, of all shades of theological belief, have embraced the fundamental principles of the Substantial Philosophy as the long-prayed-for panacea that would cause the scales of materialistic darkness to fall from the eyes of scientific investigators, and thereby let in such light as these benighted wayfarers could at last comprehend. We firmly believe that the Substantial Philosophy, while harmonizing the apparently conflicting phenomena of Nature, and thereby totally setting aside the materialistic and atheistic objections to a future existence for humanity, will form a consistent philosophical bond of social, intellectual, and spiritual union, which, by calling a truce to sectarian controversies and hostilities, may ultimately lead to that true Christian union of the Churches, which will substantially fulfill the prayer of Christ, that His people might be one even as He and His Father were one. Is not such a consummation, or any step toward it, involving the evolution of religious and scientific truth, a result devoutly to be wished? Plainly, scriptural exegesis, as held in the

various religious denominations, and as so persistently adhered to and insisted upon by each, can never yield to that prayer of the Saviour, nor to the acknowledged desirability of the union of all Christians. Something must form an initial basis, which is entirely unobjectionable, and one that all can accept without a religious scruple. Without such an initial stepping-stone to oneness of spirit, the long and difficult stride to the vestibule of the temple of unity can never be taken in the present weak, dwarfed, and crippled condition of humanity. Who knows, then, but that the stone of Substantialism, which the master-builders of the present generation have so far disallowed, may yet form that very stepping-stone to the outer court of the temple, that will ultimately lead the Church and the world into the holy of holies?

SIR WM. THOMPSON ON THE FIVE SENSES.

In the *Scientific American* of May 17th appears the address of Sir Wm. Thompson, LL.D., F.R.S., President of the Midland Institute, Birmingham, England, delivered before that institution October 8, 1888. The address is full of scientific thought, in the speaker's usual vigorous and critical style, and abounds with suggestive facts, as well as important speculative ideas relating to physics. In the interests of scientific research we now propose a brief review of that representative paper,—at least, some of its salient features,—chiefly to solve a problem he introduces which neither he nor any one else, so far as we have ever heard, has yet attempted to unravel.

The leading feature of his address was the assumption of a *sixth sense*, which he terms the "sense of force"! A less great man than Sir William Thompson, suggesting such a distinction as he intimates, and calling it a separate sense with such a name, would have excited a smile of ridicule in every college in the land. What is this "sense of force" of which he treats? He simply divides the sense of *touch*, usually called feeling, into two departments—namely, one of *temperature* and the other of *force*,—the latter relating exclusively, as he describes it, to the perception of the character or quality of a body such as the *form of its surface*, its *contour*, *roughness*, *smoothness*, etc. We fail entirely to discover any special philosophical or physiological necessity for this distinction as involving anything more than the simple tactile sense differently employed, since the mental impression in both cases is derived solely through the tactile nerves. To classify all the sensations thus derived, under the two heads of *temperature* (meaning various degrees of heat) and *form* (the latter called "force," as if there was no *force in heat*), is not only misleading, but self-evidently weak as well as erroneous. A terrific headache or a twinge of gout is neither a sensation of *temperature* nor of *contour*; yet it is the "sense of force" in a most emphatic degree—*forcing* the sufferer to scream with agony. An electric shock neither conveys to the mind the impression of heat, cold, roughness, nor smoothness, yet it is a decided sensation of "force," and as feeling it is only recognizable through the tactile nerves. How this great British scientist could so mistakenly reduce all tactile sensations to the two departments of *temperature* and *form* is a mystery to the average American thinker. A

rattlesnake bite, for example, is neither *warm* nor *cold*; nor does the victim realize the slightest impression of the *form* of the tooth or of the injected poison, as to its *roughness* or *smoothness*! Yet he receives a most decided mental impression through his tactile nerves which convinces him that something has hurt him. The same law holds equally true of many kinds of pleasurable sensations and thrills which also reach the brain and impress the mind through the tactile nerves, without in any manner involving the impression of either temperature or form. If Sir William has the right to make two distinct senses by his arbitrary method of division, then surely pleasurable and painful impressions through the tactile nerves, which involve neither roughness, smoothness, nor temperature, ought to be another classification, and still another "sense," making the *seventh*!

However, we did not start out to waste words over the correctness or incorrectness of this claimed new "sense of force" discovered by the great physicist, but to call attention to the singular fact that he really supposed himself to be alone in claiming to have discovered a "*sixth sense*." This singular claim of Sir William shows a limited reading of the most advanced scientific thought of the time that is surprising. He has only to consult the writings of Prof. Hæckel, the great German naturalist of Jena, and he will find that he distinctively announces a "*sixth sense*," which he terms the "*sexual sense*," covering, as he insists, the entire range of perceptive sensibility between the opposite sexes, of lower animals as well as of human beings; and he gives, in our judgment, strong if not ample reasons for designating that wonderful and mysterious perceptivity and sensibility as a distinct and separate *sense* not possible to include among the admitted five. It strikes us as strange, to say the least, that one so well informed in scientific matters as Sir William Thompson should never have read of this claimed discovery by the great German naturalist, so much more plausible and rational as a physiological assumption than his own strained effort to make a new sense by dividing the sense of touch. Indeed we must say, without either intending a pun or any disrespect to the great scientist, that we can see no *sense* in such an arbitrary division. So far from accepting this as the long-sought-for "*sixth sense*," we can claim the prize by a much shorter cut and on a much more rational basis by pointing, for example, to the inexplicable power of carrier pigeons and all migratory birds, as well as some other animals, in finding their way home when carried any distance in the dark. They manifestly neither go by memory, observation, smell, nor any other of the five senses, since the young homing pigeon, that was never outside of its aviary, carried a thousand miles in the night by a circuitous route and let go, will come directly home without mistake. What but another and definite *sense*, wholly unknown and entirely inconceivable to mortals, could thus enable the pigeon to perform such a marvelous feat? Such wonderful ability in an animal, equal, apparently, to the gift of prophecy or the power to foretell events, may well be set down as a distinct and separate *sense*, as much so as either of the recognized five senses.

The supposition that the pigeon is guided by an inconceivable range and refinement of the sense of *smell*, vastly surpassing that of the fox-hound, and that by this sublimed faculty it

scents the distant aviary where it was reared, and thus determines its course, is more improbable and incredible than to assume a new sense at once as the solution,—a capability entirely beyond the range of human comprehension. We predict as a complete test of the truth or falsity of this supposition of a subtle refinement of *smell*, that if the entire aviary were to be transported in the following train of cars, and stationed near to the point where the pigeon should be let loose, it would have no effect whatever in diverting the bird's course, or in the least impeding its return to its home. This, if our predictions should be verified, would rule the sense of smell out of the question, and would thus settle beyond a doubt the existence of an unknown sense, equal to smell, sight, or hearing, or even all of them combined, which we may, with reason, call the intuitive "sense of locality." We have always been an unmitigated skeptic on the subject of *clairvoyance*, regarding it as self-deception, good guessing, etc.; but really, in view of this surprising gift of a lower animal, such as the carrier pigeon, we are half inclined at times to be skeptical of our own skepticism, and with agnostic modesty exclaim—*We don't know!*

But the point we aimed to reach was this: to direct attention to the weakness of the attempt of Sir William Thompson to discover a "sixth sense" by a simple division of the sense of touch into two departments, as compared with this known intuitive "sense of locality" possessed by many classes of animals. As well, in our opinion, might that great investigator have divided the sense of *taste* into two parts, one embracing the various classes of food of nutritious value, and the other limited to the special sensations of sweet, sour, salt, bitter, etc., not available as nutriment. Would such an arbitrary division and classification be tolerated as worthy of this enlightened scientific age? Yet it is manifestly as rational and philosophical as the so-called "sense of force" to which the students of the Midland Institute listened so attentively.

After Sir William's preliminary discussion of this claimed discovery of a "sixth sense," he proceeds to consider the probability of the existence of a *magnetic sense*, and also of an *electric sense*, as some have assumed, in which he gives possibly not an unmerited slap at mesmerism and spiritualism generally, attributing much of the claimed marvelous phenomena of those *isms*, if not all, to trickery, imposition, over-surrender to the operator, etc. While discussing these supposed senses, he introduces and describes, as a possible justification of the existence of something of the sort, a most wonderful phenomenon in the action of electro-magnetism as shown by a certain experiment with a piece of copper. The experiment referred to we accept as true, though we have never witnessed it. We have seen accounts of its exhibition before scientific audiences, and of its creating a more profound sensation than any other phenomenon known to physics; and it is this phenomenon more especially, so carefully stated by Sir William Thompson, which we set out in this paper to examine and explain on the principles of the Substantial Philosophy.

The experiment, as described, is this: If a piece of *copper* or *silver* (no other metal or substance producing a similar effect) be held directly over the space between the poles of a powerful electro-magnet and let drop, it will fall through this space very slowly, as if it

were settling through thin *mud*, and that it will thus take half a minute or so to fall only a few inches. Sir William supposes that this is caused in some way by the dense collection or accumulation of *magnetic force* between these poles, thus making it of the consistency of *batter*, so to speak. Yet this critical scientist appears never once to get the idea that such a dense mass of force, which could thus impede a body's falling as if sinking in *mud*, could be nothing less than a *substantial entity* of some kind, even if wholly immaterial in essence. It is certainly a matter of astonishment that eminent scientific investigators, after encountering such evidences as this of incorporeal substance, could not grasp the simple idea of *Substantialism* as in some way the explanation of an imponderable force that will produce such physical results. Even after they have witnessed its effects as if it were *mud*, they still regard it as *nothing* entitative—a mere "mode of motion." As proof, note Sir William Thompson's words, when he tells us that these magnetic effects are "*due, as we know, to rotations of molecules!*" How does he "know" it, when nobody ever yet saw a molecule, which is a material substance, either rotate or stand still; and even if the molecules of the magnet did rotate, what possible effect would that have on the piece of copper not at all in contact with the magnet? To increase his perplexity, Sir William finds that a piece of wood, glass, lead, or organized flesh will drop through between these magnetic poles, however intensely charged may be the magnet, as if it were a mile away from it; and he further assures us that no physical body is thus impeded in its fall except the two metals *copper* and *silver*. He even relates how another scientist had gone to the trouble of constructing a monster electro-magnet, so large that a man could pass his head freely between the poles, but, as he tells us, without experiencing the slightest effect from this magnetic force. existing, as he inferred, dense enough almost to swim copper. This startling fact, as it necessarily must have been to that great *savant*, caused him to exclaim repeatedly that "the result was marvelous, and the marvel is that nothing was perceived" when the man's head passed between the poles! He says:

"I cannot think that the *quality* of matter [this *magnetism*] in space, which produces such a *prodigious effect* upon a *piece of metal* can be absolutely without any—it is certainly not without any—effect whatever on the *matter* of the living body," etc.

And so sure was Sir William, that some effect must be produced upon such *material substance*, as a man's head, though not perceptible, that he says:

"It is so marvelous that there should be *no effect at all*, that I do believe and feel that the experiment [of the big magnet] is worth repeating," etc.

Now all this reasoning comes from a philosophical misapprehension. There is absolutely "no effect at all" produced upon a man's head or upon any other animal, mineral, or vegetable substance whatever, thus passed between the poles of the magnet; and what will be a still more radical and startling assertion is, that *even the piece of copper does not sink slowly between these magnetic poles, because of any effect produced upon the material of the copper by the dense collection of magnetic force in that region!*

This, we admit, seems paradoxical and con-

tradiictory, but it will all be made as plain as sunlight soon. To suppose the piece of material copper to sink through this "quality" of the metal—this dense collection of magnetism—by a law similar to that of a body settling through "mud," really makes the problem only about as clear as *mud*, and there leaves it, since any other heavy substance besides copper—even a man's head—would evidently settle slowly through soft mud. No wonder, then, that scientists, so viewing the problem, would marvel that a man should feel no impression whatever when his head passed through this dense body of "quality!"

Let us now bring the calcium-light of the Substantial Philosophy full-focused to bear upon this problem, and see if the "marvel" will not rationally disappear with the mystery, thus adding another to the list of original philosophical solutions recorded in THE MICROCOSM. For if this one phenomenon can be rationally explained on the principles of Substantialism, then the operations of all the forces of Nature may be equally understood. Let us, then, approach the solution of the mystery with careful deliberation, and to this end we must prepare the way for the reader's apprehension by a preliminary suggestion or two, before coming to the solution itself.

Viewing magnetic currents as veritable emanations of immaterial substance passing from the magnetic poles, as the Substantial Philosophy teaches, it is easy to grasp the idea that this same incorporeal substance *latent* in another piece of similar metal (not copper or silver) might have a sympathetic affinity for such *active* magnetic rays, thus causing the piece of iron, as by cords of substantial force, to rush to the embrace of the magnet, as we know it does. Yet no other metal, which is destitute of this latent magnetic substance, will be thus attracted in the least. Copper, or silver, or gold, or glass, experiences no effect whatever from this sympathetic attraction. The very same piece of copper which, as Sir William shows, falls sluggishly through a dense collection of this magnetic force, as if sinking in thin mortar, is not in the slightest degree attracted toward the pole of the most powerful electro-magnet ever made. Why, then, does magnetism, which will not attract copper, impede its fall? It does not act this way with iron. Let such a piece of iron drop between the magnetic poles, and instead of sinking slowly toward the ground, it instantly leaps to one or the other pole, if the magnetic current be strong enough, and fastens itself there, while the piece of copper, inclining toward neither pole, settles slowly downward just as Sir William Thompson describes it. Clearly and undeniably this is a profound mystery which, as we claim, nothing but Substantialism will solve. Let us therefore, after these preliminary suggestions, attempt its solution, while we ask the reader's best mental powers to the nice analytical points involved in the éclaircissement.

The substantial force of gravity (one form of the universal *force-element* of Nature) takes hold of the piece of copper, as we usually express it, pulling it down. Yet this is not scientifically true. It pulls this metal down alone by *sympathy*, not with the material copper itself, but with the same substantial gravitational force residing in very small quantity in the copper. While this is rationally true, there exists also such a relation between magnetism (another form of this same universal force-ele-

ment), and gravity *as it resides in copper and silver only*, that this magnetic force, when strong enough, neutralizes to some degree the small quantity of gravitational force within these peculiar metals, and thus weakens the sympathy which exists between the force of gravity in such metals and the greater gravitational force of the earth. Thus, while the magnetic force in no wise tends to attract a piece of copper toward the poles of the magnet,—the copper having no *latent* magnetic force within it to be thus acted on by sympathy,—yet the force from the magnet does act upon the gravitational force as it resides within the piece of copper, owing to unknown molecular conditions, so far neutralizing it that there is but little left for the gravity of the earth to grasp. We say in common parlance that a magnet attracts a piece of iron, and that the earth attracts a stone. Neither is strictly and scientifically true. As just hinted, it is the *active force* of the substantial magnetism radiating from the magnetic poles which seizes by sympathy the latent magnetic force residing in metal of a similar quality with the magnet (it does not affect the *material* metal itself), thus drawing the two bodies together by cords of sympathetic force. The earth, in like manner, only draws a stone downward by the substantial cords of gravitational force from the earth interlocking sympathetically with the same substantial force centering in small quantity also in the pebble. If by any means this almost infinitesimal quantity of gravitational force in any body of metal could be neutralized or destroyed, the earth's gravity would not act upon such metal in the slightest degree to cause it to fall, any more than magnetic force can attract copper or other metal which contains no latent magnetism for it to take hold of. Hence this is exactly the reason why the piece of copper or silver falls slowly through a dense atmosphere of magnetic force. Such force tends to neutralize the small quantity of gravitational force *as it resides in copper and silver only, owing to some unknown quality of those two metals, thus partially breaking the sympathetic hold of the earth's gravity*. It is not the obstruction caused by the dense collection of magnetism which impedes the fall of the piece of copper *on the principle of a body's settling through "mud,"* as Sir William Thompson supposed, but its neutralizing effect upon the gravity within the copper, thus rendering it unfit, so to speak, for the gravity of the earth to take hold of. In evidence of the simple correctness of this position, that gravity is partially neutralized in a piece of copper while within a dense magnetic atmosphere, weigh it in that position, and it will be found to weigh almost nothing. A child might thus lift a ton of copper with one finger by simply bringing the two poles of a magnet, powerful enough, on the two opposite sides of the mass of copper, thus neutralizing its inherent gravity, and thereby destroying the hold of the earth's gravity upon it.

This solution, so simple and easy in itself, is not only rationally true, but it is in strict harmony and consistency with other scientific truth first published by us in THE MICROCOSM about three years ago, vol. 1, page 134. It was there urged in a set editorial, without dreaming of its relation to the present discussion, that according to the Substantial Philosophy bodies do not attract each other gravitationally according to the quantity of *matter* they contain, as the old formulas of science have

taught us, but according to the quantity of *effective gravital substance* belonging to any particular body to be acted upon sympathetically by the substantial gravital force of another body. The idea that the *weight* of a body depends upon the amount of *matter* it contains, originated in that dark age of scientific investigation when nothing was regarded as real substance but *matter*. The Substantial Philosophy has dispelled all this scientific fog by showing that gravity and magnetism are as really and literally substantial entities as the material pebble or the material mass of iron attracted by them. Plainly, to teach that two bodies act gravitally upon each other according to the amount of *matter* contained in each, is no more reasonable nor probable than that two magnets must necessarily attract each other according to the amount of *matter* contained in each magnet; whereas, it is well known that a small magnet may exert twice as much magnetic force as another magnet twice as large, simply because the small one sends out twice as much magnetism. *Glass*, as we have repeatedly urged in THE MICROCOSM in proof of this new philosophy, necessarily contains more *matter* than gold, though gold is many times heavier. Why? *Because glass is freer from pores or vacant spaces.* The only true law or criterion, as we have often urged, for determining the amount of *matter* any body contains is the absence or presence of *pores*. The *weight* or *mass* is an entirely different thing, and depends upon the substantial gravital force within the body itself, which also, in another form, constitutes the cohesive force of what is called molecular attraction. The nature and character of the molecular structure and affinity of the particles of a body determine the amount of this gravital force-element within it and thus its weight, while the quantity of *matter* depends alone upon the absence or presence of porosity. This is as true in reason as it is new in science. Hence, also, the character of the molecular affinity of a body determines the influence which another form of force, such as magnetism, for example, can exert upon its gravital force, as shown in the case under consideration with *copper* and *silver*, almost neutralizing this gravital element and preventing the earth's gravity from acting upon it. If the mass of copper be placed, as described by Sir William, between the poles of a powerful electro-magnet, the experiment truly shows that it falls very sluggishly, and we can only account for this by the substantial view as here given, namely, that the gravital force in the piece of copper is in some mysterious way so weakened by the neutralizing effect of the substantial magnetic force (all forces being but different transformations of one universal force-element) that its sympathetic affinity for the earth's gravity is thereby partly destroyed.

That it is a profound mystery how magnetic force can thus neutralize gravital force among the molecules of *copper* and *silver*, while having no such effect upon the gravital force residing within glass, wood, gold, flesh, or any other substance, we freely admit; but it is no more a matter of marvel than that this same magnetic force will sympathize with and attract to the magnet a piece of *iron*, while it will not attract in the slightest degree either *silver*, *copper*, *gold*, or "*a man's head*"! Sir William Thompson does not think of marveling at this fact, just as mysterious, and which his mode-of-motion philosophy falls just as far short of solving. Think of the idea of an in-

substantial *mode of motion*—a mere "quality of matter"—among the revolving molecules of the iron magnet (without emitting any substance whatever) becoming as thick as "mud" at a distance from these moving molecules, so that a mass of copper will almost swim in it! What skeptical scientist, who adopts the mode-of-motion theory of modern philosophy, can now question the swimming of Elisha's ax-head on water, when a mass of solid copper will float in absolutely *nothing* substantial, as force is supposed to be? But with the solution which Substantialism furnishes, the miracle of the swimming ax-head is a simple problem. The power of God, through the prophet, had simply to neutralize the action of the resident gravity in the iron, so that the earth's gravity could not fasten to it, thus reducing its weight below that of the water, and thus causing it to swim, just as magnetism can destroy gravity in copper, thus making it as light as air itself by preventing the gravity of the earth from taking hold of it.

This mode-of-motion talk, as accounting for any of the phenomena of Nature's forces, is one of the nakedest and most inexcusable absurdities in modern science. If the effects were all confined among the rotating molecules of the magnet, to which Sir William Thompson attributes the whole of the magnetic results, there might be some appearance of rationality in the mode-of-motion theory. But here are the so-called *rotating molecules* confined to the magnet, while a foot away, if the magnet be powerful enough, metals are lifted or suspended by absolutely *nothing*, unless, in addition to the "rotations of molecules," a real immaterial substance is emitted and actually goes forth to produce the physical effects observed, as Substantialism teaches.

It will not do to claim that this mode of motion continues on away from the "rotation of molecules" in the magnet through the intervening air, making the atmospheric molecules also rotate, and thus lift or otherwise manipulate the metal; for, unfortunately for this mode-of-motion fallacy, the same effect precisely takes place at a distance from the magnet through a perfect vacuum, in which there are no molecules to rotate! To resort finally to the "rotations" of the "molecules" of an intangible, incorporeal "*ether*," that will pass through glass and fill a vacuum, as some have attempted to do to smother the difficulty, is to admit as much as Substantialism pretends to claim; for such ethereal assumption merely shifts the difficulty from the substantial, immaterial, magnetic force itself to another immaterial substance based on pure imagination, and called "*ether*." The only sensible course, in our judgment, for scientists to pursue is to abandon the shallow expedient of so-called modes of motion by which to account for the various phenomena of force at a distance from the source of power, and where there is nothing to constitute such *motion*, and adopt the substantial view that all the forces are entities, and which at once accounts for observed phenomena, solves all problems, and explains all mysteries.

We thus have the pleasure of placing on record in THE MICROCOSM the true solution of a problem which has caused, as we have here seen, the greatest scientist of the world, second only to Helmholtz, to marvel with astonishment.—a problem, it may be truly asserted, with which no system of philosophy in existence, save Substantialism, can begin to cope.

COMMENCEMENT OF VOLUME IV.

With a heart full of gratitude to a kind Providence, and with many thanks to our readers, we send out this initial number of the Fourth Volume of *THE MICROCOSM*. We involuntarily catch ourselves, as we retire at night and rise in the morning, humming the grateful refrain with a slight modification of the poet:

"Safely through another year,
God hath brought us on our way."

How true this is! "It is the Lord's doings." Few of our readers will ever know the fatherly interest and solicitude we have felt during the year that is past for the future influence, success and usefulness of this magazine, as each number, regular as the month rolled round, was shoved into scores of U. S. Mail bags, and thrust into the prodigious maelstrom of our great Post-Office to be distributed by its hundreds of clerks and thus sent off on its missionary work. Not one number has been thus consigned to the fate of the mails that a prayer has not gone with it to the intent that each copy might reach its destination and gladden the hearts of its readers. With few exceptions this desire has been realized, and where any handler of the mails has for the moment carelessly forgotten the eighth commandment we have been compensated with the assurance that his temptation to purloin would be overruled for the good of himself as well as others into whose hands the stolen numbers might fall.

The Fourth Volume of *THE MICROCOSM* now starts off, we are glad to say, with brighter prospects of success and a stronger ground of real hopefulness, than has the initial number of any of its predecessors. We have received such a degree of assurance from hundreds of our subscribers during the past year, of their estimate of the value of this journal, as to convince us that the average reader cannot do without its monthly visits, and that but few who have read it for even one year will look upon the dollar it costs as any more than a paltry thing as compared with 12 such numbers of *THE MICROCOSM* as this that we now send. Scores of readers have written to tell us, as number after number was issued, that this, that, or the other article from the pen of some one of our contributors, was worth more than the year's subscription; while it is an every-day occurrence to receive letters from our oldest subscribers declaring that this is the only paper, of a dozen or more they take, of which every article from beginning to end is read, some of them several times over. This, assuredly, is most gratifying intelligence to the busy editor, whose only pay that he gets or expects is the reward of gratitude and appreciation from those for whom he labors.

In retrospect of the progress made during the journalistic year just closed, we can only record our gratification at the substantial evidences of success which have come to hand from all points of the compass. There is scarcely a civilized nation on earth where this magazine is not read, while at scores of missionary stations, even among barbarous and half-civilized peoples, the self-sacrificing missionaries have availed themselves of the help *THE MICROCOSM* yields in enabling them to look more clearly through Nature up to Nature's God. Not a state, territory, or scarcely a county or town of any size in this broad country, extending from ocean to ocean, and from the Arctic regions to the Mexican Gulf, can be named where *THE MICROCOSM* (vol. 3) has not been read by intelligent and even enthusiastic investigators of the great questions and revolutionary principles of science and philosophy continually unfolding in its pages; and we confidently trust that at each of these points not only the old subscribers will stay with us, but that they will be instrumental in extending our circulation to others.

Our experience during the past three volumes proves that there is no practical limit to the range of original discussions within the capacity of our grand army of contributors. As our writers delve deeper and deeper into the mines of precious metals which they are now exploring, every new car-load brought to the surface must only clear the way for exposing to view still richer veins of the sparkling ore, while each new excavation will add to their facility and experience for securing and utilizing the treasure. Our readers, during this volume, may therefore cal-

culate on untold wealth of thought, more precious to the philosophical and scientific investigator than can be the sacks of gold or bales of bonds to the infatuated Wall street gambler, while the microcosmic treasures which can be hoarded from these pages will leave no remorseful sting to destroy sleep, shatter nerves, or frost the head with the symbols of premature age and death.

Thanking our readers, with feelings of which words can convey but a meager conception, for the many cheerful encouragements received during the rise and progress of this magazine, and praying Heaven's choicest blessings upon each and all, we can only proffer the substantial results of the past as a pledge and guarantee of what *THE MICROCOSM* will bring forth during the year now commenced.

THE "CHRISTIAN STANDARD" CONTROVERSY.

We gave quite a full explanation last month of the circumstances which led to and accompanied the controversy between the office editor of the *Standard* and our esteemed contributor,—Eld. Thomas Munnell. We also gave in full the *Standard's* article containing the specific objections to our locust-argument, with Eld. Munnell's reply as written by us, but which the office editor refused to print, on the alleged ground of its length. As stated last month, Eld. Munnell, instead of insisting upon the printing of our answer in the *Standard*, as he should have done, and thus forcing a flat: backdown on a subterfuge which every reader could have seen through, adopted the mistaken policy of replying briefly and in general terms, without meeting definitely those ingenious objections raised by the office editor. That reply was printed and severely criticised in the *Standard*, as we stated last month, just because it did not specifically take up and answer the objections which our longer reply had conclusively met. On seeing his mistaken policy, and the handle the *Standard* made of it, Eld. Munnell wrote the office editor, insisting, as a matter of justice to the *Standard's* readers, as well as to the editor of *THE MICROCOSM*, that our original replies to his objections should be printed in the *Standard* just as we wrote them, and as printed in *THE MICROCOSM* last month. He also sent us a copy of his letter, to let us know that he was doing all he could to correct the mistake of not insisting in the first place upon the publication of our full reply in the *Standard*. We immediately wrote him, predicting that his labor was for naught,—that the office editor would be only too glad to end the controversy, rather than let his readers see our answers to his plausible sophistries; and that he would peremptorily refuse to print another line from our pen. Suffice it to say, to make a long story short, it turned out exactly as we predicted—the manuscript was returned to Eld. Munnell, refusing positively to print another word from our pen.

Thus while the principles of the Substantial Philosophy are being received by thousands of ministers of all the religious denominations with words of joy and approval, as seen elsewhere in this number, the management of the *Standard* refuse to let its readers know about those principles, not because the editor does not in his soul believe the same glorious truths, but on account of a petty personal grudge for having got the worst of a scientific argument with the founder of the New Philosophy on a former occasion, which our subscribers have not forgotten. If his readers are willing quietly to submit to the withholding of valuable information on such contemptible grounds, then we have mistaken the stuff they are made of. One thing the office editor can rest assured of, that more than two thousand of his most intelligent readers have had the privilege of examining our answers to his supposed difficulties, as printed in the July number of this Magazine, and that the same readers will also see this expose of the true inwardness of the *Standard-Munnell* controversy.

SOLID AND LEADED MATTER.

One of our observing contributors, and a good friend of *THE MICROCOSM* writes us:

"Why do you not *lead* your editorials, and thus make your intellectual work go further and make

yourself last longer? You would thus save about one-quarter of every page in the wear and tear of brain, and make your editorials look better. Any other magazine in the world of that size and at that price (\$1 a year) would not only lead the whole thing, contributions and all, but would put it in *long primer type* instead of *brevier*, thus saving about one-half in composition alone," &c.

Well, we can only say in reply, that with *small type* and *solid matter*, we do not begin to find room in the editorial department for all we want to say; nor do we find half room enough for the excellent productions of our versatile contributory staff. We have many small business items, press notices, &c., necessary to print in order to supply the "sinews of war," and we thus print our editorials very *solid* (especially for the present month), partly to atone for that draft on the reader's space. We do not intend to "burn our candle at both ends" when we can help it, as we desire, equally with our readers, that we may last for this work as long as possible. We had hoped before this time to have consummated some arrangement for assistance, that we might give ourself wholly to our editorial mission. But we have not yet succeeded in securing the proper aid.

TO THE FRIENDS OF RELIGION AND TRUE SCIENCE.

The world needs, at the present time in a special manner, a scientific and philosophical journal, which, while grappling with the profoundest problems of Nature, is not afraid nor ashamed to unfurl from its masthead the standard of religion, and thus vindicate by the principles of science and philosophy the fundamental doctrines of the Christian Scriptures, as against evolution and all forms of materialistic infidelity. There is confessedly but one such paper now published, and that is **THE MICROCOSM**. Its bold and uncompromising advocacy of religious truth, and its revolutionary assaults upon false theories of science, make it *par excellence* the Magazine for Ministers of whatever denomination, who may wish to keep abreast with the advanced thought of the times, as well as for laymen who may wish to know how to answer those who are inclined to raise doubts concerning a hereafter for humanity. For three successive years this journal has battled successfully with all forms of atheistic and materialistic unbelief, and with increasing prestige has stopped the mouths of gainsayers, and silenced the hitherto defiant scoffers at the Christian Religion. Its arguments during the past volumes have poured floods of light in the shape of collateral scientific proofs into the minds of its readers, tending to convince the skeptical and confirm the wavering, that the present life is not all there is of us or for us, and that death does not and cannot end all. The fact that **THE MICROCOSM** is strictly undenominational gives it a cosmopolitan character which exactly meets the wants of the present time, and makes it emphatically everybody's Magazine. In the estimation of the ablest and most earnest friends of religion, who have been constant readers of its pages since the first number was issued, three years ago, it is impossible to estimate the good this journal has already done in shedding light upon Nature's mysteries, and thus harmonizing the claims of science and revelation.

As a few of the thousands of Ministers of different religious denominations, who are subscribers to this publication, we heartily and unreservedly commend it to our friends, especially the clergy, as not only worthy to be

taken and read, but invaluable to be preserved in the library as a work of reference.

Rev. H. Hutchings, D. D., Pas. Bedford Av. Bap. Ch., Brooklyn, N. Y.
 Rev. Clayton Eddy, Rec. Prot. Epis. Ch., E. Haven, Ct.
 Rev. D. H. Reiter, M. A., Cong. Ch., Vicksb'g, Mich.
 Rev. D. Pratt, Jr., North Conway, N. H.
 Rev. W. W. Bailey, Pas. M. E. Ch., Granger, O.
 Rev. J. T. Lloyd, D. D., Pas. Presb. Ch., F. Wayne, Ind.
 Elder Thomas Munnell, Gen. Home Mis. Christian Ch., Mt. Sterling, Ky.
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 Eld. M. N. Downing, Pas. Free Meth. Ch., Binghamton, N. Y.
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 Eld. J. J. Miles, Pas. Chr. Church, Clinton, Ill.
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 Rev. R. L. Abernethy, D. D., Pres. Ruth. Col., N. C.
 Rev. H. C. Glover, Pas. M. E. Ch., Amityville, N. Y.
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 Rev. D. R. Taylor, North Hampton, Ohio.
 Rev. A. Reeves, M. D., Rector Prot. Epis. Church, Worthington, Ind.
 Rev. J. C. Wilhelm, Petersburg, Pa.
 Rev. Sidney Wilder, Pas. Bap. Ch., Arcadia, N. Y.
 Rev. J. D. Sands, Belmont, Iowa.
 Rev. Wm. Clark, D. D., Pas. Cong. Ch. Amherst, N. H.
 Rev. Alfred Gardner, Atlantic, Iowa.
 Rev. W. G. Thrall, Evang. Luth. Ch., Argusville, N. Y.
 Rev. Oliver P. Champlin, Emmetsburg, Iowa.
 Rev. E. B. Turner, Portage, Ohio.
 Rev. D. Oglesby, Pas. Meth. Ch., Richview, Ill.;
 And more than seven hundred others.

ENTHUSIASTIC COMMENDATIONS.

Nearly all of the ministers who signed the foregoing commendation of **THE MICROCOSM** accompanied it with remarks enthusiastically indorsing our magazine. We could give hundreds of these letters, but a mere specimen of them will have to suffice for want of space:

Port Tobacco, Md., July 1st, 1884.

DEAR DR. HALL,—I return, signed with the most entire indorsement, the slip recommending the widest circulation of **THE MICROCOSM**. Of all my periodicals of high intellectual reading, I put nothing on the same plane with **THE MICROCOSM**. It is an *absolute necessity to me*; and I cannot conceive how any man who loves the best fruits of best thinkers can do without it. Besides, it gives month by month, the very reading and discussions that commissioned defenders of God's truth must needs have. Very truly yours,
 G. F. WILLIAMS.

Binghamton, New York.

DEAR BRO. HALL,—I am asked if I can indorse the sentiments expressed in that slip favoring the **MICROCOSM**. Yes; a thousand times yes! My heart says:

"O for a thousand tongues to sing
 My great Redeemer's praise,"

that at this time a man hath come, sent by the "Holy One" to save Israel from the blinding, corroding in-

fluence of "science falsely so-called." O, my brother, my soul slakes its thirst from the waters God is helping you to bring forth out of the solid rock of truth to thousands of famishing souls. I am with you. I love you. I pray for you. Heaven preserve you.

Sincerely yours,

M. N. DOWNING.

Vicksburg, Mich.

HALL & Co.:

GENTS.—I have been a constant reader of THE MICROCOSM from its first number, and most heartily do I endorse the sentiments expressed above for its wide circulation. May you have an increased subscription list of many thousands.

D. H. REITER.

Granger, Ohio.

DEAR BRO. WILFORD.—After reading THE MICROCOSM for three years with profit and profound delight. I can, and hereby do give it the most cordial commendation to Christian ministers of every denomination. I trust the appeal to them will meet the warmest favor in behalf of this really indispensable journal.

W. W. BAILEY.

Kimberton, Pa.

DEAR DR. HALL.—Yes; most cheerfully do I give my signature and influence as an aid to increase the circulation of THE MICROCOSM among ministers as well as others. Nothing like it has ever been published, and every month seems to be an advance upon the previous one. Go on, Doctor. The Lord is in the truth, and it will prevail. May He bless you with continued health and strength for your great work.

P. RABY.

Bangor, Maine.

DR. HALL.—Though a Congregational clergyman, I can give a hearty *Methodist amen* to the sentiments and objects of the slip, which I return. I value THE MICROCOSM far more highly than any other periodical I take, or with which I am acquainted. I earnestly desire its extensive circulation among the people and especially the clergy.

JOSEPH SMITH.

South Royallton, Vermont.

* * * * * The more I think of the *Problem of Human Life*, the more highly I prize it; and I sincerely regret that I have not been able to be of more service in circulating it. You have raised a live issue, and there is no theologian before the American public whose labors are of the importance of yours. You have taken the materialistic "bull by the horns," and it is singular that no polemic aside from yourself has approached these famous scientists in a manner worthy of the best thought of the present time; and it is remarkable that no oracle of skepticism in the United States seems willing to acquaint himself with your arguments. Years ago Hugh Miller said:

"The battle of the evidences of Christianity will certainly have to be fought on the field of *physical Science*, as it was contested during the last age on that of metaphysics; and in the new arena the combatants will have to employ new weapons which it will be the privilege of the challenger to choose. The old appeal to these would be of little avail."

This battle you have commenced; and I am sorry to feel that upon such an important matter the bulk of the clergy are apathetic. The plea that "all things remain as they were since our fathers fell asleep" will not now suffice. New issues have come up that can only be met by new arguments. A repetition of sectarian platitudes will not now avail.

Believe me very sincerely and fraternally yours,
GEO. A. SEVERANCE.

Cantateo, N. Y.

* * * * * I was glad to see your article on Embryology in the July number. Your true mission is to destroy Evolution. In my view you have already done it in the "*Problem*," but only a comparative few, notwithstanding its great sale, have read that work. Among the good articles on Evolution in THE MICROCOSM, that on *Embryology* was keen, cutting and unanswerable. I do not object to you saying so much on *sound*. Although the wave-theory has been

killed, many yet cherish its corpse. I hope you will grind it to powder, and, like Moses with the golden calf, compel its advocates to drink it. *Substantialisism* is the substratum of your revolutionary discussion. I like THE MICROCOSM more and more. No publication for twice the cost has so much valuable matter. Will you give me your father's name? I like the idea of hunting up your birthplace. Affectionately yours,
L. F. LAINE.

☞ The painting described last month, "*Wilford Hall and his Lieutenants*," is now finished, and to say we are proud of this beautiful birthday present, as well as of the artist, is only saying what every contributor will echo, whose face stands out so lifelike on the canvas. We will immediately commence preparing and sending off the promised cabinet photographs of this painting free to every subscriber, new or old, who remits the \$1 for volume 4 of THE MICROCOSM. The artist, however, reserves to himself the copyright of this painting, which will cover all prints, photographs, &c., except the cabinet size which we give to subscribers as a premium. This, of course, is only right and fair to the artist, as it has cost him more than a thousand dollars' worth of artistic labor to complete it, each of the likenesses (now 37 in all) requiring about the same labor as to produce a single life-size portrait. He will, therefore, at once get up a large photograph of the painting, suitable for framing, 12 by 16 inches, which he will mail at \$1 per copy to any one desiring it. He will also color the same photographs, making them lifelike and about equal in appearance to an oil painting for \$5 each. Mr. Tiers is decidedly an artist, and we are under so many obligations to him for this beautiful and valuable present, that we here announce to our readers his offer to paint life-size portraits from photographs, on canvas 25 by 30 inches—at \$25 each, and guarantee satisfaction. The artist can be addressed through this office.

☞ We regret that many important contributions now in our safe, and some of them announced last month, could not possibly find room in this number. We can assure our readers that there are rich things in store for them during this volume, judging from the stock of contributions now on hand, and those continually accumulating.

☞ As our life-subscription offer for THE MICROCOSM will be withdrawn next month, after the circulation of this number, it might be well for persons intending to subscribe for volume four to take advantage of our proposal by purchasing \$15 worth of our valuable books at wholesale price, and thus get a life-certificate free. Circulars giving wholesale prices of books and full particulars of this offer sent on application.

☞ We have just published a small greatly improved *Webster Dictionary* (384 pages, 3 columns to the page, and containing 50,000 words, hundreds of which are not yet in Webster Unabridged), a copy of which we will send by mail free as a premium for two subscriptions to the fourth volume of THE MICROCOSM.—\$2. This is the most perfect cheap dictionary ever published. For full description see last month's MICROCOSM.

☞ THE *Walks and Words of Jesus*, by Rev. M. N. Olmsted, is a complete collation of every part of the Four Evangelists, so connected and arranged as to make of them a beautiful Harmony. It is invaluable for ministers and Sunday-school teachers. Price \$1. A sample copy of this, or of *Universalism Against Itself* (\$1), or of *Through the Prison to the Throne* (\$1), or of *Death of Death* (\$1), will be sent free as a premium for three new subscribers to Volume IV of THE MICROCOSM, with the money, \$3. Or for four new subscribers (\$4), the *Problem of Human Life*; or for seven new subscribers (\$7), the first three volumes of THE MICROCOSM bound in cloth, will be sent free and prepaid, by express. More than 51,000 copies of the *Problem of Human Life*, and more than 60,000 copies of *Universalism Against Itself*, have been sold. The latter book contains a fine steel-plate likeness of the author—the editor of this magazine.

WILFORD'S MICROCOSM.

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THE MICROCOSM.

BY REV. J. I. SWANDER, A. M.

THE MICROCOSM has entered upon its fourth volume, and the first number is at hand. The enterprise, which was formerly an experiment, is now an established fact in journalism. It has achieved a success as a reward of merit. Its merit is found, primarily, neither in its editor nor among its contributors, but in the fundamental principle of which it is the fair exponent, as well as faithful and fearless advocate. That principle is now known and read of all men who have embraced the Substantial Philosophy, and is diligently inquired after by many more, who, having caught a few glimmering rays of its morning star, are just now holding themselves in readiness to bow with scientific devotion before the rising sun of its glory. The sun of Substantialism is already above the horizon. No wonder, therefore, that the shadows of opaque theories are fleeing before the growing effulgence of its splendor. And this grand beginning has been accomplished in a few short years. What a season of jubilee for gratitude and hope! If the infancy of THE MICROCOSM has accomplished so much, what great achievements may not be expected from the more steady and sturdy blows of its approaching manhood? If this thing has been done in a green tree, what a splendid bonfire may be witnessed when the root, trunk, branches, and bitter fruit of the dry old upas shall serve to feed the flames of that inevitable conflagration whose Plutonic pencil will paint a lurid hell upon the midnight sky of materialistic evolution! *Fifty-five thousand* copies of the August MICROCOSM have been sent out upon a mission, second only to that of the everlasting Gospel. Is it wonderful? Not very. Notwithstanding the scientific idolatry of the times, there are still a large number of men who desire to enter the inner sanctuary and worship the God of truth. The only wonder is that there should be found, in this progressive age and country, a thinker, a scholar, or a Christian, who is not a subscriber and reader of this great religio-scientific journal, now generally acknowledged as the leader in the van of original philosophic inquiry.

The August number is an arch of strength and a gem of beauty. The editorials ring out with a sound more certain than air waves. The review of Sir William Thomson is also a forcible application of the fundamental principle of the Substantial Philosophy to what is now confessedly the most difficult problem in Physics. The first editorial makes its appearance in the fullness of time. There was not only an expressed desire, but also an increasing demand for something of the kind. It will prove to be an excellent primer for honest beginners in the school of Substantialism, as well as a guide for those who are ready to leave the first principles of its doctrines, and go on to perfection. To all such we commend it with our most un-

qualified approval. The doctrines so fairly and forcibly formulated therein, are destined, under God, and in harmony with the truth and progress of our holy religion, to counteract the power and poison of that epidemic materialism now so destructively prevalent, both in the faith of the Church and philosophy of the schools. Let this new creed be published for the healing of the unscientific nations. It is worthy of the man who startled the world from the slumbers of its past ages, and excited it to new efforts of more earnest inquiry for the time to come. Such a bugle-blast is worth a thousand men, and ten thousand of that doubtful gender who profess their belief in the undulatory omnipotence of the cricket. The banner of truth now waves above the outer wall of its citadel. Let the people read, and embrace the phantoms of educated sophistry no more. Yet some say that the New Philosophy deceiveth the people. Indeed! Then did the Apostles deceive the nations to whom they preached the Gospel. Deceive the people with truth demonstrated by facts? Great God! is there a scholar on earth so blind as not to see, or so full of prejudice as not to admit the essential soundness of the Substantial Philosophy? If so, we can congratulate him only upon the fact that he is in no danger of sudden death either from information on the brain, or enlargement of the moral membranes about—something supposed to resemble a human heart.

The contributions, with possibly one exception, are of a high order. They flow with freshness from the fountain, and sparkle with intellectual brightness in their streams of limpid light. These papers may be likened unto the armory of David, "wherein there hang a thousand bucklers, all shields of mighty men." Each shield is accompanied with a lance to "pierce the foe's remotest lines." The contributory staff consists of scientific freemen, and embraces writers who would be a credit to any magazine in the world. We confess our pride at finding our name in this list of special contributors, whose intellectual powers we have learned to respect, and whose manifest Christian worth we shall continue to hold in affectionate regard until both they and we are taken, through the triumphs of saving grace and truth, to recognize and congratulate each other among the substantial spirits of just men made perfect. We have longed to see their faces in the flesh: yet, if this desire cannot be gratified, our faith is willing to wait for the gathering of that general assembly and church of the first born which are written in heaven. Until the time for such a happy greeting, we should all be content with the intimate companionship of Truth, and renew our determination to guard her sacred temple from any further desecration by the money changers of false science.

We notice and note several marked features of improvement in the more recent contributions over those of the first and second volumes. Indeed, some of the articles appear to us like shooting stars of original thought, and are generally admired for a brilliancy unsurpassed,

except by the superior effulgence of the editorial sun himself. Let us have a few more such flashing meteors that dare to dart away and dash along, and map their own independent orbits through the scientific skies. Such communications will be serviceable according as they are made to bear more or less directly upon the great central question of the age. What is that question? The existence of an objective order of invisible, inaudible, intangible and absolutely incorporeal being, corresponsive with the more material side of God's great universe. We hope that this noble army of "Lieutenants" will still further increase their usefulness, by keeping this question clearly and constantly in view, and that they will also continue to send off their best original thoughts, whirling and whizzing through the intellectual atmosphere, until the last bookful blockhead in the dilapidated dormitory of the wave-theory shall be aroused to come forth and admit that the new substantial heavens wherein dwell scientific righteousness are possessed of more veritable entities than Horatio ever dreamed of in his materialistic philosophy.

This journal needs no new announcement of its principles and purpose. It seems disposed and determined not to change its base of operations, even when moving its heaviest artillery toward that point in the line of attack where the combat deepens and where falls the foe before it. It rejoices in the day of battle, not so much out of love for the fray as for the truth and triumph of the principles involved. Those principles have already triumphed. In vain will the enemy exert themselves to hold a few outposts already dismantled and passed. The invincible force of the New Philosophy has penetrated the inner works, and planted its standard above the fallen citadel of error. Yes; the battle has been won. The business of the near future is to secure the spoils and look after the wounded. As the spoils are worthless, let ample room be made for the ambulance corps and sanitary commission.

In this day of victory, let the mission of *THE MICROCOSM* be clearly defined, and fairly understood. *The Leading American Journal of Science* is no less magnanimous than brave. Success cannot intoxicate its brain. While it remains conservatively radical, it will, no doubt, continue to shun the pessimistic school of constitutional grumblers. With Dr. Samuel Johnson, and with more consistency than he, it has no admiration for those chronic "screech-owls of mankind" whose morbid spleens cause them to complain of everything in heaven above, in the earth beneath, and in the waters under the earth. There is no merit, *per se*, in disturbing the tranquillity of the world: and such, if we apprehend it correctly, is not the primary purpose of this monthly magazine. Its ultimate aim is to negotiate a treaty of peace upon a more substantial and permanent basis; yet in the accomplishment of this, its grand mission, it will necessarily provoke a conflict where there is no agreement between theories and facts. In this respect, at least, *THE MICROCOSM* will have the authority of good example in Him who "came not to bring peace, but a sword:" and, if there is not a genuine family row in the household of materialistic science long before the dawn of the twentieth century, it will be most clearly demonstrated that "mother-in-law" is not possessed of that metal commonly supposed to lie at the foundation of much domestic infelicity. Yes; let it

be distinctly understood that this magazine is possessed of a more laudable ambition than to declare war against established theories, true or false, for no other purpose than to display its valor upon the field of controversy. There are theories in science, and creeds in religion, whose underlying principles, imbedded in the Eternal Rock, have stood unshaken through all the vicissitudes of time's most stormy centuries, and whose venerable locks should teach us to regard them as sacred as the very shrine of truth, and no less inviolable than its holy temple. Yet the world, as also the Church, is too full of old heresies, and the truth too frequently held in the unrighteousness of false apprehension, for the enlightened vigilance of the nineteenth century to silence the tongue of its inquiry, or discontinue the work of its searching investigation. The correctness of the above assertion is denied, both by the pretentious infallibility of Romanism in religion, and the imaginary indefectibility of materialism in science. For our part we leave the dead to bury their dead, and press after that vital point at issue which should by this time be clear to all who have the power to comprehend the interesting situation. Dr. Hall foresaw the real issue, and threw the gage of battle with no misapprehension as to what the conflict really involved; and now, in the dawning day of victory, he can hold the newly captured fort until a righteous and permanent peace is negotiated upon the basis of a more enduring substance.

Gentlemen of the wave-theory and other fragments of an exploded false principle in science, surrender is now in order. You cannot object to the terms: they are a thousand times more honorable than your continued fealty to a manifest falsehood. Neither can you doubt the gallantry of the victorious leader under whose easy yoke you now have the privilege to pass. The weapons of his warfare have been neither carnal nor cruel, but mighty in pulling down of your strongholds of superlative weakness. Samson used the jaw-bone of an ass to slay the Philistines; and Samson was an honorable man. Wilford used an array of unanswerable facts to silence the jaw-bones of your respectable giants; and certainly *he* is an honorable man. Indeed, you are all honorable men. Then, in honor to yourselves, surrender to the majesty of truth, and weave your garlands for the brow of *THE MICROCOSM*, which is now its fairest exponent in the scientific world. Are you fearful of becoming unpopular? Please, do not deceive yourselves. This journal is growing more popular with each succeeding issue. It occupies a legitimate place in the family circle of magazines. It may have been born in advance of its age, but yet in the holiest bonds of scientific wedlock. Come and go with us. We offer you the right hand of fellowship. Indeed, you may occupy the front pews in our new scientific church. Henceforth, we shall be brethren, and labor together in the cause whose standard is now advancing to the pearly portals of unclouded light. As, by the assistance of your splendid abilities we turn many more from the broad and crooked road of false science, we shall not fail to write our sentiments of mutual confidence and glowing gratitude upon the parchment of the brightening skies, until, in our final flight, we carry our ascriptions of glory to Him whose kingdom is substantial in the essential elements of its being, unrivaled in the supremacy of its dominion, and everlasting in the cycles of its duration.

PERMANENCE OF CHARACTER.

BY JUDGE G. C. LANPHERE.

Does the character become permanently fixed in good, or in evil?

In an attempt briefly to answer this question, I shall assume the existence of a God, infinitely wise, powerful, and good; and the freedom of the will; and that we survive the grave; and that natural death does not change the character. I will not stop to reason with those who deny either of these propositions. In all human reasoning some things must be taken for granted; and these propositions have a sufficiently general acceptance to entitle them to be placed in that category.

Several years ago, as the reader may remember, the subject of endless punishment, or endless misery, was much discussed in the pulpits of the country; and at that time the Rev. Dr. Rider, an able and learned clergyman of the Universalist denomination, in a discourse on that subject, said: "*It is true, the second step in sin is easier than the first.*" The italics are mine. To my mind, the proposition is not only true, but extremely important. In the sense that the longer one continues in evil habits, the more facile and rapid his progress downward, the proposition is self-evident. All our experience goes to confirm its truthfulness. But it seems to me that the reverend gentleman, in this admission, has, to use an expression common among lawyers, "given away his case." Why is the second step in sin easier than the first? Is it not because the fear to do wrong is weakened, and the love of evil strengthened by every false step? Is not the power and the desire to resist temptation weakened by vicious indulgence, and, in the same proportion, is not our love of evil strengthened? The poet has said:

"Vice is a monster of such frightful mien,
That to be hated, needs but to be seen;
But seen too oft, familiar with her face,
We first endure, then pity, then embrace."

All do not continue in evil courses, but stop while they have the power to regain their lost integrity. Others, to all appearance, go on from bad to worse, sinking deeper and deeper in vice or in some form of selfishness. How long can this downward course continue before the individual becomes evil through and through? Evidently, it is only a question of time. The fixed and hopeless condition of the confirmed drunkard is a case in point. All our experience seems to demonstrate that this habit may become so fixed, that there is neither desire nor power to throw it off. Like the rolling stone as it descends the mountain side, the love of evil gathers momentum and strength the longer indulged. What is there to stop and change the whole character of the man? Not the Almighty, because He does not and cannot interfere with the freedom of the will. Not abstract goodness and truth, because these have ceased to influence his conduct. Not the fear of hell, because, like Milton's Archangel damned, he has made hell his heaven. Now, if natural death does not change the character,—and I think no sensible reason can be given why it should,—and if God, to be consistent, cannot any more interfere with man's freedom in the other life than He can and does in this; and if the individual, as we have seen, has made hell his heaven, what hope, or prospect, or probability is there that he will ever cease to be evil,

and come to be good; give up that which has become his *very life*, and take to himself or become an entirely opposite life? "*Can the leopard change his spots, or the Ethiopian his skin?*"

We have not traveled into the other life, and seen with our own eyes the order prevailing there; but we judge the future by the past, the unknown by what we see and know, and we have every reason to believe that the workings of the mind will be the same there as here; there will be the same order of cause and effect. Man is man here and everywhere. The road to absolute selfishness may be a long one, but persistence will reach the end at last. Self and altruism are opposite poles of the human character, and to one or the other of these every individual gravitates; and absolute self, or absolute altruism must, in the nature of things, become the final goal of every human being.

GALESBURG, Ill.

THE LAW OF DYNAMIC ENERGY.

BY PROF. W. H. H. MUSICK.

The text-books teach that dynamic energy is proportional to the SQUARE of the velocity of the moving body.

If a two-pound weight be moving with a velocity of 32 feet per second, it is said to possess 32 foot-pounds of energy, since the height to which it will raise itself against the force of gravity, 16 (feet), multiplied into the mass, 2 (pounds), equals 32. Now, if the whole of this dynamic energy be converted into potential energy by making use of the motion of the projectile to condense the atmosphere in an air-chamber, the reaction of the compressed air will (if "action and reaction are always equal and opposite") impart to a body weighing 1 pound, the velocity of 64 feet per second. This velocity is twice as great as was that of the first projectile; the energy per unit of mass must, therefore (according to the text-books), be 2² or 4 times as great; the moving mass is one-half as great, $32 \times 4 = 128 \div 2 = 64$ foot-pounds of energy, derived wholly from the motion of a body said to possess 32 foot-pounds of energy only. How can this be reconciled with the doctrine of the Conservation of Energy? Answer, who can!

I know the height to which a projectile will raise itself against the force of gravity is proportional to the square of its velocity. But I also know that this result will inevitably follow the increase of energy in simple proportion to the increase of velocity. With double the energy, the projectile will sustain its flight against the constant force of gravity *twice as many seconds*, and it is mathematically certain that with twice the initial velocity its *average velocity per second* will be doubled, which will quadruple the height ascended by doubling the energy, in simple proportion to the increase of velocity. With energy represented by 32 feet per second of velocity, a body will ascend for one second with an average velocity of 16 feet per second, rising in all 16 feet. With 3 times as much energy its ascent will be continued for 3 seconds, and starting with 3 times its former initial velocity (now 96 feet per second), its average velocity per second will be 3 times as much as formerly, or 48 feet. The whole height ascended will be, of course, 144 feet.

VANDALIA, Mo.

CAN GOD'S FOREKNOWLEDGE AND ENDLESS PUNISHMENT BE HARMONIZED?

BY REV. JOHN WESLEY.

It sometimes happens that we unlearned readers of *THE MICROCOSM* think a "*wee bit*." And though we may stumble in our grammar, we hope the editor will be patient with us, and not consign us to the waste-basket, because we do not conjugate properly, or use the proper correlative.

The following quotation, from Rev. T. Williston's article in *THE MICROCOSM* for May, stimulated the writer of this paper to not a little thought:

"But I trust my readers are convinced that Judas' freedom and ability to love, obey, and be saved, were not a whit the less because it was certain he would perish."

We are not all convinced, though we cannot assume that God's foreknowledge of Judas' destruction set aside his desire to be saved, or his ability to seek salvation: but it is perfectly clear, that, if God knew he would be lost, every effort on the part of Judas to secure salvation would be abortive. Whenever a writer affirms that God absolutely knew Judas would be lost, and in the same sentence assures us Judas had the ability to be saved, he reasons falsely—he contradicts himself. One of two things is certain: either God did, or did not, know that Judas would be lost; if the former, Judas had no power, capacity, or ability to avert the calamity. All the talk about Judas' free-agency, and his ability to be saved, notwithstanding the eternal certainty in the foreknowledge of God that he would be lost, is nothing but sophistry.

Had Judas any free-agency not conferred by Jehovah? Where did he get the dangerous power, called "*free-agency*," in the use of which he brought himself into condemnation? God evidently understood all the possibilities of Judas to secure salvation. He knew his capability of obeying, and, consequently, must have known that Judas would choose to disobey and be lost.

Mr. Williston introduces a father, and asks us to "suppose now that the father was endowed with such foresight and penetration into the future as to be absolutely certain that this unprofitful and unlovely son would never reform, but retain his odious character to the end and be lost. Would the foreseen certainty of that son's ruin render the father any less worthy of that son's love? Or would that father be any *less sincere* in offering to reward the rebellious son, if obedient, because he foresaw that his infatuated son would never become obedient?" There is no analogy between the above quotation and the case of Judas. Suppose, in addition to the father's foreknowledge, he had possessed power to confer on his son the ability to do right, to be good and obedient, but gave, instead, a disposition that led his son to ruin; who then would be to blame? Has it ever occurred to the philosophers who prate so much about man's free-agency, that God is also a FREE-AGENT? God did not create man because it was a necessity, but it was the choice, the will, the purpose, and the pleasure of Jehovah that brought man into existence. and man has no free-agency other than God gave him, which is not absolute in its nature. If one were to offer the philosophic Editor of *THE MICROCOSM* a

choice between two twenty-dollar gold pieces, and at the same time assure him that one was base and the other genuine, would not his choice be influenced by the relative value of the money?

No man is free to choose the place of his birth and education, which largely influence his conduct in after life. Had Wilford Hall, with all his great powers of analysis, been born and bred a Turk, in all probability he would believe the Koran, and recognize Mohammed as a prophet; hence we conclude that man's free-agency is modified by circumstances from without, over which he has no control. But God's free choice is *absolute*, and the entire difficulty in regard to Judas being saved or lost, is not with God's foreknowledge or man's free-agency; but in the *conception* that God has knowingly permitted the possibility of the eternal damnation of one human soul to enter His plan of creation.

If man is brought to eternal punishment by reason of his free choice in the pursuit of evil, it will be the result of a secondary free choice; hence, God's primary free choice of admitting, while knowing it, such a disastrous feature to enter His plan of creation and government, impeaches the infinity of His attribute of goodness.

When we recognize punishment as a prospective force in the government of God, we will have taken a long stride toward solving many of the difficult problems which now perplex theologians. The leading attributes of God are love, goodness, wisdom and power, and He is Infinite in all His attributes.

Now conceive, if you can, the mind of God dwelling upon the creation of man, and reasoning from God's attributes, what would His plan be? Would not Infinite love and goodness suggest, even urge, the ultimate happiness and good of the created? Did Infinite wisdom see the final state of man from the beginning? If so, would not Infinite love and goodness have withheld a free-agency in the use of which man would bring eternal ruin upon himself? God created man; God being *Infinite* in goodness, the final destiny of man must have been planned for happiness. Being *Infinite* in wisdom, God has devised a plan whereby man shall come to that destiny of happiness.

Being INFINITE in power, He will successfully accomplish His purposes and consummate His plan; hence, the final destiny of man, in ultimate harmony with the attributes and character of God, must be holy and happy—holy and happy by the primary free choice of God and the secondary free choice of man, which is eternal in its nature. This is not fatalism; nor is it making a machine of man; but it is a well-organized plan, giving man the power to choose the good, to accept salvation, and endowing him with such attributes of mind as will make his accepting it absolutely certain. There is not space to enter into the biblical discussion of this question. In the opinion of the writer, there is not a single text within the Bible, when rightly understood, that teaches the doctrine of endless punishment.

The invitation is, "Come unto me and I will give you rest;" and the invitation is not limited to any age, time or place; or to the present state of existence; and those who deny the possibility of a change after death must also deny the eternal free-agency of man. If there is no free choice in the future state, how could the angels have fallen? Angels have fallen, which argues the certainty of a free choice in HEAVEN. If

angels have been free to choose evil, *man must be free to choose good in a future state, or good becomes subordinate to evil.* We would like to discuss the problem of evil, but space will not permit; however, we do not hesitate to affirm that evil is not an endless entity, but that it is a temporary phenomenon, existing by Divine permission, and is being continually utilized by the Creator of man in promoting His eternal purposes in the progress of their development. From this stand-point, how beautiful the foreknowledge of God becomes! God was not disappointed when our first parents transgressed and were driven from the GARDEN. God knew that man would sin, and therefore provided a "Saviour, from the foundation of the world."

Christ was not a new feature in the Divine plan; and Judas was simply one of the actors in a tragedy placed upon the world's great stage by the Eternal God, and we have no doubt that Judas has long since seen the folly of sin, and accepted salvation through the blood of the Christ whom he betrayed. And from this stand-point we are able to see how God is glorified "*in them that perish,*" for they perish *not* eternally, but temporarily, and emerge from chastisement with disciplined and ripened wisdom that brings them to the feet of JESUS, *where salvation is ever to be found.* Since our education in the *Problem of Human Life*, we have come to agree with Dr. Hall, that, where a matter is in dispute, there is generally a simple way of arriving at the truth; and we are willing to let our cause stand or fall upon a simple proposition, viz: Webster's definition of the word "*eternal,*" which is, "*having no beginning nor end.*"

It has been clearly shown in the *Problem of Human Life* (as we understand it), that matter is eternal (not in the old sense), because it always existed in God, as all things that were created existed in Him. And we now affirm, that nothing can be eternal in its nature that had a beginning, for *eternal* is without *beginning* or *end*. Man, as man, had a beginning; therefore, man as man, as mortal, shall perish; but the immortal part, which is a spark of God individualized, without *beginning* or *end*, *eternal* in its nature, will survive the grave and bloom with immortal vigor in the PARADISE of God. We now propose one simple question to the advocates of endless punishment:

Are God's punishments for sin endless in their nature? If they are not, every application of the word *eternal* to express an infinite duration of punishment is erroneous; and wherever it is used in the BIBLE, it is ambiguous, and means an indefinite period of time, except in instances where the subject to which it is applied is eternal in its nature; which is *not* the case with *punishment*, because punishment *had a beginning*. Punishment began in Eden, treading closely on the heel of transgression, but not one hint of such a calamity as eternal punishment was hinted at. It is significant that the sentence ended at the grave; and it seems to us, if God had intended to reveal the doctrine of eternal punishment, that He would have revealed it in pronouncing sentence on Adam, instead of permitting the world to move on in sin without knowing the consequence. The fact is, God has never revealed the doctrine of eternal punishment through prophets or apostles.

Eternal punishment is of *heathen* origin, a relic of *heathen mythology*, and was introduced into the world during the time intervening be-

tween the prophets and the coming of Christ—known in history as the dark ages. In conclusion, we submit the following objections to the doctrine of eternal punishment—objections that we have in vain tried to answer satisfactorily to ourself; having been taught the doctrine of eternal punishment from infancy, and being loth to depart from it without substantial reasons:

1st. It clashes with the attributes of God, and stultifies His wisdom in creating man for a noble destiny, and then conferring on him a free-agency, in the use of which man would frustrate the end for which he was created, and thereby thwart the plan of his Creator.

2d. It destroys the eternal free-agency of man.

3d. A finite sin cannot merit an infinite duration of punishment.

4th. It fails to distinguish between the magnitude of crime, and to mete out equitable justice to each offender, commensurate with his guilt; eternal punishment being the doom of all who have not secured forgiveness before death.

5th. It is of no utility in the government of God, resulting in no good to man nor glory to God.

6th. God will never take away the opportunity of reformation, of repentance, or the free choice to become good, from any soul.

7th. God has admitted no feature in His government that will not result in the highest possible good to all; as eternal punishment results in good to none, it cannot be a part of God's plan.

8th. It impeaches the infinity of God's goodness in permitting the possible misery of a large part of humanity to enter His plan, when He had the power to have eliminated it.

9th. It impeaches the infinity of His justice in bringing man into existence, when He knew that eternal punishment would be his doom.

10th. It impeaches the infinity of His wisdom in *not* endowing man with such powers of mind as would bring him to ultimate happiness.

11th. It makes Satan co-eternal with God, gives the former victory from EDEN to the CROSS, and permits his triumph over the resurrection of Christ from the dead, which is to avail for a *small* part of the human family only, while the *great* mass of mankind *must* writhe in endless torment.

LANSING, Kansas.

[Mr. Wesley seems to have read the *Problem of Human Life*; though we venture to assert that he has never read, nor even seen, *Universalism Against Itself*. If he had read the latter book he would never have elaborated such syllogistical arguments about the nature of evil and the character of God's attributes as he has here presented; nor would he have tried logically to reason sin and punishment out of existence in the future state any more than he would have tried to demonstrate that no such things as sin and misery can exist here, because of the same infinite attributes of God. If he will turn to *Universalism vs. Itself*, page 221, revised edition, and read a few pages, he will see the abortive folly of syllogizing punishment out of existence in another world on account of the free-agency of man and the attributes of God, which permit sin with all its consequences to exist here. Then if he will turn to page 276, and read on half a dozen pages, he will not be so horrified at the terrible doom of the impeni-

tent in the next world, when he learns that the sinner will be kindly permitted to "writhe in endless torment" in that life—the condition which, above all others, in the exercise of his free-agency, he prefers here. According to Mr. Wesley's theological exegesis, and his analysis of God's attributes, the incorrigible sinner is already suffering, in the present life, the "everlasting punishment" threatened in the New Testament. Would it be cruelty on the part of God to permit a man to "writhe in [such] torment" forever—a species of misery which he enjoys so well here that all the happiness involved in religion and pure society will not induce him to give up? Would it not, rather, be cruelty on the part of God to deprive the poor sinner of the privilege of enjoying such a comfortable hell to all eternity? If some men, in the exercise of their free agency here, and in pursuance of the absolute free-agency of God in His plan of creation, prefer hell to heaven, vice to virtue, and misery to happiness, as all Universalists, including Mr. Wesley, admit and contend, then, unless they can prove from reason and Scripture that this attribute of free-agency in such men will necessarily undergo a radical change in the next life, they fail utterly to prove that the wicked will not continue forever to prefer from free choice, vice to virtue, and just such a Universalian hell as they are suffering here, but which they actually think they are *enjoying*! We are willing to let this article of Mr. Wesley's go before our readers with Judge Lanphere's short paper on "Permanence of Character," as a complete antidote for its poison, and as a sufficient stand-off. We pause for a reply.—EDITOR.]

FOREKNOWLEDGE AND PREDESTINATION.

BY DR. C. H. BALSBAUGH.

Which is the greater evil, to have a "monster" and "tyrant" on the Throne of the Universe, or an Ignoramus? Why should God be denied Omniscience? How minutely He knows the future, the Bible abundantly testifies. Is He a Seer by study and effort, or by the spontaneity of His Infinity? If by the first, He is God minus His essential attributes. If by the latter, He must needs know *all* things, or *not* know them by an effort infinitely degrading to His Godhead. A God that *must* know all things by the very terms of His being, blinding Himself voluntarily to free Himself from culpability in the issue of His works, is more than "tyrant" or "monster." Absolute Prescience is the only thing that saves the Divine character, or allows any chance of an orderly Universe, or of salvation from evil. The least occurrence in all the realms of the Almighty, Omniscient Creator, for a single moment not present to the Divine Mind, detracts just so much from His perfections. The only thing that justifies creation, and renders it manageable, is Omnipotence, Omniscience, and Omnipresence. Any flaw in either of these would destroy all security and all hope. God is able, and knows how to conduct His own undertaking to ends worthy of Himself. He will take care of Judas Iscariot and all others who miss the purpose of their being. Haphazard creation and generation would not only imperil Judas, but nobody would be safe. The Divine Ignorance would be overreached and confounded, and defeated at numberless points, and

God could really count on nothing with certainty. Science has grandly and triumphantly demonstrated the exactness and absoluteness of the Divine Mind. Nothing has ever been discovered to awaken the suspicion that God has been taken by surprise in the result of His vast and complicated and minute operations. He must make the eye just so, or it will be no eye. Were there no light, no eye had entered into the purpose of God. He must make man just so, or he is no man. Moral being without the power of erring, would be as grave a blunder as to put conscience into a rock, or place a man's nose in the middle of his brain. For God to make man, and pronounce him very good, and yet be ignorant of the nature and outcome of His own wisdom and power, shows neither Infinite wisdom nor Almighty power. Study and discuss and speculate as we will, there is inexplicable mystery in the very fact of our being. Because the Divine integrity and goodness and foreknowledge seem to conflict with free will and sin and damnation and an undone Eternity, does not justify us either to throw the *blame* on God, or free Him from blame by giving Him the easy character of a loggerhead. A great, solemn, terrible mystery to us is the fact of evil; but God knows Himself, and us, and all that was, is, and is to be, or He is not God. There is nothing gained in this controversy by blindfolding the Author of our being. "Neither is there any creature that is not manifest in His sight; but all things are naked and opened unto the eyes of Him with whom we have to do." It is the very omniscience and omnipotence of Jehovah that enable Him when and how to deal with evil in its incipience and climax. "That the Scripture might be fulfilled," in relation to Judas Iscariot and Christ the Redeemer, knocks the corner-stone thoroughly out of any theory based on Divine ignorance. If it is *natural* for God not to foreknow every sin and its temporal and eternal consequences, it is equally natural for Him not to know the results of His own laws, and this is tantamount to ignorance of Self. The power of choosing evil and doing wrong is as much of God as holiness and righteousness and love. Such a constitution is a necessity, and if it is an enigma to us, we may be glad it is no part of our duty to solve it.

UNION DEPOSIT, Pa.

PROF. KEPHART'S LETTER.

YOSEMITE VALLEY, Cal., July 5, 1884.

DEAR DR. HALL.—Myself, wife, and daughter Lizzie, in company with Prof. Klinefelter and wife, landed in this world-renowned valley on the evening of the 5th inst., after a continuous five days' journey of 150 miles. We traveled in a regular double-decked, Californian camper's wagon, drawn by two stout horses, carried our provisions and camp equipments (including table, stools, cooking utensils, etc.), with us, ate in the open air and slept in our wagon. Thus far we have had a grand, rusticiating time—good health, lots of fun, some game, and grand scenery in the foot-hills of the Sierra Nevadas. But the transcendently sublime was struck when we began to descend the cliffs overlooking this immensely wonderful valley. The scenery is grand, beyond the power of tongue or pen to describe. The following is my tribute to this grand art chamber of the Almighty, written while seated on a

camp-stool beneath the over-towering, snow-capped north dome:

Yosemite! Yosemite!!
 Amid thy august scenery,
 Awed into silence, here we stand,
 Peaks, cliffs and falls, stupendous, grand!
 When Nature speaks let man be still;
 Here Nature's voice our spirits thrill;
 When Nature paints, as here we see,
 Her master-piece, Yosemite,
 Poor mortals, spell-bound, can but gaze,
 O'erwhelmed with wonder—mute with praise,
 Impressed that brush nor pen nor tongue
 Nor grandest prose nor loftiest song,
 Can e'er convey to human soul
 The grandeur of this mighty whole;—
 It must be *seen*, and *seen again*,
 Nor can we grasp it even then.
 Thy towering wonders are sublime
 And will be till the end of time!

Yesterday we sat on the shores of Mirror Lake at the base of Cloud's Rest, whose snow-capped summit towers 6,000 feet above the valley, and in its crystal waters we saw most grandly mirrored the summits of three mighty peaks, 4,000, 5,000, and 6,000 feet high, respectively, and apparently within gunshot distance. Our whole party then embarked in the little skiff, and rowed over the bosom of these sparkling waters, cold as ice. One of the wonders to me is that we sit here in our camp in the valley, enjoying the gentle, balmy breeze, and looking up we see the rocky peaks, capped with snow, and glittering in the sun, and apparently not distant more than a gunshot.

The ledges, cliffs, torrents, cascades and falls, are all magnificent; and being all on such a stupendous scale, impress us with an overpowering sense of the power and majesty of Him by whose word these mighty wonders were spoken into existence. The air is, on all sides and constantly, filled with the ever-varying music and sighing of the cascades and water-falls, and it does seem to me that if there is any place in the world where the "interference of sound" does or can produce silence, it should be right here. But no; this wonderful valley never knows, and never has known, a moment of silence. The constant gush, and sigh, and roar, and hiss, and sizz, and buzz, and whir and thunder of the on-rushing waters leave no moment for silence here. But I can write no more now. You may hear from me again (and with your permission, the readers of *THE MICROCOSM*) on this wonderful subject.

Truly yours,

I. L. KEPHART.

THE VELOCITY QUESTION.

BY CAPT. R. KELSO CARTER.

After teaching the wave theory of sound for a number of years, I was thoroughly startled, when I began to read the *Problem of Human Life*, to find that the author questioned that theory. The previous chapters of the book had, however, prepared me to expect original thinking, and therefore I read on with an honest intention to investigate facts. My astonishment increased until, after reading some sixteen pages carefully, I came to this simple statement, upon page 90: "*The velocity of such waves cannot, by any possibility, exceed the velocity of the moving prongs which impel them.*" My conversion was instantaneous and

complete. At once I wrote on the margin of the book these words: "*As different forks move at vastly different velocities, waves must differ also.*" Now, the plain fact is, that sound-waves, or pulses, do not differ. The "sound-wave" from the deepest string of the great double bass travels with exactly the same velocity as the highest squeak from the E string of the violin when the finger is pressed away up close to the bridge. Here we have one unquestionable fact. Again, the axiomatic statement that the object impelled cannot possibly move more swiftly than the object impelling will certainly, to most minds, constitute a second great fact. But these being true, the wave-theory is rotten at its very foundations. For myself, I saw that these things are true, and, being unable to accept any theory in face of such a manifest contradiction, I at once made up my mind that the theory was wrong, and set to work thoroughly to investigate its fundamental principles and experiments.

This "velocity question" is absolutely vital, as all must allow, and as even such investigators as Professors Comstock and Goodenow practically acknowledge. I make the unhesitating claim that no man can overthrow this simple syllogism:

1. No material particle can move faster than the force or motor which impels it.

2. Material particles of air move at rates vastly greater than, and always different from, the forks, strings, bells, etc., which are said to impel them.

3. Therefore the supposition that said particles are really moved or impelled by said instruments is false.

The power of this elementary argument has been felt by the modern leaders of acoustics (Tyndall, Mayer, Helmholtz, etc.) so far as to seal their mouths and render them absolutely silent; and by their few followers who have ventured to speak, it has been assailed in a way that testifies loudly to its absolute importance. Long ago, some one undertook to cite the case of a base ball leaving the bat as an example of swifter motion in the body impelled. Dr. Hall sufficiently annihilated that unfortunate argument; but I have a word to say about it. Suppose I should have the hardihood to deny that the ball does move off more swiftly than the bat was moving? How are you going to prove it? I do claim that the difference is not enormously great. The only case which can be cited is that of a ball struck squarely by the center of gravity of the bat. When this is done, the bat takes all the shock, and the striker makes his best hit.

Suppose now that the bat weighs ten times as much as the ball. The pitcher ought to be able to throw the ball about five times as swiftly as the striker, with both hands, can swing the bat. If this is done, we would have a momentum of five met by a momentum of ten, and the resulting velocity of the ball would be about twice that of the bat, if the bat came to an absolute standstill and handed over every particle of its motion. The point I wish to make is that any such calculation must be based upon the relative weights and velocities of the bat and ball. Now let us apply this to the fork and air particles.

There can be no earthly use in appealing to such illustrations as the bat and ball, except to hold out the idea that in some way the question of difference in velocities between the fork and

air may be settled by a similar material line of proof. But just here one fatal fact rears its head. *The weight of the fork prong makes no difference whatever, within reasonable limits.* By suitably varying dimensions, I can produce the same tone from a number of forks of very different weights. But each fork will send off an "air wave" at precisely the same speed. That is to say, if I double the weight of the bat, and swing it at the same velocity, or nearly so, the ball will move at precisely the same rate as before. Again, I can mold the same weight of metal into forks producing tones several octaves apart, when we will have the curious phenomena of a little bat (fork prong) of constant weight, striking little balls (of air) at very different velocities, and sending them all at the same rate. This latter illustration thoroughly kills the attempt to convict me of false reasoning in the former. I shall not point out the exact nature of this possible attempt, but leave it as a little trap, so to speak.

Again, it is perfectly plain that the fork does not come to a stop, and hand over its full motion to the little balls of air. Every one knows experimentally that he cannot use a very heavy bat upon a very light ball. If the attempt is made, no sufficient resistance is felt, and the small ball cannot be propelled as far or as swiftly as one that is in proper proportion. Imagine a man striking dried peas with a large base-ball bat! Under no circumstances can such a ball be made to receive the whole momentum of the bat, nor anything like it. But how much more absurd is the difference between a heavy fork and the inconceivably minute molecules of the atmosphere! The particles struck, when elastic as in the case of air, will undoubtedly move off at a rate slightly swifter than that of the fork prong, but the question is to get this motion screwed up to some reasonable rate of speed. Can it be done?

Every man who attempts to defend a false theory is bound to commit logical suicide. It cannot be avoided. In the June MICROCOSM Prof. Comstock quoted Johnson's Cyclopaedia (Prof O. N. Rood). At the end of that quotation we read, "If the limb of a tuning-fork make 500 double vibrations per second, the velocity of propagation will exceed the mean velocity of vibration more than 240 times." Notice the words please: "*the velocity of propagation.*" In order to give him all the advantage possible I will state, that the intention is to argue that a moving body may hand its motion over to another body, that to a third body; and that the *handing over process* may go on much more swiftly than the actual motion of any one of the bodies. I want to nail this trick fast at once. The advocates of the wave-theory are getting alarmed, and are beginning to dodge the real issue. They say in effect, it may be true that the velocity of the instrument varies greatly, and may be exceedingly slow, as shown by Capt. Carter's report; but the *impulse*, ah! yes, you see, the *impulse* may pass rapidly through the entire mass of particles. Now this whole scheme is a fraud from beginning to end, and the "impulse" dodge is the pith and core of the fraud. They have innocently imagined that no man can measure the rapidity of the "impulse;" or more probably never dreamed of such a thing as doing a little square thinking on the subject. Let me ask a few questions, that may serve to let in the light:

1. When I drop one suspended ball against another, of equal weight, the second bounds off

with nearly the velocity of the first. How rapidly does the "impulse" travel?

2. If a third ball is touching the second, or nearly so, how soon will the impulse reach the third ball? I am afraid Prof. Comstock would never answer this question, so I will help him out. It is as clear as the sunlight that in no possible way could the "impulse" from the first ball, through the second, reach the third, until the second has been actually moved. There is no escaping this at all. The second ball must move, however slightly, before the third can stir, or before the third can feel any "impulse." But the ivory ball man will say, my balls are all *in contact*, and the very same instant that the first moves, it follows that the motion must extend clear through the whole mass, so that the impulse may be said to travel instantaneously. Another case of suicide!

"May be said to travel instantaneously?" No, sir, you cannot use the word "may." *Must* is the word. If it be true that an impulse at one end of a mass, like the one in question, is communicated instantly to the other end, the words mean just what they say, and it is "instantly" or *simultaneously*. Hence, when I tap on the end of a very long iron pipe (as in Biot's experiments), there is no time at all consumed in the passage of the "impulse." Or when the bell struck in Lake Geneva, the observer, nine miles away, should have heard the sound at the identical instant of the stroke. As a matter of fact, it came along some dozen odd seconds afterward. But why don't Prof. Comstock or Prof. Goodenow purchase a good file and file off the points of contact of their ivory balls a little, as Wilford Hall suggests? They will be greatly surprised to find that the last ball will not bound away anything like so far. File off a little more, and a further loss of "impulse" will be noticed. Finally, file off enough, as the Doctor suggests, to turn the string of balls into a string of flat ivory disks in contact, like sections of a cylinder, and let them hang as before. In this case the "impulse" will be so feeble that the ball will act like Dr. Hall's ball and glass rod—only bound away a very small fraction of the distance passed over by the striking ball.

What is the matter? Surely the passage of a mere "impulse" is all the better assured by making the surfaces of contact broad and smooth.

As a matter of experiment, I suspended a ball so that it just touched the knob on the breech of a brass cannon, weighing 700 lbs., and then proceeded to swing a hatchet against the muzzle to see how much "impulse" or "velocity of propagation," I could get to go through. When I banged away with all my strength the ball stirred somewhere about the twentieth of an inch, probably less. But why was this? Why shouldn't an "impulse" go through a ton of brass just as well as through an ounce? Let these gentlemen of the ball-and-bat illustrations rise and explain. Lest they should fail in the attempt, I will help them out again. If I had banged a pound ball of brass as hard as I did that cannon, the small ball would have received "velocity of propagation" sufficient to send it forty feet at least. Then why did it not receive it through the cannon? Manifestly because the cannon was too heavy to be moved bodily but a very small distance, and at a very slow comparative rate of motion. This we suppose to be all news to the gentlemen in question, so I must be exceedingly plain. In common-sense terms, the third ivory

ball in a suspended row is so quickly moved because the second is *bodily displaced* by the first, at a velocity about equal to that of the first. When the balls are filed or shaved down into disks, or, what is the same thing, when I drop one ball against the end of a solid rod of much greater weight, the ball in contact with the other end of the rod only moves slightly, simply because the first ball only gave a very slow and very feeble motion to the heavy rod. Let the gentlemen of the opposition ponder over this at leisure. The string of equal balls are each displaced in turn, and this displacement constitutes the "impulse." This displacement, in elastic ivory balls can therefore scientifically be shown to travel through the whole string at a rate of speed about equaling that of the first ball in falling, or at the moment of its contact with the second. This rate being quite swift, and the row of balls always very short (probably not more than half a dozen), the "impulse" appears to travel through them in a small fraction of a second. Just here the extreme shallowness of their reasoning becomes apparent. Why did it never occur to them to rig a row of balls extending a long distance, say thirty feet, and then repeat the experiment? At that distance the eye would not be deceived. Let the strings by which the balls are hung be thirty-nine inches long. When the first ball is drawn aside and released, it will take just one half second to reach the next. At the end of one half second a falling body has a velocity of eight feet per second, so this will be the velocity communicated to the second ball. Now, if the row of balls is only sixteen feet long, it will require *two seconds* for the "impulse" to travel across under the most favorable conditions, according to the established principles of natural philosophy. Thus, Prof. Goodenow has it in his power, by a simple experiment, to visibly upset the accepted notion about the "impulse" passing so "rapidly" through a string of balls. In the above calculation, I have made no allowance whatever for any inelasticity, but, even supposing the balls to be perfectly elastic, I have demonstrated, philosophically, that the "impulse" cannot travel any faster than eight feet in one second, when the suspending strings are thirty-nine inches long. This falls sadly short of the necessary 1,120 feet, does it not? I could write many pages upon this "impulse" business, but will stop at this point and await developments. I place this "velocity of propagation" argument side by side with Dr. Hall's now famous demonstration of the "slow motion of the tuning-fork." A number of points are held in reserve, and a good-sized trap stands open in the concluding portion of this article. Let us see if any wave-theorist can be found who can scent the bait and put his head into it. We are not through, by any means, with the "impulse" dodge.

In order properly to guard against false imputations, I will say that I propose to show that the ivory-ball illustration really has no resemblance whatever to the sound-velocity question. Who can tell why?

MIL. ACADEMY, CHESTER, Pa.

EVOLUTION ONLY A HYPOTHESIS.—No. 4.

BY REV. J. J. SMITH, D. D., A. M.

The geological record, as we have seen, not only shows that the sub-kingdoms and orders

do not form a progressive series from the lowest to the highest, as the theory of evolution absolutely requires, but that instead of this, immense chasms exist between them; and furthermore, that new and lower types of animal life have followed more perfect forms in the *same division*. But this is not all: the above facts, as fatal as they are to the theory of evolution, constitute but a very small part of the catalogue of the stubborn perplexities and vexations that beset the pathway of evolutionists.

In addition to what has been already named in the foregoing article, another serious difficulty, as presented by the geological record, is found in the fact that while the theory of evolution requires that each type and species shall have developed necessarily from the lowest forms of life—monera, protozoans, or some such primordial organisms, by very slow and gradual progress, and improvement by natural selection, the various types appear suddenly and abruptly without any evidence whatever of such gradual development from lower forms. This fact is not only fatal to Darwinism, but at the same time proves that each of the several types was the work of a separate creation. Even Mr. Darwin says:

"Natural selection acts only by taking advantage of *slight successive variations*; she can never take a great and sudden leap." Again, "Natural selection is a *slow process*, and the same favorable conditions must long endure in order that any marked effect should thus be produced," etc. (*Origin of Species*, pp. 97, 156.)

But instead of this, instead of an inclined plane of life-forms rising gradually, the very reverse is true. The geological facts, so far as they appear, are utterly at war with evolution. All the species appear suddenly, and as well organized at first as at any other subsequent time in their history, and thus unmistakably point to a Creator. Prof. Dana, whose authority in this department of physical science will not be questioned, says:

"There are great gaps of great width among species. Connecting mollusks or other invertebrates with the first of fishes, geology has afforded not a fact: it has found only great sharks, ganoids, and placoderms as the earliest species."

"The earliest fishes, instead of being those of lowest grade, are among the highest: they were ganoids or reptilian fishes."

"There are still some breaks that are most remarkable, whatever allowance be made for the imperfection of record: (1). Trilobites and Brachipods came abruptly into geological history with no recognized traces of their antecedents. (2). Fishes, the first of vertebrates, appeared in the later Silurian, with no species between them and Invertebrates as their precursors. The leaves of Angiosperms (or trees of modern tribes related to the Willow, Elm, Magnolia), and also the Palms are found fossil in the cretaceous rocks of the continent, and none whatever as yet in the Jurassic." (*Text-book of Geology*, pp. 258, 261.)

As the Jurassic period immediately preceded the Cretaceous, in which these fossils are first found, it is very evident that their sudden appearance in the latter with such fully developed forms at the very first, *shows most conclusively*, that their introduction must have been by *creation*, and not by evolution.

"The Triassic rocks," says the same author, "have afforded bones of the first mammals—Marsupials, but nothing with regard to the

line of predecessors connecting them with inferior oviparous species. The Tertiary rocks of all the continents abound, in many places, in remains of true mammals; yet, not a trace of one has been found in the Cretaceous strata; and this is true in the Rocky Mountain region, where the strata are mostly of shallow-water origin, and partly fresh-water formations." (Text-book of Geology, p. 261.)

This important fact, namely, that the remains of true mammals are abundant in the Tertiary rocks of all the continents, while "*not a trace of one*" can be "found in the Cretaceous strata" which immediately preceded it, certainly carries with it a most impressive significance. Their sudden appearance, and their complete and perfect organization, show most conclusively in this case, as in the case of Trilobites, Fishes, and Angiosperms, that there is not a single fact to make the theory of evolution anything but a doubtful hypothesis of the most visionary character, while all the facts in the case go to prove a creation as described by Moses.

The same is also true of our race. The attempt of evolutionists to prove that man has descended from the Orang-outang or any other lower type of animals is an utter failure. Not a single link has been found to connect him with any of the ape tribes, or any other tribe. This is the more remarkable, on the supposition that evolution is true, since man in the geological series is of such recent date, the connecting links of a gradual development from some man-ape should be abundant. But nothing of the kind has ever been found by friend or foe, although most diligently sought after for the last twenty-five years.

On the contrary, geology shows that man, like the other species, is introduced suddenly, and as fully and as completely organized, in all the essential elements of his manhood, as he is to-day. Professor Virchow of Munich, who is a very eminent anthropologist, in a discourse delivered some time ago before a conference of German Naturalists, when speaking upon this subject, said:

"As recently as ten years ago, whenever a skull was found in a peat-bog, or in a pile-dwelling, or in ancient caves, people fancied that they saw in it a wonderful token of a savage state still quite undeveloped. They smelt out the very scent of the ape—only the trail has gradually been lost more and more! The old troglodytes, pile-villagers, and bog-people proved to be quite a respectable society. They have heads so large that many a living person would be only too happy to possess such. * * * * * On the whole we must really acknowledge that there is a complete absence of any fossil type of a lower stage in the development of man. Nay, if we gather together the whole sum of the fossil men hitherto known, and put them parallel with those of the present time, we can decidedly pronounce that there are among living men a much greater number of individuals who show a relatively inferior type, than there are among the fossils known up to this time."

Besides, the interval between apes and man is actually the greatest existing between any other of the species. "The man-ape," says Prof. Dana, "nearest in structure to man, has a cranium of but 34 cubic inches in capacity, or half that of the lowest of existing man, and no link between has been found." (Text-book of Geol., p. 262.)

In fact, the difference between them is so manifestly great that even Haeckel, one of the most pronounced evolutionists of the age, is compelled to squarely admit that man could never have possibly come from apes. He says: "I must here point out what in fact is self-evident, that not one of all the still living apes, and, consequently, not one of the so-called man-like apes, can be the progenitor of the human race." (His. Crea., vol. ii., p. 27.)

Is not this a complete surrender of the whole question? Here is a full and candid acknowledgment, by the ablest recognized champion of evolution, that there is not a particle of evidence to be found anywhere, from a scientific stand-point, that man was ever evolved from any other species whatever. Evolution, consequently, remains an unscientific theory—an unverified hypothesis, or speculation—nothing more. On the other hand, all the known facts agree with the Mosaic record that God created man. In the language of Dana: "For the development of man, gifted with high reason and will, and thus made a power above Nature, there was required, as Wallace has urged, the *special act of a Being above Nature*, whose supreme will is not only the *source of natural law*, but the *working force of Nature herself*."

TARRYTOWN, N. Y.

WAVE-THEORISTS DODGING THE ISSUE.

BY THOMAS MUNNELL, A. M.

It was amusing during the "Moon Controversy" to see Dr. Hall's opponents first defending the old theory, then forced to modify it, then driven to invent theories of their own, then getting into controversies among themselves, and finally breaking up the conference in disorder, leaving THE MICROCOSM master of the field, surveying "the wreck of matter and the crush of" theories. The same role is now being played as to the wave-theory, by a manifest disposition to drop the words "condensations" and "rarefactions" and substitute "tremors," that involves little or no condensation, and consequently little or no force in the forward direction as the wave-theory demands. Notwithstanding all that Professor Tyndall and other scientific lights have said about the "force" necessary to "condense" the air, the habit now is becoming quite common, since THE MICROCOSM has made such havoc among the text-books on sound, to speak of air "tremors." The locust is beginning now to change his tactics. He contemplates giving up the "condensation and rarefaction" business and going into the "tremor" business. It will be so much easier. He can send "tremors" through the air 1120 feet in a second with but little trouble; but "condensing," "crowding," "forcing," and "driving" air-particles into semi-orbicular shells three feet apart at the same rate is not quite so easy for his tiny abilities. Now, let us note a few facts more definitely, and see why some gentlemen are beginning to have so many tremors nowadays as to the wave-theory.

1. A sonorous body that makes 440 vibrations in a second, condenses the air into waves about three feet apart "from crest to crest," according to Mr. Tyndall and other high authorities on the wave-theory. A locust fills four cubic miles of air by its stridulations—a mile in every direction—in about five seconds. It keeps up

these waves for sixty seconds, and therefore fills the whole space twelve times before it stops. All wave-theorists teach that it requires "force" to "condense" the air into wrinklets three feet apart at the rate of 1120 feet in a second, as may be seen by trying to move a fan or an open umbrella through the air at this ten times more than hurricane rate. This "crowding of one air-particle against another," Prof. Tyndall says, meets with resistance until it finally "stops," and that the sound-wave "urges" said particles from their "position of rest." The "tremors" of an iron bridge struck by a crowbar have no resemblance to the "condensations" of air *forward*. A rope stretched on the ground may be thrown into a kind of vertical wave-motion like the tremors of the iron bridge, but there are no "condensations and rarefactions" in the rope nor in the bridge. One part of the rope is no more condensed forward than the other. Strike an iron bar with a hammer, and it will shudder to the other end, but there are no "condensations and rarefactions" in it with "wave-crests" three feet or three inches, or any other distance apart, like the supposed air-waves. In case of the rope made to roll vertically on the ground, there may be a slight condensation and rarefaction at each bend—the concave side condensed and the convex side of the bend rarefied, perhaps, or at least strained; but this condensation is vertical, and not longitudinal, as the sonorous air-wave is guessed to be. The condensations of air are *necessarily forward*, which is not true of the rope, the bar, or the bridge.

2. Prof. Mayer says (*Sound*, p. 29): "The violin sets the air trembling with 500 tremors a second, and these tremors speed with a velocity of 1100 feet in a second in all directions through the surrounding air. They soon reach the drum-skin of the ear. The latter, being elastic, moves in and out with the air which touches it. Then this membrane, in its turn, *pushes and pulls the three little ear-bones 500 times a second and * * * shakes the fibers of the auditory nerve 500 times.*"

A marvelous animal this locust! Put only one ear-drum a mile away, and let the locust have a tube through which to pour all his little strength upon a single ear-drum, and let there be no "condensations" to make on the way, outside of that tube, and let him "shake" that single ear-drum 500 times "in and out every second," and then "shake" the three "ear-bones 500 times a second in and out," and after that, "shake the fibers of the auditory nerve 500 times in a second," and the poor little fellow will soon get the shakes himself or be converted into a regular shaker, because your unreasonable demands upon him don't give him "a fair shake."

But now remove the tube and let him kick at every ear-drum that could occupy its quarter of a square inch in that whole semi-orbicular shell with the radius of a mile—over 42,000,000 of them—and let him begin to "shake" them all with their 42,000,000 sets of ear-bones and 42,000,000 sets of fibers of the auditory nerve, and let him "bend them all in and out 500 times a second" and you will have the most remarkable animal on earth. Jumbo would be nothing to him, for while it would not require so much physical "force" to move all these ear-drums once a second, yet to move them 500 times a second and move 126,000,000 ear-bones and innumerable fibers at the same rate would require at least 500 times as much power. 500 mules

could not do half the kicking the wave-theorist demands of our little locust. To overcome the inertia of all this solid matter, and to move it "to and fro" at such a rate requires "force," "urging," "pushes and pulls," that reduce the entire wave-theory to the quintessence of absurdity.

The manifest weakening on the "condensations," and the disposition to adopt a word more suitable to the contemplated modification of views is an undeniable indication of a general rout all along the line. The battle on this point is more protracted than that over the gravitation question, and more important, but the merciless blows of THE MICROCOSM are beginning to send shudderings and "tremors" through all the ranks that predict a final overthrow of the undulatory theory, which will leave it as friendless and defenseless as the Ptolemaic theory of astronomy is to-day. If the wave-theory is still held to be true, let its advocates defend it as defined by Messrs. Tyndall and Mayer, and not stealthily drop their nomenclature and adopt another of their own that dodges the difficulties, and practically gives up the fight. It is undeniable that to condense the air as the old theory demands, requires incalculable force to overcome both the inertia of the air and the friction of air-particles, and no amount of elasticity and equilibrium in the air can dispose of that fact. Granting all that could be claimed for elasticity and equipoise, inertia and condensation make resistance to the efforts of the locust which it is useless to expect it to overcome. "and there's an end on't." Besides, whoever will study the May MICROCOSM, will see that Dr. Hall has utterly exploded the elasticity argument as illustrated by the ivory balls. The wave-theory must die; Substantialism must live because it is helping to "bring life and immortality to light."

MT. STERLING, Ky.

HUMAN ACTION NOT NECESSITATED BY DIVINE FOREKNOWLEDGE.

BY REV. S. C. FULTON, A. B., PH. B.

It does seem strange that any astute and profound thinkers should feel compelled to adopt and advocate the theory of Divine Nescience as the only solution of the relation of God to the existence of evil. How they can hold this theory, and yet admit the fact that the Scriptures contain prophecies of rewardable and punishable actions, is difficult to understand. If Divine Nescience be a fact, then belief in all such prophecy is at an end. Space will not permit mentioning other difficulties pertaining to this theory; besides, it is not the purpose of this article to discuss these difficulties.

These theorists blunder in supposing contingency and certainty to be the opposites of each other; and just here lies the great fallacy in their argument: "that the certain prescience of a moral action destroys its contingent nature." Now, if *contingency*, as applied to moral actions, has any definite meaning at all, by it we must understand their freedom, and therefore the term stands opposed not to certainty, but to necessity. This meaning, as might be very easily shown, and which is self-apparent, is fixed by the very nature of the controversy. "It is the quality of the action for which they contend, and not whether it will happen or not. If contingency meant uncertainty, the sense in

which such theorists take it, the dispute would be at an end. But though an uncertain action cannot be foreseen as certain, a free, unnecessitated action may, for there is nothing in the knowledge of the action in the least to affect its nature. Simple knowledge is in no sense a cause of action, nor can it be conceived to be causal, unconnected with exerted power; for mere knowledge, therefore, an action remains free or necessitated, as the case may be. A necessitated action is not male a voluntary one by its being foreknown; a free action is not made a necessary one. Free action foreknown will not therefore cease to be contingent."—(*McClintock and Strong's Encyclo., Article Pre-science.*)

The argument here presented is that foreknowledge does not necessitate action. It may be made clearer by supposing one man capable of foreknowing what another will do under given circumstances. Foreknowledge in such a man would be the same in kind as foreknowledge in God. Its limited character would not affect its genuineness. Man's finite love is the same in kind as the infinite love of his Maker; his knowledge the same in kind as Divine knowledge; his foreknowledge the same in kind as that of God Himself. If, then, a man may foreknow what another's action will be, is there anything in his foreknowledge that necessitates that action? Surely no one would affirm causality in such foreknowing. The actor would be entirely unconstrained by the foreknowledge possessed by the other. It is inconceivable that the foreknowledge and the act should sustain to each other the relation of cause and effect. And the argument is by no means invalidated by the case being a supposed one, as perhaps it must be.

No more, then, has the foreknowledge of God any influence upon man's actions. It cannot have, for the plain and simple reason that it is knowledge and not influence, and there is nothing causative in knowledge in such relation. Actions may be foreknown, then, by God, without being necessitated by that foreknowledge.

Bushnell, in his *Nature and the Supernatural*, by the use of a single simple illustration, has let in a world of light upon this problem of God's relation to human conduct and the existence of evil. He shows clearly, and it would seem conclusively, how God may foreknow, and even fore-ordain, that which will "make certain" evil results, without constraining or affecting at all the freedom of human action, or in any sense causing or necessitating evil.

One cannot do better than to quote the illustration in full. He says: "Suppose, for example, that some person, actuated by a desire to benefit, or bless society, takes it in hand to establish and endow a school of public charity. In such a case, he will go into a careful consideration of all the possible plans of organization, with a view to select the best. In order to make the case entirely parallel, suppose him to have a complete intuition of these plans or possibilities—A, B, and C, etc., on to the end of the alphabet; so that, given each plan, or possibility, with all its features and appointments, he can see precisely what will follow—all the good, all the mischief, that will be incurred by every child that will ever attend the school. For, in each of these plans or possibles, there are mischiefs incident; and there will be children attendant who, by reason of no fault of the school, but only by their perverse abuse of

it, will there be ruined. The benefactor and founder, having thus discovered that a certain plan, D, combines the greatest amount of good results and the smallest of bad ones, the question rises whether he shall adopt that plan?

"By the supposition he must, for it is the best possible. And yet, by adopting that plan, he perceives that he will make certain, also, every particular one of the mischiefs that will be suffered by the abuse of it, and so the ruin of every child that will be ruined under it. As long as the plan is only a possible thing of contemplation, no mischiefs are suffered, no child is ruined; but the moment he decides to make the plan actual, or set the school on foot, he decides, makes certain, or, in that sense, fore-ordains all the particular bad conduct and all the particular undoing there to be wrought, as intuitively seen by him beforehand. Nothing of this would come to pass if the school, D, were not founded; and, in simply deciding on the plan, with a perfect perception of what will take place under it, he decides the bad results as well as the good, though in senses entirely different. The bad are not from him, nor from anything he has introduced or appointed, but wholly from the abuses of his beneficence, practised by others whom he undertook to bless. The good is all from him, being that for which he established the school. Both are knowingly made certain, or fore-ordained by his act."

Can anything more clearly or forcibly illustrate the relation of God to the existence of evil? Apply the illustration to His chosen system for man's schooling. Is it not clearly demonstrated how He may foreknow human action without necessitating it?

Man is free even to ruin himself if he chooses by abusing what was meant only to do him good. Nay, further, while it is "fore-ordained," "made certain," that he will ruin himself, yet he is not necessitated in his action: and God, the originator and founder of the system he abuses to his ruin, is in no sense the cause of his evil conduct, or its terrible consequences. If God may fore-ordain evil—in this sense—without causing it, may He not foreknow human action without necessitating it? If the greater is possible, is not the less also?

WILKESBARRE, Pa.

EVOLUTION, OR NATURE'S SYSTEM OF PROGRESSIVE CHANGES.

No. 1.

BY ISAAC HOFFER, ESQ.

Evolution defined as the act of unfolding can be applied to almost every operation in nature, and every person can make his own reference in applying it to any particular action or change that may come under his notice; and this, no doubt, is the cause of some of the different views held by writers on evolution.

Herbert Spencer defines evolution to be "a change from an indefinite, incoherent heterogeneity to a definite, coherent heterogeneity, through continuous differentiations and integrations." In explaining his meaning he states "that evolution is in a great measure co-extensive with progress. The law of organic evolution is the law of all evolution. Development of the earth, of life, of society, of government, of commerce, language, literature, science, and art, is the advance from simple to complex through successive differentiations."

Dr. McCosh says that in evolution "one thing is developed into another, and one thing is evolved from another," and that "development is an organized causation working in an environment." He, however, with Prof. Ferrin, halts when it comes to "evolving man out of homogeneous matter."

Prof. E. L. Youmans, in the *American Encyclopædia*, says: "The stock of material and energy being limited, each new effect must be at the expense of something pre-existing, hence advance becomes transmutation."

If the term evolution was confined to nature's system of progressive changes, so that it would mean no more than the unfolding of that system, then the questions arising under the activities of nature and their results could be more intelligently and more satisfactorily discussed. It is important, also, to understand clearly what is meant by *progressive changes*. A mere repetition or reproduction is not a progressive change. It is simply the renewal of the same thing. In progress there must be an advance in some direction. An increase in diversity, variety, numbers, forms, characteristics, etc. In mineral formations an increase in number and variety would be an advance, but an increase in one and decrease in the other might not be an advance in the aggregate. A disintegration of mineral formations is a retrograde change, but may in a system of development be a necessary step as a preparation for new and more extended transformations. A retransformation of disintegrated material is in the line of advancing changes, but may fall short of the former stage of progress, and in such case could not be considered as a general advance. In organic productions progressive change means more than a mere renewal of life through reproduction. It means a general advance in variety and number, and in physical and mental energy. The development of a plant or animal from the seed to the adult state, unless the result is an improvement on the progenitors, is not an advance in the sense here intended.

Having thus endeavored to explain what is meant by progressive changes, it remains to show what is nature's system and mode of operation through which those changes are produced.

In all nature's operations, her forces are the acting agencies, and matter the passive thing acted on or brought into action.

But special actions by these forces can only take place under certain conditions, and within certain prescribed lines, wholly beyond their power to bring about, to change, or control; thus leaving all the operations of nature to mere chance, or to a power superior to nature. And as these operations, their effects and results, contain and exhibit all the characteristics by which man distinguishes intelligent actions and results from mere chance or accidental operations, these systematic actions and results in nature's activities must be directed and controlled by an *intelligent power superior to nature; for there can be no intelligent effect without an intelligent cause; and there can be no conditioned and dependent things, as all the actions and works of nature are, without a conditioning power, and a power to depend on—without a power superior to all conditions and dependencies.*

All the changes in nature that are open for man's investigation, and all those that we can reasonably infer as having occurred, from the sup-

posed first appearance of visible matter to the present fully developed condition of all things in and upon the earth, have taken place in time, in space, and in a systematic order, which always produced certain and definite results. It appears, therefore, that time is one in its course, space one in extent, and *progress one in plan*; and that all the progressive changes in nature have taken place in accordance with this one plan.

The history of this system of progressive changes shows that there were *three distinct periods of continuous advance, each entirely different from the other*, different in the operating and advancing energy, different in the results produced; and each marked off by periods of transition, during which the progressive energy seems to have been transferred from one force to another.

In tracing the history of these periods of steady advance and of transitions, we will be obliged to look back into the dark past through the light of the present, and accept theories for facts. The generally accepted theory that matter was once all in a gaseous state, judging from known laws and the results produced under those laws, appears rational, and is assumed as correct; and the following brief history of nature's system of progressive changes is based upon this theory:

The first period of transition was during the time that matter changed from a gaseous into a tangible and aggregated state, and as the transition—the conversion of the gaseous state—proceeded, the first period of material development was commenced, and progressive changes followed. The aggregation of matter, the shaping of the earth, and the combination and formation of minerals, must have gone forward without interruption until the earth had sufficiently cooled to have admitted the formation and retention of bodies of water. At this point a partial interruption of the continuous advance must have taken place. A partial disintegration and redistribution of matter must have resulted from the action of large bodies of water, which at that period, judging from the supposed heated condition of the earth, must have been much more extensively in action than now.

The destructive action of water may still, for a long time, not have caused a halt or a retrogressive movement in the general advance, but may have aided the advance by accelerating condensation, and the transformation and precipitation of gaseous matter. It is evident that the constructive changes diminished as the earth cooled, and gaseous matter became less, until the destructive changes through disintegration overbalanced the constructive. The point of balance between the construction and destruction of mineral formations must have been reached toward the close of Archæan time; and about this time life made its first appearance; and here was the second great transition period. Mineral formation and crystallization had reached their highest points, the general features of the earth's form were fully developed, the main mountain chains and intermediate basins were defined, continents marked off, and the general topography outlined. For a long period after this transition era disintegration and redistribution were the prevailing actions, and standing alone would appear as a destructive and retrogressive movement; but, considered in relation to the system of progressive changes, it is found to have been

a necessary process of preparation as a foundation for the next step in the march of progress.

Changes in the surface-features of the earth and in mineral formation did not cease in this transition period, and have not ceased since. The *surface-features* of the earth have been progressively changed since the close of Archæan time, and new mineral combinations have been added through the action of vital force, but the highest point of advancing formative action in the structure of the earth and in mineral formation was passed before the commencement of Paleozoic time.

It should be remembered that geological history is not marked by strongly drawn lines between the ages, or where transitions occurred. As the constructive changes in inorganic matter diminished, the progressive changes in organic life increased, until the earth was filled with limitless numbers and countless varieties of plants and animals.

Various elements of gaseous matter, and matter held in solution by water, which at that time, and perhaps now, could not be aggregated and precipitated, except through organic action, were absorbed and consolidated by these plants and animals, until the organic productions of this period of vital progress constituted a considerable portion of the crust of the earth. This period of vital and organic development reached its culminating point at the introduction of man on earth. *Physical development had reached its highest point in the production of the largest animals of various kinds; and the highest point of organic development was reached in the product on of man.*

A remarkable circumstance connected with this third transition period is the fact of a great change in the physical conditions of the earth. If geologists are correct in their view of the glacial period, there must have been such a change in the temperature, and in the condition of the atmosphere, and of the waters, as would have caused an almost total destruction of life within the limits of glacial action. The advent of man seems to have been somewhere near, or during the time of this glacial period, and whether this remarkable period of destruction to life had any relation to man's first appearance and first struggles on earth is perhaps impossible to determine. But a plausible theory might easily be established, that such destruction of the monstrous animals which roamed over the earth previous to that period was a necessity for the preservation of man in his first stages, and for the establishment of his dominion over animal life.

This third transition period brings us into the present stage of progress, where the intellectual energy of man is the sole advancing power.

There is no longer any advance in mineral combinations and crystalline formations, either in number or variety. Plants and animals in their wild state have been, and are still being, diminished. No new species make their appearance, and there are no progressive changes except under the immediate control of man.

Those plants and animals which have been brought under domestication, have, in most instances, largely increased in number and variety, and greatly improved.

By the request of several of our agents the Life-Subscription offer will continue till further notice.

INQUIRY INTO THE THEORY OF LATENT HEAT.

BY PROF. E. A. LUSTER.

This theory has been so thoroughly accepted and so little agitated of late, that to bring it in question now seems both superfluous and presumptuous. However, no student in this age of the rise and fall of theories should be compelled to apologize for attempting to point out fallacies in a theory which claims the existence of heat in a condition utterly imperceptible to any of our senses. The plan adopted will be to examine the most important arguments in favor of latent heat, to point out their absurdity, and to explain these arguments on entirely different grounds. It will be seen that the experiments used by physicists to support the theory and measure its heat fail to consider the most important source of error. It will appear also that the so-called *latent* heat is the heat lost by this source, and does not become latent. It will be found that the theory of specific heat, intimately connected with that of latent heat, contains a remarkable source of error, remarkable because overlooked by sharp-sighted experimentalists. The modern theory of heat's being a mode of motion will appear to be in conflict with that of latent heat, and will seem to have absurdity stamped on the face of it, thus condemning one or the other.

The definition of latent heat is given variously by different writers, but all agree in the main. It may be stated thus:

Latent heat is that heat which enters a body and produces a change of state without raising its temperature. This means that heat has two natures, and that when it assumes the one, it loses the other. It is here that objection starts, and the opinion is ventured that heat never loses its nature, as heat proper, while doing work, and that when it does so lose its capacity of raising temperature, it ceases to exert force. On this proposition hangs the whole matter.

The great heating power of steam and vapor is among the first facts presented to us as evidence of the existence of latent heat, and the first to cause the writer to doubt the theory. We are told that steam at 212° actually contains about 1000° , though the thermometer is unable to detect the least presence of the remainder above the 212° . Some would avoid this seeming absurdity by asserting the 1000° to be thermal units and not degrees. This does not help the matter at all. The language means either that the steam contains more than the 212° of heat, or it means nothing. Let us take the following example:

1. If a vessel containing $5\frac{1}{2}$ oz. water at 32° F. be connected by a tube with a steam boiler, then, after the steam in passing through the water has heated it to 212° , the vessel will be found to contain $6\frac{1}{2}$ oz., having gained one oz. by the condensation of the steam. The $5\frac{1}{2}$ oz. water has been raised 180° by one oz. steam; or one unit of steam will heat one unit of water to 990° — $5\frac{1}{2}$ times 180° . This 990 is called the latent heat of steam. We offer this explanation.

Water at 212° changed to steam at same temperature increases its volume about 1700 times. Every part of this steam is of the same degree, 212 . Therefore there is 1700 times as much heat in the volume of steam as there was in the unit of water that formed it. The steam is not hotter than the unit of water, but con-

tains more heat in the aggregate. This is true just as a cubic foot of iron at 1000° contains 1728 times more heat than a cubic inch at 1000°. Now if this steam were suddenly condensed back to water, the resultant temperature would be 1700 times 212°, or about 360,400°. If any one declares this impossible, let him consider the compression of air, which increases its heat inversely as the compression, two volumes of air at 70° compressed to one, giving 140°. The sun-glass simply condenses the heat from the sun by concentrating into one spot all that distributed over the surface.

Therefore, in the case above, each ounce should contain 50,000° of heat instead of only 990°, and all this without supposing any of it to have been latent in the steam. If this enormous amount is actually furnished, the difficulty will appear to lie in accounting for the loss of so much heat. This will not prove a very hard matter. There are three powerful agencies for carrying off heat from liquids: radiation, conduction, and evaporation, any one of which will rapidly lower temperature. In heating the 5½ oz. of water all three were combined, and hence the great loss of heat. It is well known that heat escapes by evaporation alone from the surface of water almost as fast as it is supplied, and quite as fast when the water is boiling. Strange to say, physicists, in their experiments on latent heat, completely ignore this source of loss, and appear to consider as latent heat that sensible heat lost by evaporation and radiation. A subsequent examination of some of those tests will establish the truth of the above remark.

2. "A pound of water at 79° C. added to a pound of water at 0° produces, of course, two pounds of water at 39°.5. But a pound of water at 79° added to a pound of ice at 0°, produces two pounds of water at 0°." The common explanation is, that heat passes from the water into the ice and becomes latent, or is rather changed to force in separating the molecules that compose the ice.

It is well known that the temperature of a body will constantly lower as long as there are other bodies near having less heat than itself. Water at 100° in a vessel exposed to air at 20°, will rapidly lose heat until it gets down to the temperature of the air, and there it will remain. The reason must be, that near this point heat flows in from surrounding objects as fast as it leaves the water by evaporation and radiation, which losses continue until, in common parlance, the water is all dried up. The term evaporation is used in a general sense, to designate the formation of vapor at all temperatures. Suppose, now, that this inflow of heat could be turned from its course and no longer enter the water or serve to raise its temperature, while the loss continues. The result would assuredly be to reduce the temperature of the water on down indefinitely. It does not require a great effort of mind to see that the pound of ice serves this very purpose. It is sufficient to say that *time* is the element here that causes the difference of temperature between the addition of water and of ice. Any one, on reflection, must perceive that if the ice dissolved instantly there could be no difference in the matter. It may however be urged that the lost heat becomes force to tear asunder the molecules of the solid. This point will be sufficiently refuted by accounting in other ways for the loss of heat in cases of the fusion of solids. This will be done during the discussion. It will be ob-

served also that the point in question is made dependent on the molecular theory, a theory by no means established, but, on the contrary involved in much absurdity. We believe, notwithstanding the theory of specific heat, that the temperatures of mixtures are in proportion to the volumes of the ingredients.

3. If one pound of mercury at 100° C. be put in one pound of water at 0°, the temperature will become about 8°. The 97°, we are told, enters the water and becomes latent.

In the first place, if the relative capacity of bodies for heat is sought, it is rather odd that weights and not volumes should be used. The specific gravity of mercury is 13½, so one pound of water is 13½ times the volume of the same weight of mercury. Now, the 100° is to be distributed through 14½ times the space it occupied at first, and, therefore, the resultant temperature will be about 6°.9. This estimate, however, makes no allowance for loss of heat by evaporation and radiation, which would likely bring down the temperature to near 8°. This explanation is dependent on a simple law of mixing bodies, and does not require us to suppose latent heat, or that of two equal volumes at same temperature, one may have far more heat than the other.

FINCASLE, Va.

EVOLUTION AND THE WEEKLY SABBATH.

BY REV. J. J. BILLINGSLEY.

I believe in the inspiration of the Bible. Therefore with reference to the Creation theory as set forth in its pages, I have this to say:

(1.) I believe that the Heavens and the Earth, including the entire Universe, is the creative work of God Almighty.

(2.) I believe that "in six days (of twenty-four hours each) Jehovah made Heaven and Earth, the Sea, and all that in them is."

(3.) Consequently, I cannot accept but do most heartily reject and repudiate that crude hypothesis of Modern Inventors called "*the doctrine of development or progression*" which seeks to account for the production of all animals, and of man himself, by gradual progress from the simple mass of a minute jelly point, quickened by electric forces to higher and yet higher forms of organism, until finally man appears—an improvement upon his prototype, the *ape* or *orang outang*.

Among many reasons for the rejection of this plausible and flattering piece of guess-work, I offer only one at present, viz: It is plainly and totally inconsistent with, and antagonistic to the Bible Teaching relating to the origin and direct object of the institution of the weekly Sabbath. It may or may not be possible to reconcile the claims of terrestrial and even of celestial Evolution, with other portions of Revelation. On these issues I shall have nothing to say in this paper. But as relating to the question of the weekly Sabbath, especially in its relation to the popular notion of Darwinian Evolution. I believe that they are inveterate and sworn enemies. That is to say, I believe that he who accepts this pleasing fallacy of Evolution so commonly paraded before our eyes by scientists, so called, must reject once and forever the inspired account of the origin and institution of the Sabbath, and therefore must reject the Bible as the word of God. On the other hand, he who accepts the Divine teaching with

reference to the origin of the Sabbath, is compelled—on the basis of consistency, and of the universally accepted rules of Biblical, or any other system of rational interpretation—to reject the Phenomenal notion of Evolution, so widely published in the world at the present time. Now with reference to the current theory of Evolution, so far as the narrative in Genesis is concerned, two facts are true beyond all controversy:

(1.) That narrative *seems* to teach that the Heavens and the Earth were created, formed, or finished in six days of ordinary length, or twenty-four hours each. This *seems* to be the teaching. In the absence of any theory, calling for another interpretation of this narrative, no one would ever have supposed for a moment that any other length of time was spoken of by Moses than a period of twenty-four hours when he writes, concerning the six work days of creation. And the man who now reads that simple narrative without prejudice, *i. e.* without a theory to sustain or without a whim to support, simply to get the truth as revealed by Jehovah concerning the origin of the Heavens and the Earth, cannot possibly see a Geologic, an indefinite, or any other period in the use of the word day, other than a period of twenty-four hours. The narrative *seems* to speak of such a day when the six days of creation are spoken of. This is the first fact.

(2.) The second is this, *viz.*: As a matter of fact, the narrative does *actually use the word day in that sense*, in direct allusion to the great work of Almighty God in originating or creating the Heavens and the Earth. After stating that "the evening and the morning were the sixth day," the narrator then says . . . "And on the seventh day God ended his work which he had made; and he rested on the seventh day from all his work which he had made. And God blessed the seventh day, and sanctified it: because that in it he had rested from all his work which God had created and made." Now on this passage, and with special reference to the seventh day, I call attention to the following points:

(1.) This seventh day *immediately* succeeds the sixth.

(2.) It is a day of *twenty-four hours long*.

(3.) It is sanctified as a day of rest, as the Sabbath, *because it commemorates the great work of God Almighty which he performed in the six days preceding*.

(4.) Therefore, by all the rules of interpretation which are known to men, it points back to the preceding six days as being of the same nature and length as itself, and with which it is intimately and divinely connected. Hence, if the seventh day is a literal day of twenty-four hours, so must have been each of the six days preceding it. And hence again, the doctrine of Evolution which requires these six days to have been immense geological periods, is false.

I am well aware that the word "day" is sometimes used in the Bible as expressive of an indefinite period, but this does not prove that it is so used in this place. On the contrary, the fact that the word is used, once, in speaking of seven consecutive days, as denoting a period of twenty-four hours, is positive proof that it is used in the same sense when the other six days are mentioned. And to say that the term day, when referring to these seven days, means immense and indefinite geological periods in every instance except one, when it means a literal day of twenty-four hours, is to place an interpreta-

tion on the Sacred Word in direct opposition to the face and purport of the narrative, and in open, shameful violation of every rule of language and of rational interpretation. The same reckless criticism of any other book would be denounced as unfair, base and infamous, not only by its author but by the world at large, and even by the most superficial of readers. A judge who would assume such license in the interpretation of law books would be laughed at by the most ignorant jurymen that ever sat in the box, and would become the butt and ridicule of the legal fraternity throughout the land. He would only declare his utter incapacity in matters of equity, and demonstrate his amazing ignorance of the simplest laws of criticism. And yet, strange to say, when we come to the Bible, all rational methods of interpretation are thrown to the bats and to the winds, and the Sacred Word becomes the foot-ball of every skeptic and scientific upstart. If such unfair methods of interpretation were applied by Christian critics to the lectures of Bob Ingersoll, he would parade and blowpipe it about in every place where an audience could be had, as a sample of Christian (?) fairness, and as the evidence of a weak and waning cause. And if the books of Charles Darwin met with the same treatment at the hands of Christian scientists that he himself applied to the Bible, he would turn over in his coffin, and the silence of his long sleep would be broken by his earnest protests. And yet when the Lord God Almighty tells the world that He created the Heavens and the Earth in six days and rested the seventh, I am politely requested to believe that the six days were six geological epochs of indefinite duration each, while the last—the seventh—was only twenty-four hours long.

As to the origin of the Sabbath, and the object of its institution, all our information is found alone in the Word of God. Outside of, and separate from it, we know absolutely nothing of the Sabbath. Even the very *idea* of it is impossible to us in the absence of Revelation. For, apart from it, there is absolutely no data within our reach on the basis of which it could either have been instituted or conceived of even by man. Now, what was the object of the institution of the Sabbath? It was to commemorate and keep in perpetual remembrance the great work which Almighty God did in six days, in creating the Heavens and the Earth; just as our present Sabbath, the *first* day of the week, commemorates the astonishing fact of the resurrection of Christ. Up to that time, our divinely appointed Sabbath was the seventh day, in commemoration of the great work of *Creation*; but since that time our Sabbath has been changed to the *first* day, to commemorate the *greater* work of *Redemption*. And as we can see the *reason* of the *change* of the Sabbath day from the seventh to the first day of the week, so likewise we can see the *reason* for its origin and the special object of its institution at first, *viz.*: to commemorate the great work which God did in the first six days of creation. In Ex. xx. 11, we are told that "in six days the Lord made heaven and earth, the sea, and all that in them is, and rested the seventh day; *wherefore* the Lord blessed the Sabbath day and hallowed it." Again, "Remember the Sabbath day to keep it holy"—why?—"for" (*because*) "*in six days* Jehovah made heaven and earth," etc. That is, the greatness of the work which God did in six days—the first six days of creation—was of such magnitude and grandeur as to

deserve a perpetual commemoration on the part of the earth's inhabitants, and for this very reason He sanctified the seventh, the next day following the sixth, and required man to keep it holy, in remembrance of what he had done in only six days. Now, considering the previous chaotic condition of the earth, from which it was reduced to its present order, "clothed with verdure, peopled with living races, and with man, illumined by the rays of the sun, and the other luminaries of heaven; and that this renovation was effected by a series of creative acts, which occupied six successive days, and were discontinued on the seventh. we can perceive very easily that these facts were and are to man a valid reason for religiously observing a weekly Sabbath."*

But now, on the supposition that Evolution is true, and, consequently, that the six days of creation were six geological ages, of indefinite and varied length, how, in the name of common sense, could a literal day of twenty-four hours long be presented as a reason why man should keep it holy? There is a gap between the premises and the conclusion, as long as one of these curiously invented geological periods—too long to be spanned, I fear, by any stretch of scientific ingenuity. To say the least of it, these geological periods "hardly strike one as presenting a cogent reason why man should rest one natural day of twenty-four hours after every six natural days spent in labor."† And yet it is true if Evolution is to be accredited. Hugh Miller has a very curious note on this point in his *Foot-Prints* (p. 308), which is worthy of consideration by careful readers.

But again, I go further and state, that if the six days of creation were geological periods, during the ages of which the earth was very gradually arranged, illumined, made fertile, and peopled with living tenants, and with man also, as the crowning act of the great process of Evolution; then, also, the seventh day must have been, by consistency of interpretation, a great geological period, in which Jehovah rested, a period which extends to the present geologic time, in which man is being developed and perfected, preparatory perhaps to higher degrees of excellency on this earth than is the present evolution of man above that of the gorilla or orang-outang. But if this is so, if this era is the great geological rest, or Sabbath spoken of in Genesis and Exodus, then on this theory:

(1.) We have no warrant for keeping holy a seventh day (or a first either) of twenty-four hours long. Hence, the abolition of our present Sabbath is in order, as it has no warrant or foundation in those Scriptures hitherto appealed to for its defense, etc., etc.

(2.) If the texts above referred to in Genesis and Exodus speaking of the seventh day in connection with the six days preceding, refer to a great Geological Rest or Sabbath, which period began with and continues during the evolution of man, then, in obedience to these commands, are we forbidden to work and labor, both we and our sons, and our daughters, our maid-servants and our man-servants, our cattle and the stranger that is within our gates; "For in six geological epochs of varied and immense durations, the Lord made heaven and earth, the sea and all that in them is, and rested the seventh geological epoch; wherefore the Lord blessed the

seventh geological day, and hallowed it." Hence, all who work and labor in any of the callings and vocations of man, during the present time, a part of this great Geological Rest or Sabbath, are transgressing the law of God, and are guilty before God as violators.

No wonder the Rev. Wm. Frazier, of Scotland, says: "The interpretation which renders the days of natural length, has its difficulties, but they seem to be less than those of the period interpretation." See *Blending Light*, p. 58.

Thus by the *reductio ad absurdum*, as well as by the rules of rational interpretation, the simplicity of the narrative in Genesis, and the institution of the weekly Sabbath contained in said narrative, do we sustain the literal features of the creative days of Genesis, as opposed to the fantastic notion of geological epochs, demanded by Darwinian evolution.

But it may be said, "What are you going to do with the geological discoveries, going to show (?) conclusively that the heavens and the earth could not have been created in six natural days—six revolutions of the earth on its axis?" In reply I would ask the inquirer what he is going to do with the Bible, if he accepts these so-called discoveries of evolution; and especially do I inquire as to what he will do with the great question of the origin and institution of the Sabbath? For one, I believe the Bible teaches that the Heavens and the Earth were created in the short space of six natural days. If the teachings of geology clash with this Divine teaching, I certainly will not let my hold of the Bible go. I will wait for geology to change its voice again, as it has so often done. I will keep to the plain and simple account even if geology teaches the opposite theory. I believe the Bible to be the Divine Word of God. Hence I unhesitatingly reject any and all of the teachings of geology at any time and for all worlds, whenever geology clashes with this Divine Record. I stand by Moses, once and forever.

ARCADIA, LA.

IS DRUG MEDICATION A SCIENCE? AND HAS IT BEEN A BLESSING OR A CURSE TO THE HUMAN FAMILY?—No. 1.

BY MRS. M. S. ORGAN, M.D.

The thorough and extensive inquiries made by ethnographers, the innumerable facts collected from every quarter of the globe, through written history, tradition, and archaeological research, have combined to establish the positive fact that human life, in its mental characteristics and manifestations, as well as in its physical aspects, must be studied as a branch of natural science. Studied thus, in the only way of arriving at reliable knowledge and definite truth, we find that, while there is an innate tendency or progressive principle which incites the soul to reach out and assimilate new truths, there is also a conservative element which inclines it to cling tenaciously to ideas and lines of thought that first made their impress, and that these are transmitted from generation to generation with as definite a precision as the color of the hair, the shape of the nose, or the contour of the skull.

The crude ideas evolved by the mental cogitations of primitive man, still exercise their projectile force upon the thoughts and actions of man to-day. Even language, considered as

* Friend of Moses, pp. 259-266.

† Friend of Moses, 244.

peculiarly a product of culture and civilization, is based on precisely the same principles as that through which our savage ancestors expressed their emotions and meager thoughts. The development of language, therefore, between its cultured and savage stages, is in its details, scarcely in its principles. And if we sift many of the departments of science, the customs and usages of civilization to-day, and trace their nucleoli back to their formative impulse, we will find them in the crude thoughts and ideas which actuated and controlled our untutored and uncivilized progenitors. This tendency of that or thus formulated belief, to run on for ages in the same undeviating channel, without its truth being called in question, is a law of mental heredity as definite and determinate in its action and results as the transmission of any physical quality or conformation. It is only when there comes a burst of creative power and a great genius is born with a strength of intellect to break these chains of mental habit, that a revolution or new era in the world of mind is inaugurated.

With this philosophical key we can unlock the mystery of the historical fact that false and absurd theories are perpetuated for ages, exerting a molding and propelling power upon the mental thought and action of humanity, without their basic principles ever being subjected to the crucible of analytical investigation, or even a shadow of distrust entering the mind as to their truthfulness; theories, too, that are often of such vital moment that the physical, mental, and moral welfare of the race is involved in their practical acceptance; for it is a fearful and significant fact that a theory is often more dangerous and fatal in its practical application than that of swords, bayonets, or bullets.

We can now the more readily comprehend how a theory so false in its premises—so antagonistic to every demonstrated principle and law of nature, as that of administering dead, inert, inorganic matter for the cure of disease, has, until a comparatively recent date, held undisputed and unbounded sway over the minds of the whole civilized world.

For a period of more than two thousand years drug-medication has arrogated the title of the "True Healing Art," and in the name of science has been pouring into the human form the most virulent poisons, the most deadly narcotics, and all the dregs and scum of earth and sea. The theory on which it is based, has, in its practical appliance, been infinitely more destructive to human life and health than all the projectiles hurled by the gory hand of war. The declared testimony of its ablest professors and practitioners makes a still more sweeping allegation.

Dr. John Mason Good, F. R. S., one of the most brilliant and profound intellects that ever graced the medical profession, declared and put on record his honest conviction that "drug-medication has destroyed more lives than war, famine, and pestilence combined."

The theory on which drugs are administered is based on the premise that they act on the living system through certain elective or selective affinities, which they have for the different organs, parts and structures, of the living system. This theory originated in the dark ages, and has come down to the present day uninvestigated and unquestioned.

It was conceived when the mental forces were not quickened and guided by the influ-

ence of scientific light. It was born in ignorance of biological, physiological, and pathological law, of the laws which govern the inorganic world, and of the relations it sustains to the organic.

In the discussion of this subject, so fraught with vital import to the human family, we propose to prove:

1st. That the administration of drugs—dead, inert, inorganic matter—for the cure of disease, is false in philosophy, absurd in science, and contrary to the teachings of nature. This I shall do: (1) by the admitted testimony of the highest authorities in the medical profession, and (2), by demonstrated facts and logic.

2d. That the fundamental dogmas and principles on which drug-medication is predicated are radically wrong.

3d. That the medical profession teaches a false theory of vitality and of disease.

NEWBURGH, N. Y.

MICROCOSMIC DEBRIS.

The births in Spain during 1888 numbered 458,000, and the deaths 418,000.

When so-called silk burns well there's cotton in it. Real silk smolders into an ash.

Each of the special performances in Munich before the King of Bavaria, as sole auditor, costs over \$8,000.

An aeronautic detachment of engineers has been formed in Berlin, and is hard at work learning the art and practice of military ballooning.

The district around Galena, Kansas, is credited with being the largest zinc producing locality in the world. Last year 70,000 tons were mined.

Female vaccinators have been introduced into Madras, so that native women need not have their prejudices shocked by being treated by medical men.

One hundred and forty-seven thousand persons visited the reading-room, in 1882, of the British Museum, and only 70,000 that of the Paris Public Library.

R. J. Burdette is 40, Bret Harte is 45, Mark Twain is 48, W. D. Howells is 46, Thomas Bailey Aldrich is 45, Joaquin Miller is 42, James Russell Lowell is 64, and John G. Saxe is 68.

A meeting of the Paris bar has passed a resolution—which, of course, has no legal effect—that the receiver of a letter has the right to publish it without the consent of the writer or his heirs.

Contrary to precedent and expectation, the Czar has appointed no governor for his heir, but will himself act in that capacity? The hours which his father gave to reviewing regiments he gives to his boys' studies.

The London Religious Tract Society knows that last year it issued 80,000,000 tracts, and that its "trade receipts" were \$948,155, but unfortunately it cannot say how many persons read the tracts or benefited by their perusal.

A dry air store has been constructed by Lord Fitzhardinge at his Berkeley Castle farm in England, with the object of ascertaining whether it is practicable to store butter when it is 1s. per pound, until winter, when it would fetch 2s.

Some time ago Mr. Ellis Lever, of Manchester, England, offered a prize of \$2,500 for the

best safety lamp for use in mines. Over ninety lamps have been sent in, many coming from the United States and others from the Continent.

In the course of last year the German Life-boat Society saved 277 lives, the rescued persons belonging to 47 German vessels, and to 5 English, 4 Dutch, 4 Swedish, 8 Danish and 2 Russian ships. The society supports 87 life-boat stations.

Mr. Froude has almost completed his biography of Thomas Carlyle. The work, which will be the chief attraction of the publishing season this year, will consist of two volumes of 400 pages each, and will be published in the autumn.

The National Library of France can boast about a million more books than that of England, but then it had a start of about a century. As early as 1617 a decree was made compelling publishers to forward to it every book they published.

There is at present a great dearth of Protestant theologians in Germany. Very few young men choose the Church as a profession, and, according to a recent account, the pulpits of several country parishes are vacant literally for want of a pastor.

At Bingera, New South Wales, the discovery of a new diamond field has been reported, which promises to rival the Kimberley diamond deposits of South Africa. A considerable number of fine diamonds have been discovered within the last few months.

As many as 20,000 deaths occur annually in India from snake bites, and since 1870 from 150,000 to 200,000 persons have perished in this way. India possesses more deadly snakes than any other country, and the bite of the cobra is often fatal within half an hour.

The Mayor of Oakland, Cal., has ordered the revival of the old custom of ringing the curfew bell every evening at nine o'clock, with responses from the bells on the engine-houses, and the police are to arrest all boys under fifteen in the streets after that hour.

The Belgian Government has officially invited all foreign Governments to take part in the Universal Exhibition, which will be opened in Antwerp the 2d of May, 1885. The works, which have made this port one of the finest in the world, will then be completed and inaugurated.

It is stated by experts that Broad River, at Anthony Shoals, Georgia, has a volume of 19,000,000 cubic feet of water per minute, and its velocity is 175 feet per minute, its fall in a mile and a quarter being 92 feet. The horse-power is calculated to be 37,286, while Lowell has 16,000.

The largest bell that was ever cast is the great bell of Moscow, Russia. It was cast in 1654, and weighed 288,000 pounds. In 1733 it was recast, and weighed about 432,000 pounds. It fell in 1737, and was injured, but it was subsequently raised, and now forms the dome of a chapel.

Madame Taglioni has left several manuscripts of interesting anecdotes, furnishing very curious revelations about the society of Berlin, Vienna, and Paris in 1840; also some piquant details concerning the Belgian court in the time of King Leopold I. It is yet undecided whether they will be published or not.

A large district in Drogheda, Ireland, was suddenly deprived of water the other day, and the water company's men were puzzled to account for the stoppage. On examination being made it was found that a pipe had been stopped by an enormous eel several feet in length and of unusual thickness.

The Crown Prince of Austria-Hungary is the latest addition to the list of royal authors, an account of his visit to the Holy Land three years ago having just been published at Vienna. The book is got up with an exceptional amount of luxury, "worthy (says one of the critics) of the rank of the author."

The total tonnage of the merchant navy of the United Kingdom amounted to 7,196,401 tons in 1883, as against 6,908,650 tons in 1882, and 6,087,701 tons in 1875, an increase of 1,108,700 tons. In the eight years covered by these figures the tonnage of sailing vessels decreased to the amount of 673,800 tons (about 15 per cent).

The long-talked-of delimitation of the northern frontier of Afghanistan is at last to be definitely taken in hand. A mixed Russian and English commission will proceed in the autumn to lay down the line up to which Russia may advance, and beyond which she can only go at risk of war with England. The task is a difficult one.

It is said that only one small herd of buffaloes remains in Texas. This has been feeding on the Pecos River, in the Staked Plains region, but a band of hunters is hovering about it continually, killing the animals as fast as the meat can be cared for, and its days are numbered. This is the remnant of what was known a few years ago as "the great Southern herd."

The Presbyterian church at Lakewood, N. J., was planned too ambitiously, and so the congregation has built a new auditorium within the old one. The stained windows of the inner one are illumined through the plain glass of the outer shell. The space between the walls and ceilings serves admirably for ventilation, keeping the house warm in winter and cool in summer.

Colonel Malczewski, who died lately at his home in Prussian Poland, was 100. While serving in the Prussian army he was taken prisoner, and forthwith entered the French army and took part in many of Napoleon's campaigns. After Waterloo he went home, but in the rising of 1830 entered the Polish army, and, being taken prisoner, passed forty-seven years in Siberia. He was only released in 1879.

We notice in the Lancaster (Pa.) *Intelligencer* that a vacant chair was placed upon the platform at the commencement exercises of F. and M. College. The graduating class adopted this course to show their respect for their late classmate, Nevin Ambrose Swander, who died in this city on the 20th of last March. When Nevin's place on the programme was reached one of his classmates arose and read a letter from Rev. J. I. Swander tendering \$200, the amount bequeathed by his son, to purchase a clock for the Astronomical Observatory of that place. The clock will bear the inscription, "Sacred to the Memory of Nevin A. Swander." — *Fremont (Ohio) Herald*.

[Young Mr. Swander was the son of our excellent contributor, Rev. J. I. Swander, and of whose early demise we gave notice in one of the numbers of last volume. — EDITOR.]

WILFORD'S MICROCOSM.

23 Park Row, New York, September, 1884.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

HENRY WARD BEECHER'S THEOLOGY.

In the May number of the *Homiletic Monthly*, published by Funk & Wagnalls of this city, Henry Ward Beecher takes his turn in the "Symposium on Evolution" now in progress in that journal, and although he tries to cover up, in smooth and rhetorical sentences, his utter abandonment of religion and the Bible as heretofore understood by Christian men, including the accepted view of the New Testament as a revelation from God, he nevertheless unmistakably admits such repudiation and adopts Evolution, with its virtual and glaring *Atheism*, in its stead. Whoever reads that installment of the Symposium controversy, and looks carefully between the lines, cannot fail to see that Mr. Beecher has irretrievably gone over soul and body to the enemies of religion; and although he still pretends to hold to religion and to believe in God and the Bible in some sense, his belief is manifestly so diluted with unmistakable infidelity, notwithstanding all his verbal efforts to keep the "ragged edge" of his true sentiments from appearing, that he ought to be ashamed ever again to enter a pulpit as a Christian minister.

The most astonishing feature of his present position, as now clearly defined and avowed in this Symposium article is, that a man of such intelligence and unquestionable greatness of intellect, can for a moment suppose that other intelligent men can be deceived or hoodwinked into regarding him as anything less than a veritable Ingersoll skeptic, laboring under a desperate effort to disguise the fact in order to retain his standing as a minister of Christ in the eyes of the world, and thus hold his position and influence in the Plymouth Church. He little knows, judging from his cool and nonchalant manner, how open Atheistic or Agnostic Evolutionists such as Huxley, Tyndall, and Haeckel must look upon his futile efforts to ride two horses at the same time, running in exactly opposite directions. There is not an unbeliever in the religion of the Bible as a revelation from God, in any rational sense, who reads that article in the *Homiletic Monthly*, or who has heard his lecture on "Evolution and Revolution," who will not involuntarily curl his lip with contempt for the self-manifest hypocrisy of the Plymouth orator. No one can help feeling a degree of scorn for one who plays such a part, pretending still to adhere to religion and the Bible, while virtually repudiating both as in no sense from God only as we are all from God, through the lineal descent of monkeys, marsupials, reptiles, fishes, monera, and sponges. Mr. Beecher cannot deny the absolute justice of this feeling for his present course. It is the painful impression of all sincere Christian

men who have listened to his recent lectures on Darwinism, accepting as he does that whole theory of evolution including man as the lineal descendant from the ape family, that his teaching is vastly more pernicious and better calculated to undermine and root out all religious belief than anything Ingersoll's lectures or Tom Paine's writings could ever accomplish. Hundreds of ministers who have gone to hear him lecture on his favorite theme have felt a sense of shame and mortification creeping over them almost unbearable before he was half through, and have wished for the power of invisibility for a moment that they might slip through the audience unseen and retire to their closets, where they might pray for forgiveness for having lent the encouragement of their presence to such disguised but transparent infidelity. Here is a case in point: A prominent Presbyterian minister in Buffalo, N. Y., who attended Mr. Beecher's lecture, said, as given in the Buffalo papers:

"I think many of Mr. Beecher's statements were scandalous as coming from a Christian minister. I think they were worse even than Ingersoll's. I have always felt well disposed toward Mr. Beecher and sympathized with him through his late troubles, but with what he said here on Tuesday I felt very much pained and shocked. I was ashamed of myself for being among the audience. He said many violent and bitter things, which cannot have other than a pernicious effect. I don't say that there may not be something to be said on evolution, but no minister of the Gospel has a right to get up and place himself in such direct antagonism to the Bible as he did."

If he is an unbeliever in the supernatural inspiration of the Scripture, and in the supernatural Sonship of Christ—in other words, an infidel in the Tom-Paine sense—let him say so as does Ingersoll, and we would honor him for his frankness, while pitying him for his error. But to hold with the infidel, as he evidently does, while continuing to wear the sacred robes of the Christian priesthood, makes him an object of scorn and unworthy to loose the latchet of Ingersoll's shoes—a man who is not a hypocrite or a two-faced pretender, whatever else may be said of him.

As proof that the whole worship of Plymouth Church—under his ministrations—praying, singing praise, preaching, attending to the Christian ordinances, etc., is but a sham and a mockery, we have only to read his words after administering the rite of baptism recently to thirty-three little children of his parishioners. He said:

"This ordinance is administered here not in any belief that it has an immediate effect on the child. It is an ordinance that has *come down to us from a faith that in our denomination has ceased to exist*. Originally it was the ordinance by which the *old mother church* hoped to cure the original sin which all man-

kind was supposed to inherit from Adam. *There was never any such sin*. Baptism never hurt, it never did them any good. We continue the ordinance from our fathers, but with us the meaning is essentially different. We do not administer it because we think it is taught in the New Testament or enjoined. We *found the ordinance*, and we have commuted it so that parents themselves dedicate their children in public," etc.

This is a sorry confession. He solemnly administers an ordinance "in the name of the Father, and of the Son, and of the Holy Ghost," that he believes to be a sham, that he says we "*found*," that is not "taught in the New Testament or enjoined," and that does neither harm nor good to the subject! Such public mockery and blasphemy was never committed by heathen priests in the names of their wooden deities, for those priests honestly believe in their deities as absolutely divine, and in their rites and ceremonies as coming from the supernatural authority of those same gods. But this greatest Protestant divine of the world, discarding the supernatural origin of either Christ or the Scriptures, and as a consequence denying the fall of man in Adam and all necessity for a Second Adam as a Redeemer or Mediator, hypocritically administers what he admits to be a human ordinance in the name of the three Persons in the Godhead, one of which he believes to be a highly developed monkey, and the other two he does not believe in at all in any evangelical or generally received sense. There is not a church in Christendom which practices the ordinance of infant baptism that should not at once protest publicly against such blasphemous mockery, and denounce the blasphemer as an apostate from the Christian religion, and thus let the world know it.

In all candor, we cannot see how it is possible for Mr. Beecher even to attempt to screen himself from the derision of such men as Ingersoll, who are not afraid to avow their true sentiments, after accepting man's evolution from the ape, reptile, fish, etc.—facts by which, when admitted, Huxley and Haeckel have been irresistibly driven into Atheism, as they frankly declare, as the only logical or rational alternative left.

Mr. Beecher in his lectures denies the whole account in Genesis as containing any literal historical truth whatever, and ridicules the idea as mythical that God should have made man out of the dust of the earth, comparing such foolish theology to the idea of little children making "mud-pies"! He has asserted triumphantly, in his lectures all over the country, that he would "as lief come from the loins of an ape as from a mudhole," and he laughs at the notion of the fall of man in Adam, thus rejecting the New Testament *in toto*, in which the

Apostles positively and unequivocally teach and variously illustrate that doctrine as the basis of Christianity. He flatly denies the doctrine of the atonement, as well as the inspiration of any part of the Bible, as a direct revelation from God, claiming that all the revelation there is about it is simply the result of the highest intellectual and moral culture and attainments of the most advanced men of any particular period of time. That the idea of God's speaking through the Prophets and Apostles directly or in any other sense than this, he holds to be but the romantic effusions of mythical writers, and, in substance, that they drew upon their imaginations to record fiction for the delectation of the ignorant, or those less advanced than themselves. Christ he holds, as we are forced to understand him, to be only the greatest of these advanced thinkers,—a man who taught sound morals, and one who really desired to benefit and raise up humanity to a higher plane of living and thinking. But who was this Christ, according to the "true inwardness" of Mr. Beecher's improved theology? He was simply a highly advanced descendant of the ape family on both his father's and mother's side, and in no miraculous or supernatural sense the Son of God any more than himself and other advanced thinkers are sons of God. Let him deny this and assert that Christ did not develop from the monkey, and the bottom drops out of his "evolution and revolution" nonsense, for if Christ could miraculously come from God without an earthly progenitor on his father's side, why not the first man and woman, and why not all beasts and animals in the origin of their respective species? Hence we assert (and invite Mr. Beecher to deny it or modify it, if incorrect, in these columns,) that he ignores the whole story of the supernatural generation of Jesus of Nazareth, regarding Mary's overshadowing by the Holy Ghost in any miraculous sense as pure fiction, and that Joseph was as much and as literally the father of Christ as was Lyman Beecher his own father. We ask him not to dodge the point of our charge, or say that we have misrepresented him. We are ready to take his confession or his rectification, and spread it out before the readers of *THE MICROCOSM*, since we are now writing only what we believe to be his actual infidel sentiments, after hearing him, though still disguised under the semblance of religion, and of the Christian ministry. But if we are right as to his real views, and if the miraculous incarnation as described in the Evangelists is fiction, then it follows that the whole New Testament is a fraud, since it is all based upon this supposed Supernatural Sonship of Jesus Christ as the second Adam—the Lord from heaven.

But even more blasphemous still. To thus hold Christ as he holds himself, but the lineal descendant from and blood-relative of a monkey, and not a supernaturally generated being, is to discard at one blow—the high moral character of the Nazarene even as a mere man, and to make him out the most consummate impostor of any age; since His claim to supernatural Sonship or direct descent from God, as he made it public in his teachings everywhere, was to act the hypocrite and impose upon the world one of the worst religious frauds ever perpetrated. Yet Mr. Beecher, with this undeniable doctrine of Christ as but a highly developed descendant of the ape family says in his Symposium article that he *prays to him as "God"!* Was ever before such idolatrous and puerile *sham* publicly confessed? Pray to a highly cultivated monkey as "God"! Then "God," in the estimation of this revolutionized-evolutionized Christian (?) minister, can be no higher or greater than that from which he descended. And if Christ as a lineal descendant of the ape can be prayed to as "God," he must be *very God*, or such praying is mockery and nothing but atrocious idolatry. It follows, further, according to this refined improvement upon Darwinism, that "God" did not create the monkey, but the monkey created God! And as the monkey was prior to this human "God," theistic evolution must break down, for how could God supervise the development of the monkey from the fish, since the "God" to whom the Plymouth pastor prays descended from the monkey? But worse still: If the "God" to whom he prays developed from the monkey, we see no reason why there might not chance to be a multiplicity of Gods equal in number to the offspring of the ape-family in the shape of men, and also innumerable female Gods in the shape of women, who also descended from the same apes just as Christ did! Has not Henry Ward Beecher, in his desperate effort to cover up his apostasy from religion, inadvertently gone into the "God"-business on a somewhat extravagant scale?

But further, if Mr. Beecher is justified in praying to the descendant of a monkey and worshipping him as "God," what should hinder the members of Plymouth Church from bowing down to other classes of idols, and even worshipping such a God's progenitor (the monkey) for that matter, with the full approval of their pastor? And why collect hard-earned money from such members of his church to send missionaries to heathen lands to prevent deluded pagans from worshipping idols, when the head and front of the first church in America has become an out-and-out idolator, and publicly confesses that he prays to a highly developed descendant of the monkey tribe, and that he

worships him as "God?" Great heavens! what are the world and the church coming to? Is it not high time that the clergy of every Christian denomination should wake up and with one voice repudiate this abomination of desolation called evolution, and rebuke in unmistakable language its aiders and abettors?

CHRIST'S MIRACLES SCIENTIFICALLY CONFIRMED.

There is no stronger scientific proof of any fact needed than we now have of the fact that Christ actually and undeniably wrought a miracle in opening the eyes of the man of Bethsaida who was born blind. The proof of the genuineness of this miracle arises from the fact that up to that time surgery, even if it then existed as a science, had never essayed to operate on the eyes of one born blind and thus cause him to see. Recently, however, the science of ophthalmology has been carried to such perfection that two cases already are recorded where persons congenitally blind have been made to see by surgical operations. In such cases, however, the persons see objects enormously large at first, and out of all proportion to the real size which they had previously demonstrated them to be by the sense of touch. But by a little experience, and by the aid of reason and the sense of touch combined, the newly acquired sense of sight is educated gradually to recognize things at a distance in their normal and real proportions.

In the light of this now admitted fact of surgery, wholly unknown in the time of Christ, how startling is the fact recorded in Mark, v. iii. 22-24, that the man on first receiving his sight declared that he saw "*men as trees walking*." That is, men seemed as large and tall as trees had previously been felt to be by the sense of touch alone. Who told this unsophisticated Evangelist, in recording a bogus miracle centuries before the real facts had been proved by the science of surgery, that if one born blind should instantly receive his sight it would magnify the apparent size of all objects manifold? No explanation of such a scientific revelation as there given in advance can account for the fact but the admission that Christ did positively open the blind man's eyes and cause him to see as described, since the effect there narrated (until recently, entirely unknown to science), of enormously magnifying objects, could only have been suggested to St. Mark by the fact having actually occurred!

But the completion of this wondrous miracle was not accomplished until Christ had put his hands the second time upon the man's eyes, thus wiping out the illusion which he suffered by the action of natural law, and thereby relieving him

from the long inconvenience which blind men who are now made to see by surgery must necessarily undergo. 'It seems as if that one sentence uttered by the man of Bethsaida,—"*I see men, as trees, walking*,"—was designedly placed on record by the inspiration of the Evangelist to stand in future ages as a breakwater to infidelity, and to show to skeptics, after science had explained the meaning of the man's words, that the miracles of Christ were really what they purport to be. Let no unbeliever hereafter, therefore, tell us that science gives us no proof to confirm the genuineness of the miracles of the New Testament.

SPENCER'S LAW OF EVOLUTION.

Herbert Spencer tells us that Evolution takes place in the animal kingdom by an invariable law of change from the homogeneous to the heterogeneous, from the simple to the complex, from the few parts in a structure to a multiplicity of parts, etc. Now if it can be shown that any lower orders of animals were vastly more complex and heterogeneous, and constituted of more numerous parts than those orders into which they are said to have evolved according to the development theory, it necessarily breaks down Evolution according to the above law enunciated by Spencer and accepted by all evolutionists as correct.

We showed in the *Problem of Human Life*, by numerous illustrations and extracts, according to Darwin, Haeckel and Huxley, the three chief authorities on Evolution and the three greatest Naturalists of Europe, that many present animal species had degenerated from more highly organized species having a much more complex organism and a vastly greater number of parts than those into which they evolved. We need not consume the space here to reproduce the quotations from those great writers so elaborately given in the "*Problem*," since that book is now so generally circulated and easily accessible to all. It is only necessary to remind the reader of a few out of the numerous instances recorded, of such retrograde "evolution." Take the *whale*, for example, which Prof. Haeckel declares to have degenerated to its present form and structure from a hooved and common land quadruped. He infers this from the presence in the hinder portion of its body of rudimentary leg-bones beneath the skin, and from the rudiments of teeth in the jaws of the cetacean young.

He further claims that the absence of upper incisors in the bovine genus of animals, such as the cow, was the result of its evolution from a genus of animals having full sets of teeth in both jaws, because it has been discovered that the embryonic calf has rudiments of upper in-

oisors which disappear at birth. So also the common boa-constrictor, it is claimed, must have evolved from some species of reptile with fully developed legs, since there is also in the posterior portion of its body, the rudiments of a pelvis and of leg-bones, as in the case of the whale. Now here, by the united agreement of the foremost evolutionists of the world, are claimed cases of evolution from the complex to the simple, from the heterogeneous to the more homogeneous structure, and from the numerous parts, such as legs, feet, toes and teeth to their absence or utter abortion, in direct opposition to Mr. Spencer's great law.

Conspicuous also as an example of this self-stultifying logic, we refer to Prof. Huxley's description of the evolution of the horse from the ancient orhippus, now found fossilized in the rocks, as he so elaborately presented its claims some years ago in his celebrated course of lectures in New York. The professor, without apparently seeing the ruinous bearing of his argument against the very foundation of the Evolution philosophy, proceeded to "demonstrate" that our uni-ungulate horse had actually degenerated from the five-toed orhippus, with all its heterogeneity and complexity of structure; and that instead of evolution acting by the invariable law of the change of animal structure from few parts to a multiplicity of parts, it had actually reversed the process in the case of the horse, and had, by gradual variation and degeneration, aborted these five toes of the orhippus with all their complexity of numerous bones, joints, tendons, nerves, ligaments, muscles, veins, arteries, etc., ending in the simple, single, homogeneous, clumsy hoof of the horse, quag, zebra, and ass. A more thorough and sweeping overthrow of a pretended law of science was never perpetrated, even intentionally, than was unwittingly done by Prof. Huxley in that famous effort to prove the truth of the Evolution theory. Yet, after he had thus razed the whole fabric of the system of "development" to its very foundation, he coolly closed his lecture by assuring his audience that "*Evolution [thus disastrously turned against itself] rests upon exactly as secure a foundation as the Copernican system of astronomy!*" Was ever burlesque more signal or conclusive in a pretended defense of a philosophical theory!

But we have by recent discoveries in the animal kingdom, still more remarkable proofs of this development (according to Mr. Darwin's theory) in the wrong direction to correspond with Herbert Spencer's great law. Take the *axolotl*, formerly much venerated by the Aztecs, a species of lizard, like an amphibian, and which has been recently on exhibition in our aquariums. It belongs to the class of rep-

tiles from which birds and all mammals have evolved, if Darwinism be true. Yet Prof. H. J. Rice, an evolutionist, declares that it possesses "three different styles of breathing,—like the fish, like the tadpole, and like the lizard," and consequently that it has three complete sets of breathing apparatus in the one diminutive organic structure! Now, if one of our early progenitors has three complete and distinct breathing organs, with all the necessary adjuncts and details of structure requisite to each respiring apparatus, how does it happen that we, as an evolution from the *axolotl*, have only one process of breathing, with only one set of respiratory machinery, while Evolution works invariably by a law of change from the simple to the complex, from the homogeneous to the heterogeneous, and from the few to the multiplicity of parts? Would it not be appropriate for Herbert Spencer, or any other man who holds to the correctness of his great law of Evolution, to rise and explain these discrepancies? THE MICROCOSM is an excellent medium in which to give such explanation to the public should it be forthcoming.

SENSATION IN AMPUTATED LIMBS.

BY PROF. G. R. HAND.

The above theme is in the line of topics discussed in THE MICROCOSM, and elaborated in the "Problem of Human Life," in a psychological explanation on the principles of the Substantial Philosophy.

A case came to my notice a few days ago, which I thought might serve as an occasion for the Editor to present to the many readers of THE MICROCOSM a brief explanation of the phenomena according to Substantialism. It would be new to those who have not read the "Problem," and there are many such.

The case is that of a young man, whose foot was amputated a few weeks since in consequence of being badly cut and mangled by a mowing machine in the locality of his instep. His foot, from the ankle joint, and from the heel forward, was amputated, the tarsal and metatarsal bones, and phalanges, all removed. He is under the surgical care of Dr. Jacobs, of Meridian, Sutter Co., Cal., at whose residence he has remained since the amputation.

I called to see him a few days ago, and found the doctor with him, from whom I learned the facts herein presented.

The young man, being under the influence of chloroform during the operation, did not know the extent of the amputation, and some time after, in the presence of some friends, he said he felt the pain clear to the ends of his toes. Being reminded that his toes were not there, he said his *big toe* was there, for he could feel it. When Dr. Jacobs assured him that all his toes were taken away with the foot, he yielded the point, and was convinced that a "feeling sense" of the presence of a member must yield to the testimony of known facts.

The Physiological explanation, that the nerves accustomed to minister to the wants and feel-

ings of the amputated member continue for a time their efforts to render their accustomed services, is somewhat vague and unsatisfactory.

But the Substantial Philosophy supplements this with the Psychological explanation that the vital entity that fills and animates the whole physical organism, and superintends the repairs, has not yet entirely abandoned the chasm of that dismemberment, and that it still maintains a conscious connection between the parts. It may be interesting to many to learn from the Editor how Substantialism supplements the Physiological phenomena, with the Psychological explanation.

SYCAMORE, Cal.

REMARKS BY THE EDITOR.

WE have been forced to believe by all the facts that have come under our observation, that the mere habit of the nerves as a part of the material organism will never sufficiently account for the sensation in amputated limbs. We have explained this quite at length in the "Problem of Human Life," and also in different articles in the previous volumes of *THE MICROCOSM*. We believe that a substantial, vital and sensuous organism pervades every part of the physical structure, and that although it is incorporeal or immaterial, as Substantialism affirms, it is nevertheless as real an entity as is the physical body which it pervades, and of which it is an exact counterpart. Hence, when the physical or material foot is amputated, this only partially removes the vital foot, an attenuated form of it following the material foot, but a vastly more dense form of it remaining connected with the living leg. Such a view gives a possible explanation of the oft-asserted and even well-authenticated fact that the cramped or bent position of an amputated limb has been uncomfortably felt by the sufferer till the separated member had been favorably and comfortably adjusted. If the facts really are as they have been so often reported on high medical authority, what philosophy so fully accounts for them as the one here suggested; namely, that a portion of the vital limb remains with the amputated portion of the material limb, causing a sympathetic relation to exist between the two separated forms of this vital organic member?

That the vital, incorporeal foot must remain in a dense form attached to the material living leg, we prove positively, since amputated members (such as supernumerary fingers on the hands of infants) have been perfectly reproduced after having been separated. Now it was admitted by Mr. Darwin, and has been universally conceded by anatomists and physiologists, that no explanation of this reproduction of a lost member can be given according to any known laws of growth or facts of science. It remained for the Substantial Philosophy to give the first and only scientific explanation

that would commend itself to our reason. That explanation is found in the "Problem" at page 460, and is repeated in the various discussions of Substantialism which have appeared in *THE MICROCOSM*. In brief, the explanation is this: The vital finger of the child remains in its perfect form attached to the hand after the material finger has been amputated, and being very dense or concentrated, as it is claimed to be in the infant, it forms an invisible outline-pattern for the vital and physical bioplasts of the child's hand to work by, and thus be guided to deposit the material molecules in such positions as to restore the finger exactly as it was before amputation. But for this actual, substantial, but immaterial pattern of a finger, along and around and through which the dual bioplasts are guided to work, no reason can be given in science why a thumb should not be produced instead of the identical finger as before, nor in fact any reason why a re-growth of any kind should or could take place. But this beautiful philosophy not only explains how the actual finger can be reproduced, but it also explains how the physical body of the infant is originally developed from the ovule. The specific vital and mental form of the infant, as perfect in all its parts as at its birth, exists in the ovule as an incorporeal entity, before the bioplasts in the mother's circulation had made the first move at constructing the embryonic body. Indeed, the entire substantial form of the grown man in all the minutia of his organism, according to Substantialism, was there in the ovule as a highly concentrated immaterial entity, when that ovule was but the 125th of an inch in diameter. So the perfect oak tree with every limb, twig, and leaf exists in its form as a vital entity in the acorn and could be seen by us had we the expanded intellectual vision requisite to see it. How grand and far-reaching and satisfying to the mind are the principles of this Substantial Philosophy!

SOUTHERN UNIVERSITIES.

We have received the catalogues of two universities in the South which deserve special attention in *THE MICROCOSM*. One is the University of Mississippi, located at Oxford, and the other is the Florida University, located at Tallahassee.

The University of Mississippi is a flourishing institution of learning, and is well patronized by the wealthy men of the Southern States, as it deserves to be. It certainly has proved itself worthy of the high position it now holds as one of the best educational centers in the South, where advanced intellectual young men can come out finished for any of the higher walks of life. Its corps of professors and its manage-

ment are all veteran educators, and show themselves devoted to the work in which they have embarked. Among the faculty, we take pride in referring to our friend, Prof. James M. Long, A.M., who conducts the school of Psychology, Logic, Ethics, and Metaphysics, as one of the best thinkers and scholars in the South. We hope to add his name soon to our contributory staff.

The Florida University is a new institution, but has shown a splendid start-off during its initial year, closed in June last. We are glad to see that our old friend, Rev. John Kost, D.D., M.D., LL.D., whom we have known intimately for more than thirty years, is permanently installed in that promising institution as Chancellor of the University and Dean of the Medical Faculty. Dr. Kost is not only a physician of eminence, but he is an author of several works on medicine and kindred topics which have had an immense sale—one, we believe, reaching more than 100,000 copies. We trust the Doctor may live to see his great enterprise financially upon a firm basis, and as prosperous as its Chancellor is popular wherever he is known. We also expect our readers to see something from his able pen before many months shall pass. We will add that we take no little pride in also noting the election of our esteemed contributor, Rev. J. J. Smith, D.D., A.M., to the chair of Oriental History and Rhetoric in that University. No professorship can fail of its true mission with such live, earnest, and competent talent occupying its chair.

REV. MONCURE D. CONWAY'S FAREWELL TO ENGLAND.

After preaching in opposition to orthodoxy for many years in England, Mr. Conway, the eloquent divine and lecturer, at last succumbs to the pressure of public sentiment, abandons the effort as a failure, and shakes the dust of London off his feet, determining to attack the orthodox element of America, as more congenial soil in which to display his polemic powers. He declared in his recent farewell address, on bidding his congregation adieu, that he had lost all hope of revolutionizing the staid religious sentiments of the English public, or of breaking through the deep-seated prejudices for orthodoxy in religion in that slow, conservative clime. It has been manifest for some time, in Mr. Conway's ministrations and lectures there, as well as in his correspondence with the press of this country, that he has lost hope of any permanent good coming to the church or the world from the persistent teaching of old-fashioned sectarian orthodoxy, of which London is a typical example. He has sprung many religio-philosophical departures upon the

public, connected with his theological ventures, and has sought in vain to incorporate them into the religious sentiment of the English metropolis; but his radicalism, Frothingham-like and Newton-like, so clearly drifting him away from the accepted plenary inspiration of the Scriptures, has tended to keep the clergy and the church-going populace conservatively aloof from what they regarded as dangerous heresy. Hence Mr. Conway's deliberate conclusion that England is a religious failure, in the sense of advanced theological views; and for this settled reason he turns to the land of the Beechers, the Cooks, and the McCoshes, as more suitable ground to till with an improved theological plow having a self-sowing attachment for dropping in every furrow turned the prolific seeds of theistic evolution or like innovations. He closes his farewell address in these memorable words:

"I believe it is to America that thoughtful men must look for the true religious development. American institutions will, from the very perfection and humanity of their freedom, sooner or later breed a great prophet, who will see the truth properly, and have the genius and strength to teach the people the true religion of the future."

If Mr. Conway will come to America with his mind released from the prejudices imbibed in his long and persistent fight with so-called orthodoxy, he will discover that no new religion is needed for the "future;"—that the old, unadulterated religion of the New Testament, properly presented to the people with the re-enforcement of Substantialism as recently evolved and demonstrated from scientific research, will answer every need of humanity, and will do more in one year to make religion popular with the educated masses than a century of such carping objections to biblical inspiration, and such virtual defense of materialism as he and Mr. Beecher have been so uselessly indulging in. It needs no new "prophet," panoplied with supernatural inspiration or bristling with cloven tongues as of fire, to call the people together and command their attention; but some one who will exercise that common sense, which is the heritage of not a few, to point the world and the church in a suitable manner to that Prophet which the Lord God raised up in Judea more than 1800 years ago. If Mr. Conway wishes something new in religious, scientific and metaphysical philosophy that will startle the thoughtful and cultured masses, on the ground, as he claims, that orthodoxy pure and simple has become threadbare and antiquated till live thinkers will have none of it, let him banish this phantom war from his over-sensitive intellect, take up the living issue of the gospel, which is still, as of old, "the power of God unto salvation," and with

his riveting eloquence and resistless logic let him enforce its claims by adding the masterly and limitless considerations of the Substantial Philosophy to support and clinch every appeal he may make, and he will not lack either novelty or resources with which to hold his audiences, and constantly add new adherents to his cause. Even England, with all her proverbial conservatism, could not stand unmoved before the claims of the old religion of the Messiah thus re-enforced and elucidated. How glorious and successful, then, would be the career of Mr. Conway in free America, if he should first free himself from prejudice, then call a truce to his unsuccessful fight against orthodoxy, and lastly accept the new departure in science called Substantialism, so completely in harmony with the necessities of the human soul, and so consonant with all true religious philosophy! If he will do this he will not waste his declining years in waiting for some "great prophet" to come with "the genius and strength to teach the people the true religion of the future," when that very Prophet is the one he is practically rejecting, and that very religion is the one he has unfortunately all the while either overlooked or not known how to enforce.

We welcome Mr. Conway to these shores, and trust that his great mental powers will be no longer envired by the circumscribed battle field of such a fruitless contest with orthodoxy, but that he will comprehend the situation, and at once enlist in that substantial crusade that is surely destined sooner or later to rejuvenate the church and regenerate the world.

THE "SYMPOSIUM ON EVOLUTION."

Many of our readers are aware that a so-called "Symposium on Evolution" is now going forward in the *Homiletic Monthly* of this city, and has been for some time. It was opened by Rev. Dr. McCosh, President of Princeton College in an argument so singularly non-committal that it was difficult to say what the Doctor really did hold to on the development theory. Several articles from different writers have followed, apparently for and apparently against evolution, but none of them sufficiently definite and outspoken to give the ring even of the sounding brass or the tinkling cymbal. Dissatisfied with these uncertain sounds, as if the writers were trying more not to give offense to any one, whatever his belief on the subject might be, than to express their own real sentiments in unmistakable terms, we wrote Funk & Wagnalls, the publishers of the *Monthly*, requesting the privilege of writing one of the Symposium articles for the *Homiletic* series, in which we proposed that our positions and arguments on Evolution should give no

such uncertain sound, but that the reader would be able to decide at a glance upon which side of the question we stood. The Rev. Dr. Funk answered our letter respectfully declining to accept an article from us, on the ground that the quota of writers for the Symposium was already full. We feel sure, however, that this was not the full or the real reason for refusing our offer, since a monthly magazine is scarcely ever so full that additional truth in the future numbers is not desirable, unless perchance there are certain ends to serve and certain matters to be guarded against that tend to exclude such truth. Dr. Funk had read the *Problem of Human Life*, and he was therefore familiar with its outspoken criticisms upon Dr. McCosh's "theistic evolution," and no doubt feared lest he might give offense to the head and front of his Symposium controversy by accepting an article from the author of such a book. We have no doubt Dr. Funk would personally not object to seeing the fur fly and would have enjoyed seeing the true inwardness of Darwinism exposed to the light. But the non-committal policy of his *Monthly* seemed to forbid it. Hence, we were not allowed, much as we and others wished it, to present the real issues in discussion in plain language, and then to give the readers of that Symposium controversy the real arguments against the theory of modern evolution. Such readers, therefore, as the next best thing, are referred, for the light they have been thus refused by the *Homiletic* management, to *THE MICROCOSM* and to its fore-runner, the *Problem of Human Life*.

THE SOUNDING OF TELEGRAPH WIRES.

Eld. C. P. Evans, of Oskaloosa, Iowa, in a letter to *THE MICROCOSM*, speaks of the roaring sound of telegraph wires, caused by the wind blowing against them, and calls our attention to the often-observed fact that when near to the telegraph pole the sound is loud, but when midway between two poles, though near to the wire, no sound is audible. He desires us to give an explanation of this problem in *THE MICROCOSM*.

The solution, we think, is very simple, on the substantial hypothesis, but entirely inexplicable according to the wave-theory. If sound is a real substance, as we claim it to be, like heat or light, its radiation from a sounding body, or a sound-conducting body, must increase in proportion to the surface radiating it. As an illustration, suppose an electric current to be passed through a solid wire one-fourth of an inch in diameter, sufficient to heat it red-hot. Then suppose that for a small section of this wire we substitute a tube of the same material and of the same weight to the foot, but drawn so thin

as to make it six inches in diameter instead of a quarter of an inch; it is plain that the tube thus conducting the current would also be heated red-hot; but while the heat of the *wire* would scarcely be felt a foot away, the same amount of heat precisely spread out over the surface of the tube would roast beef at that distance from it, owing entirely to the greater radiating surface of the metal, thus emitting the substantial but immaterial heat-corpuscles in greater quantities. The two cases are quite analogous. It is precisely the same with light. Suppose the quarter-inch wire were of *platinum*, and the current of electricity strong enough to make it incandescent, it is plain that an intense light would be emitted. Then convert a section of this same conducting-wire into a thin tube of the same weight, but six inches in diameter; its incandescence would of course be precisely the same under the same electric current, while the intensity of the substantial light-rays emitted would be exactly twenty-four times greater, owing to the twenty-four times greater radiating surface of the metal for emitting and diffusing the light. Thus, the three substantial forces and manifestations—sound, heat, and light—radiate from their respective sources by quite analogous laws, though each is governed by certain conditions peculiar to its special uses in the economy of Nature. The sound of the vibrating wire in being conducted to the ground by the *pole* spreads out all through its fiber and is heard because it has a vastly greater surface to be radiated from than while traveling along the thin wire, though by placing the ear very close to the wire the sound can be heard.

But, in addition to the greater radiating surface of the telegraph pole, it has also a better quality for radiating sound-corpuscles than the metal wire. As proof of this, no such quantity of sound would be heard if the pole were of iron instead of wood, for want of this necessary radiative quality. Hence, wood is employed in the sounding-boards of all musical instruments, not only for the larger radiating surface which they afford, but for their better radiative property. A sheet-iron sounding-board to a piano would vibrate incidentally with the strings the same as a wooden one, and, if the wave-theory were true, ought to send off as much sound, since the mechanical action on the air would be the same precisely in both cases. But the truth is, the sheet-iron sounding-board would not give off one-tenth as much sound as a wooden one, owing to the superior radiative property of wood as adapted to the diffusion through the air of sound-pulses. This single argument, if there were no other, destroys the wave-theory of sound, showing that the mechanical disturbance of the air has noth-

ing whatever to do, in any case, with the sound we hear. Thus it turns out that the solution of every new problem that comes up only gives additional confirmatory proof of the correctness of the Substantial Philosophy, and of the total fallacy that any of the natural forces are modes of motion. We thank Eld. Evans for raising the question, thus giving us the opportunity to explain it while driving another nail in the coffin-lid of false science.

TYMPANIC VIBRATION.

[The following letter from Prof. Henry C. Cox, A.M., principal of the Pikard School, Chicago, Ill., who has taught the wave-theory for fifteen years, is one of a large bundle of straws which are now showing the direction of the scientific wind.] ♦

MR. EDITOR,—I wish to show another phase of the beauty and simplicity of the wave-theory of sound.

According to the authorities, there are as many movements per second, of the tympanic membrane, as there are vibrations of the air. For C^2 there are 256 vibrations; for D^2 288; for E^2 320; for F^2 341+; for G^2 384; for A^2 427+; for B^2 480; for C^3 512.

Now, suppose that C^2 , E^2 , G^2 , and C^3 of the piano be struck simultaneously; according to the wave-theory, the tympanic membrane vibrates within the same second 256, 320, 384, and 512 times! Accommodating, isn't it?

Again, suppose we strike D^2 , F^2 , A^2 , and B^2 ; then, this same accommodating membrane moves in and out 288, 341+, 427+, and 480 times in the same second.

Is not the absurdity to which the theory leads us in this particular, a sufficient cause for declaring it false?

Then think of the wonderful harmonies which the ear is able to translate to the brain, that, according to the wave-theory, bring a labor upon the tympanic membrane which, by the very nature of things, it is unable to perform.

When, Mr. Editor, it can be shown that the same instrument can be made to vibrate 288, 341+, 427+, and 480 times in the same second, and occupy the entire time for each, then I shall desert you and your company and reaffirm my belief in the wave-theory, but not before.

HENRY C. COX.

GIFTS TO COLLEGES AND UNIVERSITIES.

(PROF. SCHELL'S LETTER.)

EDITOR OF THE MICROCOSM.—I have been looking over a list of the colleges and universities of this country that have been endowed by the legacies and gifts of public-spirited and noble-minded men and women.

Such generous liberality certainly presents a redeeming trait of the present age, one which does credit to humanity, and goes far to demonstrate that the world, instead of degenerating, is rapidly rising to a higher plane of moral and intellectual excellence.

Among these creditable exhibitions of generosity and nobleness of spirit I will name a few

of the institutions of learning thus endowed, with the amounts of the various gifts contributed, as well as the names of the immortalized donors: Johns Hopkins University, \$3,142,000, by Johns Hopkins; Lehigh University, \$3,000,000, by Judge Packer; Vanderbilt University, \$1,000,000, by Commodore Vanderbilt; Princeton College, \$1,500,000, by John C. Green; Cornell University, \$1,000,000, by Ezra Cornell; Girard College, \$8,000,000, by Stephen Girard; Boston University, \$1,700,000, by Isaac Rich; Harvard University, \$500,000, by Benjamin Bussy; Amherst College, \$200,000, by S. A. Hitchcock; Columbia College, \$650,000, by S. W. Phoenix; Vassar College, \$800,000, by Matthew Vassar; Madison University, \$300,000, by J. B. Colgate; Wesleyan University, \$450,000, by G. J. Seney. Also, Mrs. Jennie M. Fiske gave \$1,000,000 to Cornell University. Hundreds of other bequests of large sums could be enumerated, amounting to many millions of dollars, given by wealthy men and women, who, dying, saw no better way to serve their generation and the generations yet unborn, than to give a part at least of their earthly possessions to better the moral and intellectual condition of those to follow after.

In pondering over these noble gifts to educational institutions. I was led to ask, Why cannot some wealthy man or woman see the importance of endowing, by a permanent legacy, *THE MICROCOSM*—one of the most important educational institutions of this land? It is strange that this suggestion has not before occurred to some one of your contributors. I am confident that *THE MICROCOSM*, owing to its radical investigations, is doing much for the cause of science and the advancement of original philosophical thought, and that this is the settled conviction of thousands of its readers. This being so, why should not some wealthy man or woman build for himself or herself a monument by setting apart a fund for the permanent endowment of *THE MICROCOSM*, thus giving the magazine free, if need be, or, at most, at nominal cost, to hundreds of thousands annually, who would be willing to read it? Such an act would foster education in its truest sense, and would lead to the permanent dissemination of more real scientific and useful knowledge—bringing it within the reach of a great number of persons—than can ever be effected by any moderate sum expended in any other manner.

H. S. SCHELL.

P. S.—By the way, I have received and carefully examined your small Webster Dictionary, which you offer as a premium for two subscribers to *THE MICROCOSM*, and I must say, in addition to its being an excellent dictionary, I regard the numerous new words in the Supplement (not to be found in any other dictionary) as worth several times its cost.

H. S. S.

NEW YORK, August 12, 1884.

THE MISSIONARY PAMPHLET ON SUBSTANTIALISM.

The orders for this pamphlet in advance of its publication, so long talked of, are now deemed sufficient to justify our proceeding at once to electrotypes the pages preparatory to getting out an edition. Although not nearly enough pledges for copies have been sent in to cover expenses,

yet, as we have always been in the habit of doing, we are not afraid to take the risk in a work that promises so much in so grand a cause as the spread of the Substantial Philosophy. We have probably ten thousand readers who are fully converted to Substantialism as the only doctrine in science, philosophy, and religion which will harmonize the three, and bring them together as a complete trinity in unity. We believe that thousands of these readers, as hundreds of them have already written us, regard the event of their acquaintance with the principles of the Substantial Philosophy as an epoch in their individual experience—a mental transition from darkness to light—in which the shackles of unbelief were broken, and in which skepticism gave way to a clear acceptance of the doctrine of a future life for humanity. If Substantialism really possesses this power with intelligent skeptics, as so many are now testifying—men and women who had settled down in the cheerless conviction that death absolutely ends all—surely it becomes all believers in such a sublime doctrine to lend a helping hand to put it in the reach of all their friends and neighbors who can be induced to read the “little missionary,” whether they can be induced to purchase it at 10 cents or not.

The Rev. Dr. Bailey, a minister of the M. E. Church, of Granger, Ohio, was the first to suggest such a pamphlet in the April number of the previous volume of *THE MICROCOSM*. His plan was to issue a pamphlet of about 72 duodecimo pages, with strong cover, containing the best arguments and illustrations that can be compiled in favor of the Substantial Philosophy, including its leading principles and articles of belief, as made known in the different volumes of *THE MICROCOSM*, and that we should appeal to our readers to order these pamphlets at cost—ten cents each—by the tens, twenties, or more, as God had prospered them with means, to be sold at cost where practicable; and where persons were indisposed to buy, to loan the pamphlets to be read and returned to be re-loaned, and so on till worn out. No one, as Dr. Bailey has since urged, can begin to know how much good he might accomplish in the liberal use, as here indicated, of a single dollar's worth of such “little missionaries” among his intelligent neighbors, who are always apt to be skeptical of a future life, under the prevalent pernicious teachings of materialistic science, about in proportion to their intelligence.

This suggestion of Dr. Bailey's struck us favorably, and we accordingly appealed to our readers for pledges to take ten or more copies, as soon as notified that they are issued. Thousands of copies have thus been ordered, and we trust earnestly that thousands more will be intimated before they can be got ready. We

shall lose no time in the work consistent with our editorial cares, and will notify all, through these columns, to remit for the same, and thus save us correspondence, postage, etc., for individual notifications.

CAPT. CARTER'S ENCOURAGING WORDS.

DEAR DR. HALL.—I have just read your article on Sir William Thompson's address. I regard it as one of the ablest articles you have ever written.

"Your position that the weight of a body depends upon the amount of *gravital force* it contains, and not upon the *mass or quantity of matter*, strikes me as an original discovery of great importance to science.

"The Tyndall correspondence and the raking he receives from Prof. Drake are rich. What skulking cowards those great scientists are, anyhow!

"God bless you and bring you safely through another year.

"Your sincere friend,

"R. KELSO CARTER."

OUR PREMIUM WEBSTER DICTIONARY.

Some of our subscribers think the dictionary we offer as a premium for two subscriptions, is not a "*Webster dictionary*" because it does not show Webster's name attached to it. We are not responsible for any man's misapprehension or want of knowledge. It is a *Webster dictionary*, nevertheless, being based entirely on Noah Webster's orthography, pronunciation, and definition, as any one can see by comparing with the unabridged work. It is exactly what we have represented it to be—384 pages of three columns each, containing also hundreds of unusual words in its Supplement not yet to be found in *Webster Unabridged*, and that it is the best dictionary for its size ever published. Several subscribers, on renewing and sending one new subscription, according to our offer, have asked us to "send on the Webster Unabridged" (a \$12 book) as we had promised. Such subscribers would expect to buy a brown-stone house, furnished, for about two dollars. We would advise all such subscribers to quit taking *THE MICROCOSM* as soon as their subscriptions expire, as we can never hope to satisfy any such insatiable greed, even if we were to issue the magazine weekly at a dollar a year, and then throw in a family Bible as a premium.

THE OFFICE EDITOR'S AGONY.

We sincerely sympathize with the office editor of the *Christian Standard*. In his issue of August 16th he gives more than a column to an effort at vindicating his course in so abruptly

stopping off the controversy with Thomas Munnell, and that, too, without any previous warning. He now lays all the blame for the disappointment of his readers to the violation of contract on our part, in the shallow pretense that our articles (written for Eld. Munnell to sign) were longer than the stipulated one column of the *Standard*. This alleged contract is a wretched subterfuge which, though technically available in his case, should have been cheerfully waived by any investigator who honestly desires the truth in science. He tries, for example, to make capital out of the fact that we predicted in our letter to Thomas Munnell, as we stated in the August *MICROCOSM*, that our article would not appear in the *Standard*; and intimates that we knew we were safe in so predicting, after making the response more than twice too long for the "contract." But this fact was not the basis of our prediction by any means. We knew our man, and knew positively, from what we had learned about him, that the office editor was not the individual to let his readers see arguments which he knew he could not answer, and which tied him hand and foot. As to the extra length of the response, it would have been an easy matter to have divided the article and given it in two issues of the *Standard*, had he been half as anxious to let his readers see the truth as he now is to shield his own scientific reputation. Look at the injustice of this plea of "contract." He presented a long string of objections to our "locust argument," accompanied by numerous assertions which, though entirely fallacious, required necessarily much more space to explain and refute them than merely to state them. This he knew when he printed them. But when we had used only the necessary space courteously to explain his difficulties and annihilate his objections, he at once took advantage of the column "contract" to end the controversy, rather than allow his readers to see the ridiculous character of his sophistical reasoning exposed. And now he wastes another column of their space with a self-convicting explanation of his own want of courage, when his readers would have greatly preferred seeing him attempt to answer two or three of our arguments in reply to his last objections. We do not think that "Bro." Munnell will thank him for his obsequious taffy while slapping "Mr." Hall. If the office editor labors under any such weak delusion, let him read the Elder's telling article on Sound in this number of *THE MICROCOSM*, in which the very backbone of the *Standard* argument is effectually broken.

PROF. KEPHART'S LETTERS.

We present in this number the first letter of Prof. Kephart, our old and reliable contrib-

utor, describing his camping trip to the Sierra Nevada Mountains, and the beautiful scenery of the Yosemite Valley. We have received his second letter, for the October number, and have the promise of a series of several others to succeed it. His description really makes us *sad*, to use a mild expression, to know that we cannot tear ourself loose from this laborious work of editing, and managing the business portion of, this magazine, and take such a trip to the mountains for a month or two, for the purpose of mental relaxation and bodily recuperation, which we so seriously need after about eight years of constant application, and without even a *single day's vacation*. Our original partner, from whom we hoped to receive practical aid, relapsed into inactivity, not to say indifference, near the beginning of this magazine, since which time we have run it practically alone, with the aid of as little hired help as absolutely needed to get out and mail the consecutive numbers. We say frankly that under such circumstances we feel tired, weary, worn; and long to lie down under the shadow of one of the mighty mountains described by Prof. Kephart for a month's rest. But we suspect there is no such luxury in store for us, and nothing analogous to it, till we finally rest from our labors, when we hope that our works will follow us as well as live to our credit.

OUR BIRTHDAY—AUG. 18TH.

OUR 65th birthday has come and gone. The little boom started by the kindness of Eld. Mullis, and carried forward by the generous aid of Prof. Goodrich, has been as pleasant and gratifying to the busy and weary editor of THE MICROCOSM, as it has been successful in placing in his hands a little ready cash to cheer and encourage him in his work. Hundreds of the readers of this magazine showed their appreciation of its usefulness by sending the stipulated mite to swell the birthday present. When the amount was placed in our hands by the professor, it made us feel younger, and inspired us with renewed courage to continue the struggle for Substantialism, till its triumph should be complete.

We owe and feel much gratitude to the dear friends who have so kindly remembered us in our laborious work, and their letters, containing the small remittances, which have been handed to us by Prof. Goodrich, will be filed away as mementos of the kindness which prompted so many significant remembrances.

The presentation passed off without ceremony, save a very neat speech by Prof. Goodrich, accompanied by an original poem which we would print but for its exceedingly flattering character. Being sensitively modest (for

which we have not received due credit), we reluctantly deprive our readers of this decidedly rich poetical effusion. We thank Prof. Goodrich, and through him every contributor to the precious fund. May Providence smile bountifully upon each and all concerned, and may the future conduct of THE MICROCOSM recompense this demonstrated partiality of its many friends.

A KINDLY INDORSEMENT.

A. WILFORD HALL:

DEAR SIR,—I have been wanting to write you ever since I first read your "Problem of Human Life," which was some two years or more ago; but have neglected doing so till now. I have wanted to say to you that I have never read any book, the Bible excepted, with so keen a relish as I did that wonderful book of yours; and when I came to your assault on the Wave Theory of Sound my heart leaped for joy. I never believed that theory, and in a sermon six years ago, in speaking of the mysteries of nature, I said: "What is Sound? who can tell? The answer which science gives to this question is evidently as far from the truth as was the old theory of the support of the earth on the back of a huge turtle. If I am not sadly mistaken the time is not distant when it will be discovered that sound is as much a substance as electricity and odor are substances."*

I rejoice that my prophecy has so soon, and so completely, been fulfilled, and that you have enunciated and *demonstrated* the grand doctrine of *Substantialism*. I indorse that doctrine in all its length and breadth, height and depth. It gives a clearer view of "things that are seen" than we can have without it, and it gives a solid and abiding foundation for our hope and trust in reference to the "things which are not seen and eternal." I read THE MICROCOSM with great pleasure and profit, and I have never enjoyed *thinking* as much as I have since I began to read its pages.

God bless you in your great work is my sincere and earnest prayer. You have already made to yourself an *earthly immortality*, and there is a brighter one for you beyond.

K. D. NETTLETON,

AVON N. Y.

Pastor M. E. Church.

AN EXCELLENT NOTICE OF A WORTHY ACT.

[From the *Harper (Kansas) Times*].

ANOTHER LIBRARY PRESENT.

Chas. B. Titus, last week, presented the Harper Library with a new volume "The Problem of Human Life," by A. Wilford Hall. This is one of the most remarkable scientific works of this century, and has already reached a circulation of fifty thousand copies. It embraces his theory of "Evolution of Sound" and "Evolution Evolved," with a review of the six great modern scientists, Darwin, Huxley, Tyndall, Haeckel, Helmholtz, and Mayer. Hall's scientific theories have caused a greater sensation than anything published on the subject of modern science. Mr. Hall stood alone a few years ago and without the backing of any col-

* The Evolution of Sound was first published in 1877, some seven years, ago but was written several years sooner.—EDITOR.

lege, but with the opposition of all he has come to the front, and in his powerful grasp the leading scientists above mentioned seem mere pigmies. Every teacher and student of science should read this book. Mr. Titus has the thanks of the association for the valuable gift.

[Cannot some friends of Substantialism in the different colleges where *THE MICROCOSM* is read, go and do likewise? There is no prophesying the good that will be done by this act of generosity, though small, on the part of Prof. Titus. A subscription for the fourth volume of this Magazine donated to any college would have a similar effect. Who will be the pioneer in such a good work? EDITOR.]

PROF. CAMPBELL'S OPINION.

I received the August number of *THE MICROCOSM* last week, and have read it with deep interest and pleasure. I am free to say that *any one number* of the whole issue has been worth a whole year's subscription, and I am surprised to see an indifference about renewing on the part of any one who has ever read a single number. Send me a few old copies of back issues, and I will use them to advantage in extending your subscription list. * * * *
What courageous scientists Tyndall and Mayer have been shown to be by Professors Rogers and Drake! * * * Yours sincerely,

BENJAMIN CAMPBELL.

UNIONTOWN, Pa., Aug. 15th, 1884.

A KIND LETTER FROM A GOOD FRIEND.

MANSFIELD, Ill., Aug. 18th.

HALL & Co.:

GENTS.—Inclosed I send you \$1, my subscription for Volume 4 of *THE MICROCOSM*. Among your subscribers,

I was one of the first,
Even if one of the worst;
And in view of the past
I expect to be one of the last.

With many great thinkers, I say, Long live "Substantialism" and its founder.

M. CREWS.

Pastor M. E. Church South.

THE POLITICAL CAMPAIGN AND ITS EFFECTS ON BUSINESS.

With all publishers of books and unpolitical papers or magazines, *THE MICROCOSM* necessarily feels the effects of the presidential furor of excitement which is now sweeping the country from side to side, and from end to end. We confess that, with many others similarly situated, we did not duly weigh or even anticipate this state of things, especially commencing the new volume as we did at the very beginning of such an intense political excitement. Had it, by sheer coincidence, begun in December or January, after the political die had been cast, and the people had settled down satisfied and satiated with the exciting and comparatively trashy reading about the various move-

ments and operations, and especially personal and official scandals of the different contending armies and their leaders, it is clear to us now that it would have been many thousands addition to our list of new subscribers, as well as many more thousands of immediate renewals, who for the cause named have put it off till the storm shall be past, if they do not by such neglect and apathy forget it entirely.

It is only human nature to indulge the appetite for devouring the running discussions so palatable and prevalent in a campaign of this kind, upon which, as the millions of adherents of the different parties are foolishly taught to believe, the prosperity, if not the fate of the nation almost depends. The assumed paramount importance attached to such fallacious suppositions, urged with flaming and flaunting head-lines in 8,000 different political papers, scattered broadcast over the land with unwonted zeal and industry, and carried into every nook and hamlet of this great country, is well calculated to excite the lighter and more trivial strata of the average intellect, and for a time at least divert it from the more durable and useful instructions of solid literary, scientific, and religious publications. We have just learned of one weekly journal in this city which, up to the date of our going to press, has lost 28,000 subscribers by non-renewal, chiefly for the cause we have named, as we have been reliably informed by one connected with the office. The efficient cause which has led to such a sudden falling off in subscriptions, is the enormous amount of free political reading matter sent everywhere and to everybody at the expense of the various campaign funds, much of which is extorted from the people on the plea of aiding the vital interests of one or another of the precious candidates. Thus the temptation to read nothing but the various political platforms, the histories of the nominating conventions, the lives and public services of the various candidates, the harangues and eulogies by their oratorical admirers, the candid opinions of the apologists for their personal and political crimes, etc., etc., is supplemented with the people's inability to take any really useful and permanently valuable publications by this very impoverishing tax levied to supply such campaign funds, and thus keep up such an incessant flood of free political documents.

Under the circumstances here truthfully narrated, it behooves every genuine friend of *THE MICROCOSM*, who wishes to see its noble work of battling against false science, and in defense of true religion and true philosophy, go forward uninterrupted, to spare no pains in adding new subscribers to our list while personally urging old ones to renew their subscriptions without waiting for this political storm to blow over. One other thing remains to be stated which every subscriber and friend can do to aid our work, and that is to send for a few of our valuable books to sell at a good profit, and thus take from our shelves a stock, the cash cost of which we will gladly use in extending this magazine. *This is the actual use to which we have devoted every dollar we have received for the sale of our books.* Let every friend of *THE MICROCOSM* consider and weigh these words.

WILFORD'S MICROCOSM.

Vol. IV.—No. 3.

NEW YORK, OCTOBER, 1884.

{ One Dollar a Year.
{ Single Copy 10 Cts.

THE PHILOSOPHY OF CREATION.

BY REV. THOMAS M. WALKER.

To an atheist attempting to solve the problem of existence there is no alternative to evolution. To suppose that matter had its origin in chance, and that animal forms, as they now exist, fully equipped for the battle of life, sprung spontaneously into being at some time in the past, is too ridiculously absurd to be entertained for a moment by even the most unbalanced mind; and no less absurd is the thought that all these things have existed, just as they now are, from eternity. The atheist says, There is no God. Then to his mind all things, like Topsy, must have "growed," and to help him against hard questions there is an infinite past and boundless space into which he can retreat beyond pursuit.

But to the theist, and especially the Christian theist, there is a God distinctly recognized as the First Cause, the Creator of all things and by whom all things consist. This God is possessed of power and wisdom, and other attributes in an infinite degree. This none pretend to call in question. Indeed, these are so clearly seen from everything around us to be part of God's being that we are justified in drawing from them conclusions in regard to His works and ways. It is a truth never controverted that God has made nothing in vain, and that His methods are always best.

We see a universe—to our minds it appears to be an infinite field in which creating and controlling energy has been at work—we may assume that it is the work of God, and that it was neither created in vain, nor simply as an experiment to test His power and wisdom. There was a purpose, and one worthy of His own infinitude. Such a purpose we can see connected with the existence of intelligent beings as angels and men; beings without limit in their capacities to learn, to reason and to retain knowledge, and equally so to enjoy grandeur and beauty and fitness. The earth serves as an abode for man during his probation; other parts of the material creation may serve a similar purpose for other beings, but this is a small part of what is accomplished. The whole extent of creation, not only the material but the immaterial, including even the existence of sin and misery in the world, with the resurrection and the judgment, is, and is to be a great object-lesson set before an intelligent universe. By this the existence and character of God is made known, and in its reflex influence is intended to excite the wonder, gratitude and love of the beholder, and thus fill him with the highest, purest and sweetest enjoyment. Here, by illustration, we understand what is meant by power, wisdom, love and other abstract qualities; and in the wonders of creation we see, as far as our minds can at present comprehend, the sublimity of these attributes as they exist in the person of God. It is in this way that God makes Himself known. It is true that He has given to this world a written revelation that

tells us of power, of wisdom, of justice and love. But words must be attended by illustrations, otherwise they are as meaningless as a dissertation on light and color would be to one born blind. For the same reason the universe of material and immaterial things, to our minds, comprehends all that is possible. We have no illustration of anything beyond. But this, we believe, is by no means the end. This magnificent creation, as we justly consider it, is the first lesson that God has set for His children, like the A B C that the master writes on the blackboard for the beginner. This has been varied in the past, and no doubt will be in the future, by more or less important changes preparatory of what is to follow, and when this lesson has been sufficiently mastered it will be blotted out, and another substituted, giving higher conceptions of God's known attributes and likewise illustrating other things in the divine essence of which finite beings are now ignorant, and indeed of which they can have no conception. This will be repeated; one lesson rising above another, giving higher and higher conceptions of the Godhead throughout eternity, for God is infinite—inexhaustible. Any conception of creation that leaves God wholly or in part out of view; that does not exalt Him supremely, making Him all and in all, cannot be true, whatever may be its claims to belief from other considerations. God must forever be the central object of the universe—the Sovereign supreme, and the point at which all lines of legitimate thought must converge and terminate. Any end short of this we cannot conceive.

This wonderful display of creating and controlling energy is according to some plan. It is either evolution or it is special. Either all things have been evolved from some primal germ by inherent laws or else they have been miraculously produced in their species by the direct power of God. The theory of evolution is of modern date and we have no fear in predicting that its duration will be brief, though advocated with great confidence by men of eminence in the scientific world. A fatal objection to the theory is that its advocates can give no reason why God should have adopted this method of creation rather than any other; and yet there must be a reason if the theory is true, for God does nothing without reason. And in a matter like this where intelligent beings are most deeply interested it must be open to their comprehension and study. Theistic evolutionists may tell us that the theory being established by other considerations, it must somehow best promote the honor of God; but how this is done they fail to tell us. Does it bring us most directly face to face with God in His creating and controlling energy? On the contrary, it has the effect to push God out of sight as far as possible. Prof. Haeckel and his school find no place whatever for God in the universe. Theistic but infidel evolutionists hold, simply that God created a germ, and then this germ with its God-given energy has hatched itself into and con-

trols the universe, except that on emergencies God gives a helping hand, especially in introducing the rudimentary forms of animal life. Is this, we may ask, consistent with what we know of God? God is the fountain of knowledge and the end of all knowledge is to know Him. This will hardly be denied. Is it then possible that He should hide Himself so that He should not be seen, or be scarcely seen in all the field of human investigation? The theory of evolution is built upon the order and harmony of nature. It is claimed that there is a regular gradation in animal organism from the lowest to the highest, and that this shows the track of creation, that the higher were evolved from the lower in regular succession by fixed physical laws. But evolutionists themselves shut out the possibility of such changes taking place as they claim to be necessary. We are told that a change of structure is by the accumulation of slight accidental variations in the same direction, and that these changes must be beneficial to the being, otherwise they will be blotted out in the next generation by the law of survival of the fittest, in the struggle for existence. Any one, however, can see that any variation looking toward a change of structure is, to say the least, of no value to the being until the change has been so far perfected that it can be utilized. Take the formation of an eye for example. Of what advantage could all the incipient or transitional forms of that eye be until it is so far perfected that it can be used for vision? Long before that point could be reached by slight variations it would be pronounced by Natural Selection an intolerable excrescence and be blotted out. So it would be in the formation of any new part or function by this process. The slightest change would be just so far an inconvenience, and this must increase with every additional change up to the point of usefulness—which point, evolutionists themselves being judges, could never be reached. This wonderful order in nature utterly fails as a foundation on which evolution can rest, and even proves it impossible. The chasms everywhere are too wide to be leaped, and the intermediate steps have never existed. But is there not a purpose in this unity of nature instead of being an accident, that happens to show the track of creation? Any one with a moment's reflection can certainly see that the world presents just the form in detail that we might expect, independent of all thoughts of evolution, in coming directly from the hand of a Creator of infinite wisdom. He would thus best make himself known, and provide for the instruction and happiness of his intelligent creatures. How would the matter now stand if this order did not exist? It is easy to see that the evidence of the existence of God would be at zero, and we would live in the presence of a tangled web which no finite mind could ever unravel. Order and harmony are the laws of God, and the manner in which we see them declares in the highest style the glory of God, and for this were the heavens and the earth created. Here in creation there is the etching of a wonderful picture—there are just strokes enough to make it perfect, fewer would have left it incomplete, more would have marred its beauty. It is the work of a Divine Master. The principle of unity in diversity is seen everywhere in creation, and equally so where there would seem to be no room for evolution. It is seen in color; it is heard in sound. Here may be found an answer to the question suggested by Prof. Abernethy in

the August MICROCOSM. A few fundamental forms of sound, like those of light, by combinations and blendings, would produce endless diversity in sound, as the same things in light give all the shades, tints and colorings in the universe. This, of course, does not apply to the wave-theory. It is this unity in diversity that charms us in looking at the handiwork of God. This is beautifully and forcibly expressed in one of his last lectures by our honored naturalist, Agassiz. He says: "Sometimes in looking at this great epos of organic life, carried on with such ease and variety, and even playfulness of expression, one is reminded of the great conception of the poet or musician when the undertone of the fundamental harmony is heard beneath all the diversity of rhythm or of song. It has the freedom of manifestation, that independence that characterizes the work of mind compared with the work of law." From the apparent similarity of process the cause of evolution is thought to be strengthened by the developing of a perfect organism from a formless egg or a minute germ. There is, it is true, a similarity here, but it is wholly superficial. The one is the forming of a perfect being from a shapeless mass; the other is the growing of one perfect being out of another in endless succession. The laws, too, that govern in the two cases have no points of similarity; the one is brought about by the instrumentality of a vital principle, whatever that may be, imparted to the germ by which it is shaped into an organism after its kind; the other is by accidental variations and survival of the fittest. But more than all is the fact that, while for evolution as a method of creation, no reason can be given arising out of either the glory of God or the good of man; for the development of all forms of organic life from the germ we can see not only reason, but necessity in the economy of creation. By this all organic beings are placed almost completely under the control of human intelligence. The world on this account is a pleasant habitation for man, and not one of startling uncertainties. Man would be utterly helpless in the battle of life, if everything from a thistle to an oak, or from a mouse to a lion sprung into existence suddenly and full grown, without premonition. If God designed that man should dwell in quietness, and set bounds to his possessions, and make some kind of calculation for the future, we can see no other way than that which His infinite wisdom has adopted in the gradual development from germs, under easily understood and easily controlled conditions, of all organic life on earth, and that this order should nowhere and never be disturbed, except when an end worthy of Himself is to be secured.

FOUNTAIN GREEN, III.

A CAMPING TOUR TO YO-SEMITE VALLEY AND CALAVERAS BIG TREES.

BY PROF. I. L. KEPHART, A.M., D.D.

My contribution to the September MICROCOSM having informed its readers that a party of five—Prof. Klinefelter and wife, and myself, wife and daughter, Lizzie (aged 13 years), were in the far-famed Yo-Semite Valley, it is now thought proper to further acquaint them with some of the particulars of that tour, and more especially with some of the characteristics of the wonderful scenery. It had often been asserted within my hearing, that "for grandeur and stupen-

dousness of natural scenery, California beats the world,"—that even the Himalayas of Asia and the Alps of Europe present nothing to equal Yo-Semite. This I was seriously inclined to doubt, and having taken up my abode in this State, I resolved to improve the first favorable opportunity to gaze upon and wander among its grandest scenes.

That more excursionists and sight-seers do not visit Yo-Semite is chiefly owing to two reasons: first, the obstacles in the way of getting there; second, the expensiveness of the tour to all who go there in public conveyances and depend upon the hotels for food and lodging. The nearest points accessible by rail are Milton and Merced—the former 89 and the latter 87 miles distant from the Valley. From these points the Valley is reached by stage, over a rugged, steep, mountainous road. The time required by the stages for covering this distance is about 22 hours of actual travel, in the middle of which is sandwiched a night's stop-over of 18 hours, and the charges for fare are about \$10 each way. In addition to this, the State lays a tax of three dollars on each and every one who visits the Valley—a method resorted to as a means by which to secure the funds required to make and repair roads and bridges, and otherwise improve the Valley. And right here I wish to say that it is the opinion of many that this per capita tax imposed upon those who undergo the hardships of this journey for the sake of seeing the greatest display of natural scenery is quite unworthy the great State of California. The tax is imposed upon all, whether they enter the Valley by public or by private conveyances. Each one pays \$1.50 on entering the Valley and \$1.50 on leaving it, which causes some to remark that "it is the only show we ever knew of that we have to pay as much to get out as to get in." The tax-gatherer, however, explains that they would take the three dollars as you enter the Valley and be done with it, but most tourists prefer to enter by one road and leave by another (there are three roads by which you can enter the Valley), and the object of charging separately for each way is that the State may know what each road pays.

The charges at the hotels in the Valley are from three to five dollars per day, according to accommodations; and the use of a horse and saddle to climb one of the trails to the summits of the towering cliffs is two and one-half dollars.

Having resolved upon a tour to Yo-Semite and the Calaveras Big Trees, the next point to decide was, how shall we go—by public or by private conveyance? Camping, during a part of the summer, is very popular in California, and is resorted to quite extensively by all classes. A party with wagons and outfits, set out from home, and go away to some point of interest either in the Sierra Nevada or Coast Range mountains, remain three, four, or five weeks, camping out, fishing, hunting and "roughing it" all the time—thus securing for themselves relief from the heat of the Valley and the benefits of the invigorating mountain air. Although neither of us had had any experience in camping in California, yet, because we believed it would be more novel, more interesting, more beneficial to the health of ourselves and families, and, especially, most in accordance with the size and weight of our pocket-books, we decided to make the tour "a camping." Accordingly, we hired a regular double-decked camping wagon for which we paid twenty dol-

lars for the round trip, to be made in from twenty to twenty-five days.

As a camping wagon is a novelty, it may not be amiss to describe this one. The running gears are moderately heavy, very compactly built, and thoroughly ironed. The spindles are annealed wrought iron, and a first-class brake (one of the essentials) attaches to the hind wheels. The bed is twelve feet in length, mounted on first-class springs, and covered with a high oil-cloth covering, supported by well-rounded bows. In the hinder half of the wagon-bed there is a second floor raised eighteen inches above the first floor. This constitutes the "double-deck." The lower apartment, thus set off, constitutes a "stow-away," in which are placed nearly all the articles that belong to the culinary or commissary department. On the second floor are placed a straw ticking moderately filled with straw, pillows, blankets, and bed comforters, and this constitutes the ladies' sleeping apartment. Around the sides of this apartment, on hooks provided for the purpose, are hung their hats, shawls, small satchels, etc. Immediately in front of this chamber is placed the seat occupied by the ladies; and in front of this the seat occupied by the Professor and myself. These seats are also mounted on springs, thus giving the advantage of the action of a double set of springs, which effectually breaks the jolts occasioned by the rocks in the road. If, during the day, the women become weary with the journey, as they often do, they retire into their sleeping chamber, lie down and take a nap, while the wagon pursues its weary way up and down the immense hills, and across the yawning canyons. Each night the seats were removed from the wagon and a bed made in that part of it, where the Professor and I slept as snugly as if we were in a palace.

To this wagon were attached two good, trusty, stout, tough horses, furnished us *gratuitously*, by Mr. W. H. De Verees, who resides six miles west of Woodbridge, and is an intelligent, enterprising, prosperous "rancher." He is a warm, liberal friend of San Joaquin Valley College, and has two promising sons who are taking courses in the college, and although we had no claim whatever on his generosity, yet, that we might be enabled to make the tour, we had but to ask him to hire us a span of horses for the journey, when he generously gave them to us *gratuitously*! It is scarcely necessary to say that we can never forget his kindness. To his sons we are indebted for the use of a fine fowling-piece and all the ammunition needed for the tour, free.

The outfit for our culinary department consisted of a piece of heavy sheet iron two feet square, in which were two No. 7 holes, somewhat like the top of a cook stove. This was our camp stove. To use it we cut a small trench in the ground three inches deep, banked up either side with the loose earth, built our fire in the trench, and laid our stove on it, and in this way we could easily cook without being annoyed by the kettles and pans falling over. In addition to the stove, we had a coffee-pot (good coffee is a *sine qua non* of a pleasurable camping tour), dinner-pot, stew-kettle, frying pan, Dutch oven (if you know what that is), tin cups, tin plates, spoons, knives and forks, sauce dishes and tin pans.

In the way of eatables, we set out with several loaves of bread, meat, potatoes, onions, wheat flour, corn meal, graham flour, oat meal, canned fruit, pickles, mustard, vinegar, butter,

etc. Some of these, as meat, butter and bread, had to be renewed on the way, but of nearly all the others we carried, from home, a supply sufficient for the tour.

For our horses we carried with us when we started three sacks of crushed barley. This is necessary, for one of the chief items of expense to campers in the Valley is horse-feed. Hay there costs three cents a pound by the bale, and barley is proportionately expensive. This is owing to the fact that no hay is grown within forty miles of the Valley, except what is grown in the Valley on what is known as the Valley Ranch, and the way into the Valley is so very steep that a ton is a big load for six horses. And, as might be expected, those who take wagon supplies into the Valley take advantage of the necessities of the case, and make all the money out of it they can. They go upon the presumption (which is true to a great extent) that those who can afford to visit Yo-Semite are abundantly able to pay well for their supplies. This is the prevailing sentiment, not only among teamsters and the proprietors of stage-lines, but with the railroad company also. The freight on ordinary store-goods from San Francisco to Yo-Semite is six dollars per hundred pounds. Then, the State exacts a big bonus, or rent, from those who remain in the Valley doing business—such as hotel-keepers, livery-men, artisans, guides, etc. Mr. Harris, who runs the bay-ranch and livery-stables in the Valley, told me that he pays the State \$500 a year for his privileges. When it is remembered that the season for visitors and business only lasts from sixty to ninety days, the reasons for high prices in the Valley become at once apparent. The fact that we carried nearly all our supplies with us into the Valley rendered the expense of our five days' sojourn there very moderate. Hay we procured on the route as we needed it, at reasonable prices; and in the Valley, by feeding more crushed barley and less hay, we managed to rub through on one bale, weight 185 pounds, for which we paid the handsome sum of five dollars and fifty-five cents!

Having thus introduced our tour to the readers of THE MICROCOSM, and the length of this article having already reached its limit, I drop the subject here, promising (with Dr. Hall's permission), in my next article, to enter upon an account of our journeyings, the incidents and scenery by the way, etc., etc.

WOODBRIDGE, Cal., August 5, 1884.

EVOLUTION ONLY A HYPOTHESIS.

BY REV. J. J. SMITH, A. M., D. D.

If evolution were true, as we have already shown there should be no intervals between the species, no chasms, no gaps, no breaks at all, but an unbroken series of gradational forms connecting all the types, so that each should be found running into others by slow or numerous transitions. But instead of this we see sudden breaks and yawning chasms between them, with no connecting links; no, not a single instance to be found where one species has been known to have been evolved from, or out of another. Consequently just at this point, where evolution should be strongest, it is the weakest. Where transitional fossilized forms should be abundant, not one can be found. "The transmutation forms," says Prof. Lewis, "which must certainly have been passed through should

be abundant somewhere—more abundant, in fact, as they must have originally been more numerous, than the extreme states marked by fixed and distinct and well-defined separations from each other. Nature should have been full of them."

And, although through the extensive researches that have been made for the last thirty years, some *thirty thousand specimens of extinct animals* have been found, many of them in situations, and under conditions, in which it would seem that all forms would be preserved, yet not one of all this immense number has proven to be of a transitional character. Nor is there a particle of evidence that any transitional forms ever existed. Evolution, with our present knowledge, can only be regarded as a hypothesis, in fact, a most transparently visionary speculation.

"The primitive types," says Louis Agassiz, "have remained permanent and unchanged,—in the long succession of ages amid all the appearances and disappearances of kinds, the falling away of one species and the coming in of another—from the earliest geological period to the present day." Again: "Our domesticated animals, with all their breeds and varieties, have never been traced back to anything but their own species, nor have artificial varieties failed to revert to the wild stock when left to themselves. Darwin's works and those of his followers have added nothing new to our previous knowledge concerning the origin of man, and his associates in the domestic life."

Professor Barrande, the great palæontologist, declares that in none of his investigations had he found any one fossil species developing into another. Further, that there was no evidence of any one species, fossil or other, losing its peculiar characteristics to acquire new ones belonging to other species; for instance, however similar the dog to the wolf, there was no connecting link; and among extinct species the same was the case; there was in no instance a gradual passage from one to another. Nor has Darwin or any of his adherents, after all their extensive research and investigations, found a single case of transmutation of a single species, nor even so much as a single case of variability in an established type of vegetable or animal life, that would enable them, or any one else, to class such variety as a new species. Where then is the consistency of adhering to a theory so entirely destitute of evidence?

Besides all this, it is a well-known fact that the species cannot hybridize and thus produce between them a single new species. For hundreds of years breeders and fanciers have been experimenting to produce, if possible, a fertile species of hybrids, but all to no purpose. It never has been done and never can be. A single cross in some cases may be effected, but such hybrids are absolutely sterile both among themselves and with their parent forms. Thus nature, or rather the Creator, has erected an impassable barrier, or wall of separation between the orders and various types. Hence, all abnormal divergences in the species, instead of perpetuating themselves, invariably tend to revert back to their normal or original forms. Hence, there exists an unyielding manifest law of nature asserting its authority throughout our globe, that is in direct and unmistakable conflict with the theory of the transmutation of the species, and which proves evolution to be not merely a hypothesis, but a most visionary speculation, if not a gigantic falsehood.

And yet evolutionists would have us believe in the face of all these stubborn facts that there is some indefinable and incomprehensible law of transformation in nature by which a pigeon can be changed into a buzzard, a dove into a hawk, a canary into a goose, a wren into an owl, a humming-bird into an ostrich, or by which a sheep can be changed into a tiger, a hog into a lion, a skunk into a horse, a mouse into an elephant, and so on. And yet even all this falls short of that still greater absurdity involved in the theory of evolution; namely, that man, the lord of our globe, came from yet lower forms than pollywogs and lizards. Can anything be imagined more ridiculously absurd than this?

TARRYTOWN, N. Y.

SUBSTANTIALITY OF THE HUMAN MIND.

BY REV. T. NIELD.

In treating of the human mind in this paper, we shall include all that is implied in the term *ego*—the entire man as distinguished from his corporeal tenement. We hold that the mind of man is a spiritual substance. Amongst those who differ from us in their views upon this subject are those who hold that we have no *direct* evidence that the mind exists as an entity, and that the mind, as cognized in our mental activities, may be merely a manifestation of a primary force acting through our mentality. We answer, 1, That the evidence of the mind's entity is the most direct possible—more direct than any other.

The senses are intermediaries between the subjective and the objective, the self and the not-self of the material realm. What the mind knows of the not-self is through these intermediaries, and is but the impression made by them upon consciousness. Such knowledge, therefore, is secondary; for the senses do not *know*. The impressions they make are not knowledge, but evidence. *The mind is the knower*, and all that it knows through the senses is the evidence they give. But what the mind knows of itself it knows without the aid of intermediaries. Of its own existence it has direct consciousness. Since the mind knows the not-self it must know that it is self that knows the not-self. There can be no consciousness that self knows something until there is a consciousness that self exists. The cornerstone of all the mind's knowledge is this **I AM**.

2. As the mind reaches outward through the senses for the objective in the material realm, and becomes conscious of the not-self, so it turns outward and seeks through a higher sense for an objective, conscious of a not-self that is greater than itself. Some persons call this the religious instinct. We prefer to call it the spiritual sense. But by whatever name it may be called, it is there. It has been characterized by a few as only a tendency to superstition that has been cultivated by an interested priesthood. It may be replied that there is something there for an interested priesthood to cultivate. There is something there that has made the priesthood. The fact that there are these "priests," and that there is a universal aspiration to commune with an Infinite One, proves the ego's consciousness that it is itself an entity and not the objective Infinite that it seeks. There is this difference, however, between

the two kinds of knowledge; that which is acquired through the senses is a knowledge of the finite and, in material things, the *less than self*; that after which it reaches through the spiritual sense is a knowledge of the Infinite—the *greater than self*; and since finity bears some comparison with finity, but none with infinity, the mind can know more of finite matter than it can of infinite spirit. The fact, however, is cognized by the mind, that not only is there an Infinite Mind, but that itself is not that Infinite; and the cognition of this fact implies a knowledge of its own personal entity as distinctly as it can have a knowledge of anything. The ego knows this or it knows nothing. *It is, or there is nothing to know that anything is*. And since the mind is an entity, and since it is active within itself and acting both upon substance and matter, we conclude that it is itself a substance.

Having thus briefly shown that the mind is an entity, we now proceed to establish our conclusion that it is a *substantial* entity. The author of *The Problem of Human Life*, in the opening paragraph of chapter 2, makes this truly philosophical remark: "Nothing can be conserved or preserved unless it be something that exists, and it seems to be an axiomatic truth that nothing can exist unless it be a substance of some kind." A recent writer, while claiming that mind exists as an entity, and that it is immaterial, indestructible, life, intelligence and spirit, still denies that it is a substance. Such a position involves a self-contradiction. We cannot conceive of an indestructible abstraction; of life without something that lives; of intelligence and spirit—the supreme factors in all activity—as but *nothing with a name*.

A fundamental position in the above writer's theory concerning "the laws of mind" is, that "like produces like." He holds, too, that "thought is an emanation of or from mind." Now, if the mind be not substance, and yet thought is produced by mind, we have the phenomenon of like producing unlike—substance, emanating from that which is not substance. We answer the writer in his own words: "*The bestowal of any endowment whatever upon anything whatever, which neither the bestower nor the recipient possesses, would be to create something from nothing—a thing which science utterly repudiates*." If the mind be not a substance, then substantiality is something which it does not possess, and which, therefore, it has not the power to bestow. Since "thought is an emanation of mind," it possesses nothing but what it receives from the mind; therefore, since the mind has no substantiality to bestow, and thought has nothing but what it receives from the mind, the mind can bestow no substantiality on thought—it is not a substance. Thus it follows, on this writer's own theory if thought is a substance, that mind, the thought-producer, is also a substance.

The same writer holds, further, that thought is mind-food, that the mind feeds on and assimilates thought. Suppose this true, and it again follows that mind must be substance. Matter cannot be assimilated by that which is not matter. No more can substance by that which is not substance. Assimilation implies appropriation of prime elements contained in the thing assimilated, and their conversion into sameness with that by which they are assimilated. As Webster says, it is "to convert into sameness of substance." Hence to claim that an entity feeds on and assimilates substance,

while itself not a substance, is an utter absurdity.

We do not wish to be understood, however, as admitting that thought is substance. We have merely shown that to contend for the substantiality of thought is, logically, to concede the substantiality of mind. We believe that thought is *not* substance. At the same time we believe that mind is substance, and this for the following reasons:

1. Say that the mind is, and we admit that it is something.

2. It thinks, and so it acts. Something acts. We know of nothing else that has the power to act, which is not itself substance.

3. Its acts pass from itself and produce an effect on other things, thus proving that there is enough in common between the nature of the agent and that acted on to make contact possible.

4. It can produce an effect on matter. It is the germ of all that constitutes our essential personality. As such it acts upon the nerves by exciting the emotions. By its normal activity it develops the brain in quantity and quality. By excessive or abnormal activity it wears out the brain. It can cause and cure disease.

5. It is the architect of all the achievements of man. Whether symbolized in language as its most direct expression, or in art, skill or muscular force, as less directly expressing the form and character of its productions, all the works of man, we say, are but the outwrought manifestations of mental activity. They are effects that have passed over from this final cause through the medium of a secondary cause—matter. Such effects, we affirm, prove that the cause must be a substantial entity.

And yet it is not uncommon for men of a certain scientific bent to distrust the idea of the mind's substantiality on the ground that it is not directly recognizable by the senses. They would do well to remember that, to be so recognizable, it must be but a slight remove from matter proportionately more gross and less elastic in its capacities than it is. And yet it is not beyond sensuous recognition. It is enthroned above the senses, and decides upon all the testimony they give. Sometimes it overrules the testimony of taste, of hearing, of smell, and even of sight. Nay, only the mind knows that we have the senses. They are its servants, and without its presence would be useless. Thus we see that the senses are only the mind's lackeys. The mind itself is the man, and the senses are its point of contact with matter, itself above matter, and yet sufficiently allied to be a substance.

Others, again, claim that mind is only the play of organized matter—brain-molecules in motion. They indulge in a jugglery of words in which unmeaningness is made to pass for a definition. It were about as scientific to define heat, as expressed in the generated force that drives a locomotive, as the play of the molecules of the iron composing the engine.

There is no effect without a cause adequate to produce the effect. Matter, being under the control of gravity, is unable to move itself; hence motion in matter is an effect whose cause is behind the matter. And unless the motion be caused by gravity it is greater than gravity, since the resistance of gravity has to be overcome to produce the motion. Then if we admit that in thinking there is a play of the molecules of the brain, we have only yet found the effect. There is the moving force behind the

thinking, and behind the force a generator of thought. And since thought implies consciousness it is a conscious agent that generates the thought-force. In other words, there is a thinker—an entity. And this entity is more potent than all others of which we have knowledge, since it can overcome and utilize all other forces and potencies whether of substance or of matter. Its fiat overrides gravity, gives tone to sound, bridle the lightning, decomposes and re-adjusts the combinations of matter. In brief, mind is the autocrat of substance and of matter.

None, we think, will question the statement that there must be an affinity between sound and the generator of the physical energy for one to evoke the other; between gravity and matter for one to act on the other; between electricity and a copper wire for one to conduct the other. And this affinity seems to imply that they have something in common that serves as a point of contact through which one affects the other. And here it would follow as a consummate analogy in nature, that there is an affinity between mind, and that upon which it acts, which implies that it has something in common with substance and matter. Not that it is matter nor yet such substance as it acts upon. But as it acts indirectly upon external matter through a mediating material organism, so, through the substance of its own nature, it acts directly upon other substances. Were it not a substance—the highest form of conceivable entity—there would be no point of contact at which it could touch and affect other substances, and through them produce its wonderful manipulations of matter.

ELMIRA, Mich.

FOREKNOWLEDGE IN A NEW LIGHT.

BY REV. B. F. WHITE.

[We give the following conclusion of an article from the pen of our old contributor, as another curiosity in philosophical argumentation. Will the Rev. Mr. Williston briefly expose its fallacy if the logic be fallacious?—Ed.]

"God being morally pure, necessarily implies the possibility of the existence of moral impurity. He, being infinite in His perfections, could not (*per se*) bring into real existence this possible impurity; but He could and did create a finite moral character in His own image, and as soon as this finite morally pure being came into existence, the circumstances existed in which this possible impurity might become real; for finite moral purity could not exist except under law: law implies authority on one side, and obedience on the other. Obedience necessarily implies moral agency, and moral agency implies the power to willfully obey or disobey. This finite morally pure agent brought into real existence that which was before only a possible existence, by disobedience.

"God being infinitely perfect, must have perfect knowledge. The perfection of knowledge is only absolutely found in knowing things as they are. Moral character being necessarily hinged on conditions, that is, on obedience or disobedience, God's knowledge would be imperfect to know unconditionally that which He had made conditional, and that which in its nature is necessarily conditional. God's knowledge, either present or future, only demonstrates its absolute perfection in knowing conditional things conditionally, and unconditional things unconditionally.

"Man's life and destiny as a moral agent are necessarily conditional. God knows them in this relation, and cannot know them otherwise than conditional; otherwise He would know that which is not knowable, and this would make God's knowledge imperfect. We thus account for the origin of moral evil, among men, by man's own personal disobedience, and we can thus see the philosophy of future rewards and punishments as the just results contingent upon conditional moral agency. God is not responsible for the *real* but the necessarily *possible* existence of moral evil and its consequences among finite moral agents."

MONROE, La.

ETHNOLOGY AND THE UNITY OF THE RACE.

BY J. W. LOWBER, M. A., PH. D.

Ethnology, a science of quite recent origin, treats of National Distinctions. It deals chiefly with the effects of physical influences on man, such as food, soil, and climate. In this respect it very much resembles Geology. It deals with the peoples that inhabit the earth, as does Geology with the strata that compose it.

Some Naturalists have taken the position that instead of the human family having descended from one pair, it has had many sources; and that each race has had its own Adam and Eve. Prof. Agassiz, the distinguished Naturalist of Harvard, was opposed to the doctrine of the Unity of the Race. Sir R. L. Murchison advocated the position that the different races not only proceeded from various original stocks, but that they were also introduced upon this earth at different periods. Gladdon and Nott have maintained that the races of men are different creations; that the Negro and Indian are incapable of reaching a high civilization; that they have not sufficient mental power to perceive religious truths; and that there is not for them any more immortality than there is for the brute.

It is useless to state that this doctrine is contradictory to some of the plainest statements found in the Word of God. The Bible clearly teaches that the whole human family descended from one man, Adam, whom God created in His own image, and from one woman, Eve, who was the mother of all the living. A central truth, in the Bible, is the fact that all mankind died in the first Adam; and that the whole race is to be made alive in the second Adam, the Lord from Heaven.

It is thought by the opponents to the doctrine of the unity of the human family, that the difference between the races in reference to the quality of the hair, the color of the skin, and the form of the skull, justifies their position. We think not; for all these things can be satisfactorily accounted for by considering carefully the influence of climate upon, and the habits of life among the different races. Besides this; those nations, which are known to be of one origin, frequently differ as much among themselves as do the different races of mankind. The dark Hindoo and the blonde Norwegian, the light-haired German and the black-haired Frenchman, are known to be of one race; yet, they differ nearly as much among themselves as do the different races of mankind from one another. The science of physiology is now sufficient, not only to explain the causes of difference in the color of the skin;

but, also, the reasons why the hair of different individuals and different races is not alike. As the hair is but a modification of the skin, the coloring matters in its pigment-cells influence it, as do certain pigment-cells the color of the skin. In golden hair, there is an excess of oxygen and sulphur, with a deficiency of carbon; but in black hair, the deficiency is in sulphur and oxygen, with an excess of carbon. These things are sufficient to explain the difference between the golden hair of the American blonde and the black wool of the African.

We mention briefly the points of identity between the different races, which clearly teach the unity of mankind. (1). The great laws of the vital functions are the same in all races. (2). Fertility is considered a sure test of specific identity. The different races are not only fertile with one another, but their offspring are equally fertile. Abundant proof of this can be found in every quarter of the globe. (3). The language of the different races can be traced to one original language. Language is peculiar to man, and all races have this peculiarity. The greatest of living Philologists have now reached the conclusion that all languages may be classified into three classes—the Aryan, the Semitic, and the Turanian. These point back to Japheth, Shem and Ham. (4). All races have the same intellectual faculties. (5). All races worship. God has given the same object of worship to all, and commands all men to repent.

LOUISVILLE, Ky.

THOUGHTS ON SUBSTANTIALISM.

BY REV. J. I. SWANDER, A. M.

The thoughts clothed in the language of this paper are suggested by the contents of a letter now in our possession. Its unworthiness is the only thing that renders it worthy of notice. As a rule, we have been in the habit of consigning anonymous letters to the waste-basket, with mingled emotions of pity and contempt for such unprincipled scribblers; and we hope that the honorable readers of THE MICROCOSM will pardon us for this single departure from the line of wisdom and propriety. The letter in question bears its post-mark from Chicago, Ill., and its ear-marks from a very pious philosopher. The writer informs us that we have "stepped from the realms of pure and intellectual philosophy," and that our articles in THE MICROCOSM show "poverty of thought." This latter bit of information is not news to us, and the reception of it does not surprise us in the least, but we do confess our surprise, and hereby express our astonishment that one who still moves in the realms of a "pure philosophy" should forget to sign his name to his very "intellectual" communication. Outside of "the realms," we still have this one consolation, that if our thoughts are full of poverty, our productions are not leprous with that mendicancy of morals which prompts some men to play the part of a contemptible coward. Is it possible that the policy of silence is giving way to the "pure" philosophy of assassination? If so, let the change be made without delay. The good cause will go forward despite the hissing of the snake in ambush. Men will still continue to think. Even the poverty of thought is better than the wealth of thoughtlessness. Let us venture a few more thoughts on Substantialism.

Thoughts, we say, not arguments. Men think too little, and reason too much. For

this reason their reasoning is sometimes unreasonable in the light of truth. The religion and philosophy of the future must embrace more of God's facts and less of man's theories. The approaching crisis calls for no less faith, but more of that earnest, laborious, and profound thinking which leads to a discovery and proper apprehension of that rock-ribbed article in which the major proposition of the perfect syllogism is imbedded, and from which the process of sound logic moves forward to its just conclusion.

Thoughts on Substantialism. Yes; honest thoughts, and free from prejudice. What is the use of any further discussion of the wave-theory, or, for that matter, any other theory based upon the assumption that matter is the only form of created being? Questions concerning the laws of gravity, magnetism, and sound, can never be satisfactorily settled until there is a more manly willingness and earnest effort to look beneath the material surface in search of certain invisible entities and elementary principles not generally acknowledged in the superficial and contradictory theories of the schools. Back of all theories and discussions relating to the qualities, properties, and phenomena of being, is the *question of being* in itself considered. Toward this fundamental question, the honest and diligent philosopher would do well to turn his most unbiased attention, if he would emancipate himself from the tyranny of traditional theories, and triumph gloriously where basic truth unfolds her banner and gains the victory with stubborn and substantial facts.

The case calls for rational thought. Is it unreasonable to believe that there is an order of being beyond the comprehension of the human intellect? If so, the Christian religion is unreasonable in its claims, and untrue in its nature. The apprehensible is not always comprehensible. It is not unreasonable to assume the existence of immaterial and imperceivable entities not found in the category of material things, and whose actual being cannot be proven by any chemical or mechanical test. When an unanswerable array of observed facts demonstrates conclusively that certain acknowledged effects cannot possibly be produced by any cause, force or energy inherent in the mere material world, and that such effects cannot be accounted for except upon the hypothesis or theory that there is an immaterial substance, it is unreasonable to deny the existence of such substance. Materialistic evolution, including the advocacy of the wave-theory of sound, makes this denial in the very face of such facts and effects. It is, therefore, unreasonable and untrue. If religion clearly sees and understands by the things that are made that there are invisible things of God from the creation of the world, true science is bound to look beneath and beyond the sphere of the visible in search of something that shall prove more satisfactory in solving the most difficult problems of the age, and lead to a rational rejection of those infidel theories so obstructive to the progress of both religion and science.

Thoughts for religious thinkers now standing at the threshold of the new philosophy: Why should such persons allow themselves to be ushered into the school of Substantialism? Can the acceptance of its doctrines be of any benefit to the disciples of Christ? Paul never saw *The Problem of Human Life*. St. Stephen never read *THE MICROCOSM*. The apostles had a more

sure word of prophecy. But does not that word of prophecy embody the essential principles of the Substantial Philosophy, and authorize its fundamental teachings with a cordiality equalled only by the emphasis with which it denounces the mere outward letter? Is Substantialism contrary to the doctrines of the New Testament? Is not the principle for which it contends an essential element in the objective constitution of the Christian religion? As an essential element thereof, has it not been left out of view, in the false trend of materialistic thinking or thoughtlessness, until it is now ignored and hooted with worse than pharisaic bigotry? Such questions we suggest for the thoughtful—for those who have the will, the power and the courage to accompany us through this shorter catechism. For our part, we here place our solemn vow upon record that if, after a full investigation of the whole subject, it shall appear to us that the fundamental principles advanced and advocated by the Substantial Philosophy are not essential parts of the Christian religion, in harmony with its teachings, and also serviceable in the satisfactory solution of its most interesting problems, we shall abandon the whole subject as something entirely unworthy of our further confidence and consideration.

Let us examine the claims of this Substantial Philosophy at a single point, and see whether its alleged fundamental principle can be applied to the Christian religion in such way as to harmonize with its laws as now partially known in the light of divine scriptures, human reason, and Christian experience. Let the thoughtful reader turn to Dr. Hall's review of Sir William Thomson's earnest blundering in search for more *sense*, as given in the August *MICROCOSM*. On page 28 the editor asserts with his usual confidence: "It is the active force of the substantial magnetism radiating from the magnetic poles which seizes by sympathy the latent magnetic force residing in metal of a similar quality with the magnet, thus drawing the two bodies together by cords of sympathetic force. The earth, in like manner, only draws a stone downward by the substantial cords of gravitational force from the earth interlocking sympathetically with the same substantial force, centering in small quantity also in the pebble." Now, in our anxiety to test the applicability of this philosophy to the principles and practical workings of the Christian religion, let us submit a few questions, not in the way of an argument, but for the purpose of suggesting thought: 1. Does religion etymologically signify the bringing of sundered parties together again? 2. Does religion, as a "heavenly gift," actually bring about a reunion of God and man? 3. Are the parties, to be thus reunited, in any sense possessed of a similar quality by virtue of the one being in the image of the other? 4. Is there, by virtue of this common quality, an affinity between the two which is not known to exist between God and the irrational part of creation? 5. Does not the absence of such a point of similarity render it impossible for God to take upon Himself the nature of a stone, a tree, or an animal? 6. Is not the existence of this peculiar affinity between God and man by nature the essential ground of possibility for the Incarnation? 7. Was not the existence of a false affinity between man and the powers of death the soteriological necessity for the Incarnation? 8. Does the superior power of the higher and normal attraction so overcome

the lower and abnormal (as the magnetic force is shown to have neutralized the gravitational force in certain bodies) as to lift man out of the "mud" of carnality, and deliver the soul and body "from him who hath the power of death, that is the devil?" 9. Does the Incarnate One, after having taken His seat upon the mediatorial throne, in any sense *draw* men unto Himself? 10. If so, is this power by which He draws analogous to that of the magnet—is it in any sense spiritual or supernatural magnetism? 11. If so, is such magnetic force a mere quality of something, or a *real something* in and of itself according to the fundamental teachings of the Substantial Philosophy? 12. If the latter, or in either case, is the attraction between Christ and the Christian mutual and reciprocal, so that the power in one interlocks sympathetically with the power or force in the other?

What saith the Scriptures? Touching the point of inquiry just now under thoughtful consideration, do not the sacred oracles plainly teach that in Christ and the Christian, or between the two, in such organic way as that each one is in the other, there is an element common to both? Without such a common and substantial ground of union and communion would there be any efficacy in Christian prayer, any benefit in the use of the Sacrament, or any sense in a profession of religion? Are not the children of God "partakers of the divine nature?" Does not the same *Spirit* of Him that raised up Jesus from the dead dwell in those who have been begotten again to a lively hope? and does not that Spirit bear witness with the spirit of the begotten in confirming the same glorious truth of adoption? Has not the true disciple the *mind* of Christ? Does not the Good Shepherd give His sheep the same eternal life which is fontally in Himself? Does not the objective "*faith* of the Son of God" become subjectively the faith of the individual believer? Are the aforementioned "nature," "spirit," "mind," "life," and "faith," mere motions of being? or are they terms expressive of real entitative being? Is not faith the very substance of things hoped for, and the supernatural force-element which draws the soul to God? Does not this force-element in its positive operations neutralize and overcome that abnormal gravitational force of carnality which, in this life, adheres to the Christian in a limited degree? Is not this counter-pulling the real cause of the moral conflict in the history of the world, as well as in the history and experience of each individual Christian? Is not this what Paul meant when he spake of two laws at war in his members? Yes; emphatically yes; and that great apostolic thinker saw no hope of deliverance, except in the substance of things hoped for. So far as its principles entered into the constitution of the Christian religion, Paul taught the Substantial Philosophy. If he were on earth to-day, he would laugh the wave-theory out of countenance, and brand the high priest of materialism as a whited wall. His writings give no encouragement to the molecular theories of the age. He never gloried in the exclusive subjectivism of the Gospel. He believed himself filled, surrounded, overshadowed and uplifted with substantial realities and forces. Refusing "old wives' fables," and looking forward in search of a more enduring substance, he clearly foresaw that the last drama of the world would be a splendid illustration of the principles taught by its wisest Christian philosophers.

"The Lord himself shall descend from heaven . . . and the dead in Christ shall rise first: Then we which are alive and remain shall be caught up together with them to meet the Lord in the air." That will be a grand practical demonstration of this force element, and an overwhelming proof that The Substantial Philosophy is the philosophy of heaven. The saints will give their unanimous approval by a rising vote; and the advocates of the wave-theory will possibly continue to express their dissent by moving in the other direction.

THE ALL-INTERPRETER.

BY DR. C. H. BALSBAUGH.

We are expressly told in Matt. i. 21, that the name of Jesus indicates His office. He is so called, "*for He shall save His people from their sins.*" Sin is transgression of law, and for man law is embodied in matter. In Genesis ii. 16, 17, we see how the material and immaterial are woven together, and how all human sin is connected with a perversion of nature. The Divine voice of injunction and reproof issues from the things in which lies the test of human fealty. Gen. 8. 8-11. God has many ways of speaking and revealing Himself, but we are dull of hearing, and having eyes we see not. It is very clear from Rom. i. 19, 20, and the parabolic teachings of Jesus, that one of the objects of such stupendous and magnificent creations of matter was to teach finite minds the "eternal power and Godhead" of the Creator. Nature is a vast text-book, and God has crowded every page with lessons of infinite moment; but man has turned nature into a great scheme of self-interest, so that few can see anything in it but a gigantic, many-wheeled, self-lubricated machine to make money and gratify the senses. Jesus looked upon nature with a Divine eye, read in it the grandest lessons of spiritual wisdom, and used it for but one purpose. Bread was to Him more than bread, and water more than water. Eating and drinking were to Him profounder spiritual realities than physical. His great surprise parties, when He repeatedly fed thousands out of His creative fullness, were Gospel expositions on the low plane of carnal capacity. Jesus never partook of a mouthful of food simply to allay His hunger. He never preached to others what He did not exemplify Himself. With Him the satisfaction of hunger was secondary. John iv. 81-84. To Him the sun was the symbol of Infinite grace and of His Incarnate Mission. John i. 4, 9, and 1 John i. 5, 7. The air which we all constantly breathe is a teacher of the deepest mystery that can take place in the human soul. John iii. 8. God has so arranged nature that we cannot draw even a single breath without occasion of being reminded of sin and the necessity of regeneration, born again by that Spirit which our common breath emblemizes. One of the great ends of Christ's Incarnation and Mission was to spiritualize nature for us. A lily has a Gospel to preach which will not be exhausted through all eternity. Christ made science a vehicle of revelation forever when He said, "Consider the lilies, how they grow." Do we *consider* them? Can we tell how they grow? The glorious lesson must be learned somehow, or Heaven be missed. The law of the lily is the law of "growth in grace, and in the knowledge of our Lord and Saviour Jesus Christ." Jesus,

the carpenter, knew science better than John Tyndall and Ernst Haeckel, and He declared it as the demonstration and mouthpiece of the Eternal and Omnipotent God. The Nazarene Peasant is as historical a personage as Haeckel, and Divinity can no more be wrested from the facts of His life than the silly doctrine of "Spontaneous Generation" from the history of Haeckel. Jesus was the inconceivable impossibility of a living Godhead, or all atheistic scientists are the veriest blockheads. The world is full of God, all worlds. The universe is the expression of the Divine fullness. God is light, let there be light, and light was. This is a sample of all the rest. We cannot turn our gaze anywhere without seeing the finger-prints of Jehovah. No one can measure space, and just as little bound the Divine Omnipresence. They are co-extensive. And Jesus is "the express Image of His Person." He is not only an eternally living God, but an all-filling God. There is just enough Pantheism in the Divine economy to prevent a breach of the vital bond between the I AM and the universe. This was the Psalmist's conviction. Ps. cxxxix. 1-18. This is the right faith and feeling. David was so deep in the mind of God, so "after the heart of God," that his consciousness led him to personate Immanuel. Ps. xxii. 1; Matt. xxvii. 46; Acts ii. 25, 26, 27. This is what God seeks to accomplish in us all, Tyndall, Huxley, Haeckel, and their large skeptical brotherhood included. The same Holy Ghost that generated and developed Jesus, must also fashion the Christian. We are all sinners in an organic sense, because the first Adam is our father, and we can be saints only by a Divine blending with the second Adam. Mystery, of course, but where is it not? Immanuel was here, proved Himself God, and this is His doctrine: "Ye must be born again—born of God." This is fundamental, and to gainsay this is to make God a liar, and this is precisely what irreligious scientists and their religious abettors are doing. A gospel all dirt is an insane absurdity. God needs dirt, or it would not be in existence, but dirt and God are not synonyms. The bodies that are wrapped round our souls are as material as the dirt beneath our feet. God made the dirt, and out of dirt made the physical constitution of man, and then became man Himself. In Christ Jesus matter serves a high and holy use. Here are radical and solemn lessons which we are "slow of heart" in learning. Keeping this great truth in our minds, we get a profound and clear insight into the meaning of Paul in 1 Cor. x. 31. God took matter into eternal wedlock with His Divinity, in the person of Jesus Christ, and has thus touched and sanctified all our relations with matter. The Word is God, and by Him all things were originated—not by extraneous manipulation, but out of His plenary being—and so it need not seem very strange that He took it back again in the Incarnation. He was a carpenter, and swung the ax and shoved the plane and saw with hands that were moved by the life of God. This is the true idea of a Christian. Every step we take, every inch and atom of ground on which we tread, and all else we do, must be done on principles and in relations to God and nature and our fellows which were hallowed by the life of Immanuel. "To me to live is Christ," and Christ is God manifest in the flesh. This is the supreme end of the Divine enfleshing—that Christ might be "the first-born among many brethren." Temples of the Holy

Ghost, miniature Immanuels, God-born, eternal sharers of the Divine nature and beatitude and glory, this is the grand outcome of the Divine economy as revealed in the Christ. The God-Man the first-born, His elect the after-born, formed in the same matrix, generated by the same Father, filled and thrilled and Christed by the same Spirit. Jesus is Alpha and Omega, the All-sustainer, the All-interpret—forever.

UNION DEPOSIT, Pa.

"THE NEW ATTEMPT" CRITICISED.

BY ROBERT WALTER, M. D.

We believe Judge Lanphere's "New Attempt to Solve an Old Problem," in the August MICROCOSM, is worthy of severer criticism than we shall give it. Evidently an attempt to reconcile a false theology with common sense, it strives to justify to the human mind conduct on the part of the Creator which, if exhibited, would be wholly inconsistent with the first principles of justice, as the human soul in its best estate conceives them. We advise the judge either to recast his theology or cease to promulgate it. Let the reader judge as to the justice of our criticism. He says: "As the basis of my argument, I assume the freedom of the will, and such freedom implies that every man makes his own state or condition of mind." Who can doubt that this statement, "a basis for argument" though it be, is opposed not only to the facts of observation, the teachings of science, and deductions of philosophy, but to the express declarations of the Scriptures themselves, which one might suppose the judge is attempting to explain? How clouded must be the intellect who can assert "that every man makes his own state or condition of mind." As well affirm that every man is consulted beforehand when and how he shall be born, under what circumstances he shall be reared, and what shall be the influences of his education. The legitimate consequence of this theory is that the progeny of the opium-eating Chinaman, degraded to the lowest depths by poverty and sin, saturated to the very center of being with a poison which unnerves, so as to necessitate an inherited morbid craving for repeated indulgence; in addition, the victim of unenlightened heathenism, rendered incapable of original thought by centuries of Chinese conservatism, starts in life with opportunities the equal of the highest product of Christian civilization, including not only the benefits which naturally accrue from obedience, as these are transmitted from father to son, but including also the advantages of education, the opportunities for social life, the development which necessarily follows the spirit of investigation, of study and application, which is the distinguishing feature of western Christian civilization. The judge must have had little experience in Christian or social life if he is able to lay his hand upon his conscience and affirm that *he always thinks, acts, and feels as he pleases*, and therefore that anger, covetousness, rivalry, uncharitableness, etc., never enter his soul. As well might he undertake, by an effort of the will, to cause his heart to cease its beating, his lungs their breathing, or his stomach to indicate hunger, as to assert that he can, of his own will, enjoy the highest degree of serenity and peace amid the clashing of warring ele-

ments, physical, mental or moral. Is he so imperturbable that he could without wincing experience the destruction of his family, the loss of friends and property, and social position; and if not how does he make "his own condition of mind?" Though upon the mighty ocean in a frail craft, the waves running mountain high, the storm gathering in blackness and howling in fierceness, and God's thunderbolts flashing athwart the sky, he would still, by an effort of the will, maintain a calm serenity, and await without fear or tremor the end of all things earthly. He can read the tales of shipwreck, of burning cities, of famine and pestilence, and be unmoved, and even when the last trumpet shall sound, and he finds himself to be "the last" who sought to "be first," he will still remain equal to his necessities, independent of his circumstances, defiant of his conditions, the very representative of that free will which is above and beyond even the Almighty Himself. When the attempt to reconcile prevailing theological notions with supreme justice and love, necessitates such blinding and torpidity of intellectual and moral consciousness as this, it were well that a Paul should come again to give us a little true theology.

But your contributor expresses himself more fully when he affirms "that man is free, is master of himself and of his ultimate destiny;" and he says this notwithstanding he assumes to discuss his subject "not as a Christian but as a theist." We shall not further waste time in discussing the subject from the facts of observation; but desire to direct the reader's attention to the testimony of Holy Writ. The judge has surely not forgotten that the sins "of the fathers are sometimes visited upon the children unto the third and fourth generation." Will he therefore explain how a man can be free, "master of himself and of his ultimate destiny," at the same time that he is the victim of a terrible burden imposed upon him by the terms of his being and without his consent? The very terms of his begetting are parts of his environment—"born in sin and shapen in iniquity"—is a better theology than that which the judge promulgates. Man can no more lift himself out of his degraded condition and become rich in intellect, sublime in thought, or keen of moral sense, than he can heget himself, or lift himself into higher altitudes by tugging at the straps of his boots,—or than the Ethiopian can change his skin, or the leopard his spots. But perhaps the truth thundered from Mount Sinai, and which still reverberates adown the halls of time, losing nothing in power or significance by its antiquity or distance, is unacceptable. Let us then refer to later times when one of the grandest characters that the world has ever produced, inspired from the heart of Omnipotence itself, makes the declaration which is confirmed by universally present and everywhere conclusive evidence, "that the carnal mind is enmity against God, is not subject to the law of God, *neither, indeed, can be.*" Man can no more cease to sin, than the cripple can heal himself, the blind can recover his own sight, or the dwarf expand into a giant. Function depends upon organization, and the quality of the function corresponds to the quality of the organization, and until man can make himself over again into a new character, he cannot cease to represent the characteristics of human life, as these are universal and invariable.

"Ye must be born again" is a truism, which reason, philosophy, and common sense but serve to confirm. Both science and common sense affirm that universality is the evidence of necessity. Death is universal, and therefore cannot be avoided.

Sin is equally universal, and death results from sin. "So death passed upon all men because that all have sinned." To say that man can cease to sin by virtue of power in himself is to deny a universal fact, sustained by the express declarations of God's Word. If he cannot cease to sin then he *is not free*, but is the *slave* of sin, "for we know that the law is spiritual; but I am carnal, sold under sin. For that which I do I allow not; for what I would that do I not; but what I hate, that do I." Rom. vii. 14 and 15. If man is sold under sin, how can he be a free man? If he is a free man, whence the need of a savior? Man is dead in sin; if dead how can he be a living free agent? Dead people do not control their activities. Man does as he can, not as he would; and God deals with him as a helpless creature incapable of the least act of good in himself.

The judge further says, "circumstances and inherited qualities exert a great influence over him, but not a controlling one." Will the judge please tell us what there is in man besides "inherited qualities?" If he can suggest some other source whereby man attains his organization, constitutional tendencies, peculiarities, than inheritance through parentage, we would like to hear him express himself. If "circumstances and inherited qualities" do not exert a controlling influence on man, what in the name of reason does control? If I am not what I am, then I must be what I am not, and if I do not according to my inherited qualities, then effects do not follow causes, actions do not depend upon organization, something comes out of nothing, science is a myth, and revelation a distortion of truth.

Again, "neither God nor man without the consent of the individual can enslave the mind." What a mistake! Man has before now scared his brother into lunacy, and God deals with all men just as He pleases, and the judge's articles would enslave the mind if they had force enough, just as many other forms of false doctrine have done it, *volens volens*. Is it possible that one conversant with the facts of life, having some conception of scientific principles, with an open Bible before him, can put forth such an erroneous doctrine as this?

To close we will simply commend the reader to the first chapter of Paul's Epistle to the Ephesians, in which he asserts that we are "predestinated according to the purpose of Him who worketh *all things after the counsel of His own will.*" God consults the interests of the universe, of the truth, and of Himself without asking when or how we shall be born, what the circumstances under which we shall be reared, or what the opportunities for education we shall have. God has done the work and accepted the responsibility, "having made known unto us the mystery of His will, according to His good pleasure which He hath purposed in Himself: that in the dispensation of the fullness of times He might gather together in one all things in Christ, both which are in heaven and which are on earth."

We believe that a clear apprehension of this subject would lead us to exclaim with Paul: "Oh, the depths of the riches both of the wisdom and goodness of God." But in the light of doc-

trines such as we are here criticising, Paul's enthusiasm falls dead. We stand by the Apostle Paul; believe in his theology, and strive to practise his precepts; and correspondingly we abjure the teachings of all who would make the Word of God of none effect by either their traditions or their philosophy.

EVOLUTION; OR, NATURE'S SYSTEM OF PROGRESSIVE CHANGES.—No. 2.

BY ISAAC HOFFER, ESQ.

The progressive changes under the mental force of man have a much wider and more extended range than under chemical and vital forces. The march of mental energy extends into every field in which the forces of nature have ever operated. There is not a feature in the whole earth or in its physical conditions; not a mineral, a plant, or animal into which mental energy has not extended its search. Not only to know the thing itself, but the cause and manner of its production, its nature and characteristics, and the purposes for which it could be used. It takes in its field of operation not only the whole of the material world, the universe, the stars and the heavens, the past, the present and the future, but it takes in the realms of the invisible, intangible, and immaterial. All the progressive changes now taking place in the surface appearance of the earth, in mineral manipulations, and in vegetable and animal productions are under the production and control of mental force. It continually changes and transforms the works of nature and brings about new orders of things, and assumes control of matter and life, and of the forces of nature, and makes them its subservient agencies. But its grand progressive, unmeasured and immeasurable march is in the sphere of intellectual development, which extends beyond and transcends all physical possibilities. There is no line of action within the reach of mental comprehension in which intellectual development is not advancing. Knowledge is gathered in millions of directions by millions of minds, and the aggregate daily advance is inconceivably great; and yet the prospective intellectual development in the sphere beyond all physical possibilities is still infinitely greater, if the past history of progressive changes furnishes any data for future calculations.

If this brief outlining of the history of progressive changes is correct, it will be seen that at each transition point a new force was introduced. Before and during the first transition period we can conceive of only two forces, repulsion and attraction, that could have been at work; but as matter became aggregated, and consolidation commenced, chemical force was introduced, and commenced the forming of mineral combinations and crystallizations. The opposing actions of the two former forces were a necessity for the action of the latter; for affinity and crystallization have no effect on fixed matter, either in a diffused or solid state, and can only operate when matter is in the process of aggregation and consolidation either from a state of fusion or solution. It was therefore the favorable conditions brought about by the actions of repulsion and attraction that admitted the introduction and the action of chemical force.

The immediate cause of varying and increasing mineral combinations and crystallizations—the cause of progressive changes in the chemical

period—was not alone in the operating force nor in the constituents of matter, but in both. The sixty-odd elementary constituents of matter admit of a countless variety of differently proportioned combinations; but certain elements of matter can be combined only with certain other elements, and then only in fixed proportions, and the important question here arises: What draws the line between combining and non-combining materials, and what marks off the proper proportions? Force being the moving, shaping and controlling power, evidently selects the material and measures the proportions required for the combination, and characterizes the production. Chemical combinations frequently produce a complete transformation of the characteristics of constituents, so that the combination is entirely different from either of the parts; and this change must be due to the combining force, for matter has no power to change its position or its character. But susceptibility in matter has its limits, beyond which forces do not, or cannot go. This, however, is only a negative effect, and has nothing whatever to do with positive results, except in the limitation of action, and even this limitation is at least as much in the force as in the matter.

The limit of progressive changes in mineral formations would seem to be the number of combinations that chemical force can make out of the sixty-odd elements of matter; but whether this limit was ever reached cannot be determined, because a third and important factor is necessary in all mineral combinations, as already stated: namely, proper conditions.

These conditions are wholly beyond the control of chemical or vital forces, and while conditions have no power or control over matter or forces, and are themselves only an effect, yet nearly all actions in nature are dependent upon them.

The necessary conditions determined the period of predominant chemical actions, they made possible the introduction of vital forces, and opened the sphere for the display of life. Life could not exist where different elements of matter, while in the process of consolidation from fusion, were being formed into mineral combinations; but as the conditions changed through the cooling of the earth, and became unfavorable for chemical actions, and favorable for vital actions, the transfer of progressive energy from chemical force to vital forces became a necessity. It is evident that in the first period the temperature of the earth alone determined the conditions that were favorable or unfavorable to the formation and crystallization of minerals; but afterward minerals were formed from matter held in solution by water where the conditions were not solely determined by great heat; and as both temperature and conditions are only effects, we must look for the agencies that cause these effects. As different states of matter are dependent mainly on temperature, heat must be the direct controlling cause of those states; but as heat is supposed to be only a mode of action, there must be some acting energy which operates through that mode.

What is the mode of action that produces heat? We know of none except such as produce *friction and pressure*, either among particles or masses of matter. The interactions or opposing actions in matter, by repulsion and attraction, would produce friction and pressure. The general movements of the atmosphere, of

water, and of matter—the aerial, aqueous, and igneous actions—and all the effects of such movements are either directly or indirectly caused by these two forces, and their operations are sufficient to account for all the general changes in the conditions of everything that exists. The mountains of the earth, and the basins of the seas, all the movements of water, and actions in the air, all the general separating and aggregating changes in matter, and changes of temperature are caused directly or indirectly by the actions of these two forces. All the actions of chemical and vital forces are not only dependent upon the conditions produced by these forces, but the material is suitably prepared and supplied by the same general modes of action; so that these two universal forces are the conditioning agencies and the great motive powers in all the operations of nature, in the material world, and we might say in most operations of man. All the water-power, steam-power, magnetic and electric, and explosive powers, are the effects and results of repelling or attracting actions, or both. Even physical and animal energy are supplied and sustained by the same mode of action. These two forces are not only the great motive powers in the operations of nature, but they are the foundation forces and furnish the fundamental modes of action for all other forces except mental force.

Heat, in its various degrees, is a most important factor in all the operations of nature, and its great source at the present time seems to be the sun. Recent investigations, through improved appliances, show that the sun is in matter in an intensely agitated condition. The rays of light that come to the earth are not hot in themselves, which is evidenced by the fact that the highest mountains, even in the warmest latitudes, are continually covered with snow; but the rays as they pass through the denser atmosphere, into the lower valleys, and there strike the earth, produce heat by friction and pressure among the molecules. Hence it is not the heat thrown out by the sun and extended to the earth and imparted to it by contact, but its reproduction on the meeting of the rays with the matter of the earth.

These rays, it appears to me, must be the moving, agitating force in the sun, and not the mere effect of such agitation; and when they meet the matter of the earth, they cause heat-producing action, the same as in the sun, only in an inexpressibly less degree. This heat produced on the earth is in proportion to the number of rays in a given space, to the direction, and to the resistance met; that is, the concentration of dispelling energy, and the amount of resisting matter in a position to be affected by the energy, determines the degree of heat.

The heat of the earth, not caused by the rays of the sun, is undoubtedly governed by the same laws, and any change in the preponderance of repelling or attracting action, in matter equally affected by both, would produce a corresponding change in the degrees of temperature; assuming the point of greatest heat to be where the opposing action of the two forces would be nearest balanced.

It is generally supposed that plant life is the great storing agency of the heat-producing energy of the sun, and while this may possibly be true in one sense, the more probable and direct cause of the combustible nature of vegetable productions is found in the fact that gaseous substances are combined with other substances,

and converted into a solid and entirely abnormal state; and the theory of latent heat, while true apparently, is not true in reality. The example of dissolving "quick-lime" by water, generally relied on to prove the existence of latent heat, only proves that the rapid disintegrating action—the quick destruction of the solid combination—effected by the dissolving action of water, produces the heat.

A rapid disintegrating action such as takes place in the burning of wood, coal, or other combustible material, must of necessity cause friction; for the molecules, or minute particles held in combination cannot be broken up, torn from each other, and converted into a gaseous state without a crushing action, in which there must be both friction and pressure. Many combustible materials are compound combinations of volatile substances, held together in a more or less solid and entirely abnormal state, and in such an unstable condition that but a spark is needed to start the dissolution; which goes on with more or less rapidity, according to the character of the combination and the surrounding conditions. In nitro-glycerine a jar will start the dissolution, and the change will be a total destruction of the combination, and an instantaneous transformation from the solid to a gaseous state. The mode of action which produces heat is in all cases the same, however much the starting causes of the actions may differ. There must be motion and resistance to motion, or actions and counteractions, such as produce friction and pressure, and such as result from the opposing actions of repulsion and attraction, or else there can be no heat generated.

While attraction, and chemical and vital forces are constructive in their direct actions, the effects of their indirect actions are often the reverse. Water drawn by attraction from the clouds to the earth, and from the elevated regions to the lower levels, while in itself a direct integrating action, by its dissolving and erosive effects, has been the great agency of dissolution and redistribution of matter. Chemical dissolution is a fact as well known as chemical combination; and the destruction of organisms to sustain life is universal. Repulsion is a general and universal destructive force. Heat, light, electricity and other destructive and moving effects are mainly caused by the actions of this force; and yet, its actions are an absolute necessity for the operations of chemical and vital forces. These four forces seem to have been the only agencies employed in all the changes that have ever taken place in nature; but the direct and indirect actions, and the counteractions and interactions of these forces are so varied in themselves, so complicated in their effects, and so wonderfully different in their results, that this brief explanation, which was deemed necessary to the further consideration of nature's system of progressive changes, touches only a few of the leading points, and merely outlines the views entertained on these points.

IS THE PHILOSOPHY OF SUBSTANTIALISM TRUE?

BY REV. F. HAMLIN.

That remarkable man, Henry Drummond, F.R.S.E., F.G.S., who published numerous books, and took a deep interest in religious subjects, has, in his great work entitled "Natural

Law in the Spiritual World," not only made a valuable contribution to scientific-religious literature, but the foundation upon which he rears his whole beautiful superstructure of unanswerable argument is the very theory of Substantialism advocated to-day by Wilford Hall.

Referring to an argument presented in the "Unseen Universe," Drummond says: "The conclusion of that work remains still unassailed, that *the visible universe has been developed from the unseen.*" And he further adds: "Apart from the general proof from the law of continuity, the more special grounds for such a conclusion are, first, the fact insisted upon by Herschel and Clerk Maxwell that the atoms of which the visible universe is built up bear distinct marks of being *manufactured articles*; and, secondly, the origin in time of the visible universe is implied from known facts with regard to the dissipation of energy. With gradual aggregation of mass the energy of the universe has been slowly disappearing, and this loss of energy must go on until none remains. And as that which has its end in time cannot be infinite, it must also have had a beginning in time. Hence the unseen existed before the seen." Thus the priority of existence of the unseen, as well as the "marks of being manufactured articles" which appear everywhere in the matter of the universe, both favor the origin of matter from the unseen, rather than its "creation out of nothing."

Speaking of the effect of environment on condition, he says: "The Spiritual Faculties are organized in the spiritual protoplasm of the soul, just as other faculties are organized in the protoplasm of the body. The plant is made of materials which have once been inorganic. An organic principle not belonging to their kingdom lays hold of them and elaborates them until they have correspondence with the kingdom to which the organizing principle belonged. Their original organizing principle, if it can be called by that name, was Crystallization; so that we have now a *distinctly foreign power, organizing in totally new and higher directions.* So in the spiritual world, we find an organizing principle at work among the materials of the organic kingdom, performing a further miracle, but not a different kind of miracle, producing organizations of a novel kind, but not by a novel method." Here we see how beautiful and perfect is the harmony of Divine method in the natural and spiritual world, if we presuppose the soul to be a *substantial yet real entity.* Indeed, only as Christianity adheres to the doctrine of Substantialism in all its details, as set forth by the Editor of THE MICROCOSM, can she expect bravely to meet and immediately to overthrow all her enemies. The world moves, and ere long Dr. Thomas Young's statement that "there is nothing in the unprejudiced study of physical philosophy that can induce us to doubt the existence of immaterial substances" will find a place in the creed of all clear thinkers, and then the Vogts, the Haeckels, and the Buchners will "go to their own place."

PEEKSKILL, N. Y.

PROBABLE ETERNITY OF MATTER.

BY REV. H. H. BALLARD.

Can we go back to where no matter was,
And nothing but an empty universe
With nothing filled, and find an idle God,
With nothing else to do than be? Unknown

To any but Himself? Why need He then Have been? And what relation did He then Sustain? Did not duration then exist? And space? If not duration, how did God Exist, and not continue? And if space Was not, then where did God reside? If He Existed and continued not, then He Did not exist at all. And if He lived Nowhere, then He existed not.

And did He make Himself? He acted then before He did exist! Self-creation will not Do. For nothing then might act, and thus at Any time create another God! And If *nothing* could create a God, what could It not create?

No more could matter make Itself than God. The sun could never shine, And light forever non-existent been.

Go back and see, if see you can, without One spark of light, or visual orb in all The universe, this boundless realm of naught, Spread out in vast infinitude's domain, And tell me why there was no matter then. And if a past eternity elapsed Before creation's work began, then why Did God so long remain alone, with all His shining attributes so deeply hid? What purpose answered then the universe?

And tell me, furthermore, if matter did Beginning have, then must it not have end? Is attribute eternal stamped on that Which did begin? And shall the same dark blank, As at the first they tell us did exist, Hereafter be? Eternity again Containing nothing but an unknown God?

Come, biggest dunce of nature, atheist By name, and let me tell you how it was. There always had to be a God: therefore There always was. And matter always should Have been, with gravitation's bracing ribs, That space itself might not collapse; and that Duration might divided be in parts, And not all be an everlasting now, With neither past nor future in its course.

God needed matter, too; on which to write His name, and show His pow'r. Again we say, That matter should have been, and therefore was. Perhaps, eternal.

ELLSWORTH, III.

[Remarks: All Mr. Ballard needed was the Substantial Philosophy to help him out of the trouble his profound thoughtfulness led him into. As we are forced to assume the existence of something self-existent and without beginning, absolutely inexplicable and even unthinkable,—God,—why not let this single and simple infinite mystery and unthinkable embrace and contain enough from, and out of which to create the universe, as we elaborately argued in reply to President Clark Braden in the *Christian Quarterly Review* as copied in the January MICROCOSM, volume 3? The substantial, immaterial elements of Nature, such as Electricity, Gravity, Heat, Light, etc., or the universal force-element from which all the various manifestations of natural force came, might rationally be assumed to have eternally constituted the exterior nature or

body, so to speak, of the One Only Self-Existent I AM, and out of which, rather than out of *nothing*, He made *matter* and all material and immaterial entities. This forms a basis of conceivability, even though beyond our comprehension, as is everything connected with the infinite. This we have incidentally added as a part of the Substantial Philosophy, seeing no rational ground for opposing such a satisfying conception. If others, however, possess a faith sufficiently stalwart to believe in the possible creation of something out of nothing, we surely have no quarrel with such, since Substantialism proper contains enough for every essential want of man, even should that article of its faith be eliminated.—EDITOR.]

SPECIMEN LETTERS FROM THE CLERGY.

[We could print scores of letters from ministers similar to the ones we here copy, but we have room only for a mere sample. Rev. Dr. Crouse says:]

TIFFIN, OHIO, Aug. 25, 1884.

A. WILFORD HALL, PH. D.,

28 Park Row, New York:

MY DEAR BRO.,—After reading the *Problem of Human Life* and *THE MICROCOSM* for about three years, and both with great advantage and profound pleasure, I am prepared to give the *Substantial Philosophy* my hearty and unqualified indorsement. I feel that duty and gratitude alike compel me to acknowledge that I have received more helpful benefit from these invaluable works than from all my other reading, except the Bible, and even that has become fresher, clearer, and more intelligible than it ever was to me before.

I have felt for some time past that I must curtail my reading matter of a general character, and in looking over it all, I have asked myself the question, Can I spare *THE MICROCOSM*? and the response came as if from the very marrow of my bones, No, not that.

But your article in the August number, "The Substantial Philosophy—its general formula and grounds of belief" has put the idea of dropping *THE MICROCOSM* entirely out of sight.

I want to say to you, God bless you, for I am sure that He has raised you up for a time like this.

Find within the money to pay for the fourth volume.

Very truly yours for the cause,

J. CROUSE.

The Rev. Robert C. Wall, Rector of St. Jude's Church, Tiskilwa, Ill., closes a long letter in review of the *Problem of Human Life*, and *THE MICROCOSM*, in these words:

The wave-theory of sound, as a mode of motion in physical science, has been crushed to atoms by the well-directed blows of the Substantial Philosophy. This now stands on record as an indisputable fact of science. You have opened the eyes of all thinking men to one other beautiful thought, namely, that this new philosophy is of God, and that you have only been the means of uncovering its beauties. As an eminent artist said once while standing on a block of marble—"I will uncover this image." The beautiful statue existed in all its perfection before the covering was removed. So you have simply removed the obscuring veil of false science from this divine system of philosophy, which exposes the true image of God. The Bible is full of Substan-

tialism as a spiritual philosophy which your valuable researches have shown to extend also into the realm of physical science. It is blended with the whole record of the Incarnation as it mysteriously unfolds the inaccessible chambers of the Deity. This image of the invisible God—this one *substance* with the Father—is what the Substantialism of the Bible rationally teaches, as so clearly confirmed by the New Philosophy. With many prayers for the prolongation of your life and health that you may continue your arduous and useful labors, I am faithfully and fraternally yours,

ROBT. C. WALL.

The Rev. A. McIntyre, of Long Ridge, Conn., writes:

DR. A. WILFORD HALL,—I scarcely know how to express my thankfulness for your kindness in sending me the August number of *THE MICROCOSM*. I had never seen or heard of the magazine before; and I assure you it was a glad surprise to me. I now propose to become acquainted with it. I have read every article carefully, some of them with intense delight. "The Substantial Philosophy—its general formula and grounds of belief"—I have read more than once, some of it several times over, and I propose to study it. It furnishes a substantial foundation for our faith and hope which is *impregnable*, and you can never know what a sense of relief it gave me, as its substantial revelations began to dawn upon my mind—to think that there was a clear, scientific and rational method of escape from the materialistic atheism now flooding the world. Then I re-examined the New Philosophy more leisurely, and as I surveyed its principles I not only saw a way of escape, but I was rejoiced to see that you had successfully wiped out the enemy; and I exclaimed, "How are the mighty fallen, and the weapons of war perished!" I confess that materialistic speculations have bothered me greatly in my ministry, and I had about concluded to ignore them altogether and wait for light. Thank God, your August number has furnished exactly what I needed. The principles of Substantialism have given me all I need or desire. With them I feel strong enough by the Lord's help to storm the citadel of infidelity single-handed and alone. Inclosed find \$2, for the *Problem of Human Life*, and the fourth volume of *MICROCOSM*, according to your special offer.

Most truly and sincerely yours,

A. MCINTYRE.

ANOTHER COLLEGE WHEELS INTO LINE.

[The following letter from Prof. Seitz speaks for itself:]

DR. WILFORD HALL: DEAR SIR,—Inclosed please find \$2 for the renewal of subscription for myself and Prof. W. H. Sutton, both of Spencer, Tenn. We cannot do without *THE MICROCOSM*, though we have carelessly neglected renewing till the present. We received the August number, and I would say I fully agree with you in your theories, and so teach my classes in Burritt College, of this place. I am satisfied you are right, and bid you God speed in the great and good work you are accomplishing.

Most truly yours,

A. T. SEITZ.

BURRITT COLLEGE, SPENCER, TENN.

Sept. 8, 1884.

LIST OF LIFE-SUBSCRIBERS.

We print herewith our complete list of life-subscribers up to date, who have received a certificate to that effect, by purchasing \$15 worth of our books at wholesale price. A few others who are soliciting subscriptions for books in view of sending the \$15, are not yet included in this list.

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IS THE FAITH CURE A DELUSION?

BY MRS. M. S. ORGAN, M. D.

Among the many reasons which retard the welfare and progress of the race, is the tendency, even with educators and professed philanthropists, to promote their inherited beliefs and acquired ideas, without any attempt or desire to weigh objections that may be urged against them;—to require from those who antagonize their opinions or doctrines, weapons to destroy their structures, rather than tools to clear and trim their own.

In the investigation of every question pertaining to the interest of man, the only object sought should be the evolution of absolute truth; no matter how effectually that truth may hew down our prejudices and preconceived opinions,—no matter if it should wrench from the soul every strongly fortified dogma and principle which it has nourished and cherished all its life. A mind that is not thus liberalized and open to conviction, can never attain grand and symmetrical proportions, nor become a strong motor force for moving the masses to higher planes of life.

The question under consideration aptly illustrates the propensity of the human mind to enforce its tenets despite all the facts and principles that may be urged against them. The religionist on the one hand asserting with a dogmatic positiveness, that diseases are cured through faith in Divine power; while on the other hand scientists, with a dogmatism equally positive and stubborn, assert that it is an impossibility,—that the "faith cure" is but an imaginary result, born of a religious fanaticism.

That cures are effected through faith, no one but a prejudiced mind will deny. When a fact so well attested as that of restoration to health through the power of faith, is presented, the honest seeker after truth will not sneer and cavil, nor make absolute denial, but will at once begin to investigate, and try to ascertain what is the true philosophy. Let us then, in the spirit of earnest and impartial inquiry, endeavor to find the rationale of the cure—its *modus operandi*.

In order to ascertain this, we must invoke the aid of science, for no question can be rightly understood without a scientific knowledge of its basic principles. This prejudice against, and opposition to, science, evinces a palpable ignorance of what science really is. Science never conflicts with religion or ethics; it is in reality their handmaiden, shedding light to aid them in evolving truths which help the soul in its upward growth. As defined by its leading exponents, it is simply a higher development of common knowledge. "The science of any subject is the highest and most exact knowledge upon that subject."

Physiological and psychological science demonstrates the intimate and reciprocal relation of mind and body. So intimately blended are they in their action and sympathy, that the most observing philosophers are unable to draw the line of demarcation, as to where the influence of mind leaves off and that of body begins. Many an individual's intellectual capacity is crippled, his moral sense blighted, and his spiritual vision shrouded with darkness through diseased physical conditions; a torpid or congested liver frequently producing these results, and even driving the mind to despair

and insanity; for whatever the character of mind or of that which constitutes the substratum of the sensorial power of the brain, it resides in and acts through this organ, the same as if it were a constituent element of it, and controlled by the same laws, and consequently is subject to all the disturbing influences which affect the brain.

On the other hand, observation has fully shown the fact of the stimulating and controlling power of the mind over the body. Though we use the term reciprocal action, as between mind and body, it is more in accordance with established opinion than with philosophical truth; for the real fact is, mind is the potent, primary and formative power—matter is but the clay in the molding hand of the vital force, and, therefore, the action of body on mind is but a *reflected action*.

The mother, in a fit of anger, may so change the organic powers of the mammary gland, that a deadly poison instead of nourishment, is secreted, and which, if taken by her infant, would cause its death. Many such instances are recorded by physiologists. An agony of fear has, in a few hours, turned the hair gray. A sudden fright has often produced temporary paralysis of the whole muscular system. A transport of grief has often caused death, so also has a transport of joy. An undue stimulation of the emotional nature has produced trance of the body. Intense excitement of the religious faculties has frequently resulted in insanity. And so, we might go on and give illustration after illustration, each furnishing additional proof of the power of mind over the body—quicken the organic functions into normal or physiological action—or by an abnormal intensity of feeling, changing them into pathological action, with its injurious and often fatal results. With these facts and their underlying philosophy before us, we can comprehend how an individual possessing a strong faculty of faith, can, through an active exercise of its power, so stimulate the brain and nerves as to quicken them into a new life, and through them, start all the clogged up machinery of the body into healthful and vigorous action. Not only will the *direct* action of faith accomplish this return to healthful activity of the organic functions, but also the secondary influence induced through the inspiration of hope, is conducive to it; for repose and harmony of mind is absolutely essential for healthful conditions of body.

Until quite recently, mental Hygiene has been—at least practically—almost entirely ignored by the medical profession, whereas it should be the primary consideration; for, as we have seen, mind is the primordial substance, the propelling power, the molder of the material; the body is but the instrument, controlled and directed by the force of the emotions, the mandates of the intellect, the determinate power of the will and moral sense, and instinctive dictates of the propensities. How many individuals would ever recover from acute or chronic diseases, were it not for the strong, positive faith they have in the skill of the physician and the mysterious potency of the drugs he administers? Let the sick once lose faith in the ability of the physician, or the efficacy of his medicines, and they will rapidly decline despite all instinctive efforts of vitality to balance its forces, remove obstructions, and restore normal conditions, and all extrinsic effort to aid the vital force in its remedial struggle.

Acting in conjunction with the power of faith, in effecting a return to health, is the mental and physical magnetism of the minister or other spiritual adviser, who thus unconsciously becomes a physician to the body, as well as spiritual physician and director. Vital and mental magnetism is now a scientifically recognized agent in the restoration of health. Its potential power in curing disease, even the most obstinate and chronic, has been so thoroughly demonstrated, that no one but a bigot will ignore or deny its efficacy. Magnetism and electricity are not confined to the material world; their power and manifestation extend through the vital and mental domain as well. That their effects are not so generally recognized, is simply because scientific investigation has not been turned in this direction to the same extent.

When the focused light of science is brought to bear upon the action and results of vital and mental magnetism and electricity, it will be the death-blow to the claims of spiritualism and mesmerism; what is attributed to the power of spirits and supernatural agency, will be clearly demonstrated to be nothing more than the natural play of forces established by a wise and beneficent Creator in the organic and mental economy. When the underlying principles of life are more fully unfolded, and the laws of vital and mental force, with their reciprocal and conjoint action, understood, all diseases will be understood through the mentality acting on the vital or incorporeal substance of the body. All that is essential for the accomplishing of this result is, a scientific enlightenment as to the legitimate means to be used for bringing these laws and forces into normal, and therefore effective, action. This is not a mere poetical prophecy, or fanciful theory. It is a rational and logical deduction, based upon true scientific data. The latest and most thorough scientific research has given the basic principles for the evolution of the theory, that the human system is a dual organism—that a vital or incorporeal substance permeates every organ, every part, and every atom of the body—that it is in fact the *real* organism—the corporeal or material playing but an accessory part. All the demonstrated facts of biology, pathology, the transmission of mental and physical characteristics, harmonize most completely with this theory, and can be explained by it; it thus stands the test demanded by a true scientific theory, according to the standard fixed by the highest authorities. All the theories heretofore advanced have failed to explain all the phenomena of life or vitality; and therefore they cannot lay claim to science; consequently all the methods and systems of remedial appliance, based upon these theories, must necessarily be erroneous; and, in their practical application, injurious and fatal to health and life.

But because these cures of "faith" are effected through natural laws and through natural means, does not make God any the less the great Physician—the effective Healer. Through His creative power these laws of vital and mental magnetism—of sympathy and reciprocity—are established in the organic economy of the human body, and man has only to bring these laws into harmonious action to accomplish beneficial or normal results. Yet the very power to act—to bring these laws into harmonious accord, is the gift of God; for all gifts are from Him, but they come to us mediately or

through law—never through direct or supernatural interposition.

NEWBURGH, N. Y.

SCIENTIFIC DODGING.

BY CAPT. R. KELSO CARTER.

There are some living men who attempt to defend the wave-theory, besides those whose assumption of sublime indifference has been so rudely shaken in THE MICROCOSM. And then there are those who tell us that they are no advocates of the wave-theory, but that we are all wrong notwithstanding. One of the latter class lately wrote me a letter containing this sentence: "No sane philosopher ever said or dreamed that an air-particle quivers any further or faster than the bell that shakes it." Well, who said that any one ever did? Surely not Dr. Hall nor the writer. But we have said a good deal about another aspect of the case. All the "sane philosophers" that ever wrote upon the subject of sound always said, and always honestly believed, that the "bell that shakes" the air-particles, or the fork or the string, was moving with the greatest swiftness. A Tyndall says, "Imagine the prong of this tuning-fork *swiftly advancing*." He did not say, and did not mean "quickly changing direction," as some of these scientific dodgers would have us believe. No, nothing of the kind. He said "*swiftly advancing*," and he meant just that, and nothing else. He, nor any one else, ever dreamed that the prong was not "*swiftly advancing*," until the "Problem" woke him and the rest of us up to the startling fact; and even then, no one dared imagine what slow motion really is, until Dr. Hall's experiment, extended by the writer, carried the figures down to one inch in two years.

A learned professor has been writing to me, and giving me quotations from Newton, to show that the great philosopher plainly taught that the velocity of the air-particles, adjacent to the vibrating instrument, must be the same as the instrument's rate of motion. For the sake of argument, allow that Newton meant to teach this. All the worse for the wave-theory. For it is perfectly plain that Sir Isaac himself supposed the actual rate of motion of the fork-prong or string to be very rapid; and we know certainly that all the living acousticians of any repute held firmly to this belief five years ago. But the great fact now stands revealed that a fork may sound audibly when moving at the rate of an inch in a year or two. Whereupon some of these artful dodgers come up smiling and say that what all the writers meant was "rapidly changing directions," whenever they said or wrote "*swiftly advancing*." Could any more transparently false or more miserably weak defense be well presented? In the first place, the language of Tyndall *et al* is so absolutely clear as to strangle the defense at the very outset. "Imagine the prong of this tuning-fork *swiftly advancing*," and "it carves or molds the air into condensations and rarefactions," cannot by any possibility be construed to mean anything but the plain sense. Why don't some of the dodgers write to Professor Tyndall and point out to him his grievous failure to understand his own theory and language? In the next place, the great Newton himself plainly says: "*The parts of the tremulous body, alternately going and returning, do in going urge and drive before them*

those parts of the medium that lie nearest, and by that impulse compress and condense them; and in returning suffer those compressed parts to recede again and expand themselves." *Principia*, B. II. prop. 43, case 1.

This says not one word about the motion of the "tremulous body" being thousands of times slower than the hour-hand of a clock. Nor does it give any ground to imagine that Newton ever dreamed of such a thing. Was that great philosopher so utterly lost to common sense and reason as to talk of such an inconceivably slow motion as "urging," "driving before it," and as giving an "impulse" to anything? Perish the thought! If he had ever obtained a glimpse of the truth as to the real velocity of sounding bodies the *Problem of Human Life* would have been anticipated. But he never dreamed of such a thing; nor did any other philosopher previous to the announcement in that book.

But here our dodger emerges once more and declares that it is the "impulse" that swiftly advances, and not the air-particles themselves; and he insists that this is clearly contained in the *Principia*. We will grant that the impulse velocity may be inferred from that great work, but deny the distinction between that and the rate of motion of the air-particles. Without specially insisting on this, we do maintain that Newton supposed this last motion to be swift. And in any case, under any supposition of his meaning, we are confronted by the extraordinary paradox, that no matter how widely the velocities of impartation may differ, the pulse velocity will always be the same. Now let us look at this absurdity a little. We all know that a base-ball struck by a bat, at a velocity of two, will start off about twice as fast as when struck with a velocity of one. But by this "impulse" dodge we must believe that if I strike an atmosphere composed of base-balls with blows delivered at all possible velocities, each will be transmitted clear through this atmosphere at precisely the same rate of speed, that rate to be dependent upon the elasticity of the medium, that is of the base-balls. In other words, the velocity of the blow given to a row of balls or particles has nothing whatever to do with the velocity of the impulse that is caused by that blow. We wish that every "sane philosopher" would coolly consider this pitiable absurdity, and then see if some better defense of the wave-theory cannot be attempted. It is with difficulty that we can seriously attempt to deal with such childish foolishness as this. Gray-haired mathematicians ought to be heartily ashamed of folly so transparently ridiculous. I cannot go into this subject too deeply because I am awaiting the result of the trap set in my last article upon "The Velocity Question," and do not wish to anticipate. I would suggest, however, the trial of an old amusement for boys, viz.: the construction of a "rattlesnake" out of a number of bricks, set on end. Let the "impulse" dodger see whether he cannot notice a difference in the impulse velocity when he knocks the first brick violently against the second, thus sending the second violently against the third, and so on, and when he merely tips it over. I hardly think he will fail to be convinced, without any reference to the *Principia*.

The dodgers have clearly seen that no defense could be made of the wave-theory directly; and, as men always do when sorely beset, they have endeavored to divert atten-

tion to a false issue. Ingeniously enough they have selected the "impulse" velocity as their line of attack, because they have instinctively felt that the velocity of an "impulse" cannot well be measured by actual experiment. Feeling, therefore, tolerably secure on this point, they begin to explain that no air particle was ever supposed to move faster than the generating instrument, but that the "impulse" is handed over from particle to particle with a rapidity exactly equal to 1,120 feet a second. And this, they claim, has been clearly taught by wave-theorists from the very beginning. Now this defense is ingenious, because it is undoubtedly true that an impulse may be handed over through a string of balls at a rate exceeding that of the original blow; but these gentlemen have entirely overlooked one or two most terribly fatal facts. These facts I propose to bring out with force enough to annihilate the specious plea of the pseudo wave-theorist. Do not feel too secure, gentlemen. The actual velocity of an "impulse" shall be accurately measured, and the fog of theory be dispelled by the light of facts. Meanwhile we leave before the readers of *THE MICROCOSM* the absurd dilemma of the dodgers, whereby they are compelled to believe that a blow of one pound upon a piston will transmit an "impulse" through a long tube in the same time as a blow of one hundred pounds. If this be not true, then the last rickety support gives way at once beneath the struggling wave-theorists. More anon.

PA. MIL. ACAD., CHESTER.

A DEFENSE.

BY M. B. SHUPE, M. D.

DEAR EDITOR,—Being a reader of *THE MICROCOSM*, I ask the privilege of replying through its columns to an article ("Is Medicine a Science?") written by D. D. Swindall, D. D., M. D., and published in the July number of your journal.

In the consideration of the above-named subject, the gentleman places much stress on the term "Allopathy," and loses sight of the fact that no class of practitioners do, or ever did, claim to be members of an allopathic school, as the term was created by homeopathsists to distinguish other systems of medical practice from their own. Hahnemann gave to his own system the name of "Homeopathy," derived from the Greek *omoion*, like or similar, and *pathos*, disease; and to other systems the name of allopathy, from *allon*, other or different, and *pathos*, disease. Hence we see the term "allopathy" was used by the homeopathsists to distinguish a class of individuals who never acknowledged themselves as belonging to such a school of medicine.

Not regarding an allopathic system of medicine, I will not discuss "The Allopathic Law of Therapeutics," as given by Dr. Swindall, but will notice the quotations given in his article from Professors Wood and Dunglison. The gentleman quotes from Wood as follows: "If we can produce a new disease in the exact position of the one that may be existing, we may possibly supersede the latter; and if the new disease subside without injury, we cure our patient." Looking over the quotation and turning to page 55 v. 1, referred to in G. B. Wood's *Therapeutics*, I find it given thus: "If, therefore, we can produce a new disease,

or new mode of abnormal action, in the exact position of the one that may be existing or expected, we may possibly supersede the latter; and if the new disorder subside spontaneously without injury, we cure our patient." It is only necessary to say that Professor Wood in writing the above article was discussing the "Supersession of Disease" as a therapeutic process in dealing with diseases not having a definite course to run. The pathological law that two morbid impressions cannot exist in the whole system, or in any one part of it at the same time, is almost as universal as the philosophical law that two bodies cannot occupy the same space at the same time. The preceding fact is well illustrated by Prof. Wood in the cases of intermittent diseases cured by quinine and arsenic, in which he affirms, and many others will corroborate his affirmation, that the above-named medicines establish their own morbid impressions in the absence of the paroxysm; and the system being thus occupied at the moment when the disease was to return, is incapable of admitting it. However, this abnormal action produced by the medical agents will approach nearer and nearer the health line, until the system resumes its natural functions.

In order to save writing at length, I will not notice the selection from Dunglison, which is in character that of Wood, and would say that Dunglison was an author of about thirty years ago, and no doubt held ideas that would not be indorsed by the practitioners of "The Regular System of Medicine" at present, as this system has not been on the stand-still for these past thirty years, but has ascended in the scale of medical knowledge sufficiently far to be marked by vast strides of success.

Noticing next in order, the accusation made by Dr. Swindall against *poisons* and *narcotics* suggests calomel as a typical element of the former, and opium, or its alkaloid, morphia, as a representative of the latter. He quotes as a definition of poison, "that which, when applied externally, or taken into the human body, uniformly effects such a derangement in the animal economy as to produce disease." Now, according to the definition just quoted, almost any substance can be so injudiciously handled as to "effect such a derangement in the animal economy as to produce disease." Take, for example, flour. It is a well-known fact that men working in flouring mills for a considerable space of time acquire pulmonary as well as other diseases, due to the inhalation of flour, particles of burr, too, in the form of dust. So, too, can "sulphuric acid, carbolic acid gas, calomel and opium" be handled by unskilled physicians so that no therapeutic application is made of them, but the reverse; given when contra-indicated, positive harm must and will result from these agents as well as from the flour referred to. If the above-named medical agents be handled by practitioners who cannot discern indications for them, and apply them at an improper time and in too large quantities, they then cease to be a medicine and become a poison. Prof. Harrison, in giving the effects of calomel, gave the effects of calomel poison and not the medical effects. We notice the symptoms quoted by him, in cases where men have been exposed to the effects of the substance for a long time and in great quantities, as in the manufacturing establishments where the drug is manufactured, just as the men referred to in the flouring mill. But inhaling flour into the system,

day in and day out, is not the nutritive application of flour; impregnating the system with calomel, when there is no indication for it, day in and day out, is not the therapeutic application of calomel.

Narcotics.—In considering these very valuable agents, the doctor condemns them too, and says, "that very small doses of opium or morphia will sometimes produce convulsions in very young patients." If we would discard all agents which have produced convulsions in young patients, I fear we would never feast at a very bountiful board, as it is quite common for children to have convulsions from irritable particles of the most healthful food introduced at an improper time and in an improper manner into the stomach and intestines. Here we must condemn the administer of the medicine for producing the above-named trouble as well as condemn the administer of the food for producing its trouble. It is true that very young children are peculiarly susceptible to the influence of opium, and great caution should be observed in exceeding the ordinary full dose which experience has shown to be safe. Quite frequently particles of solid extract may be seen at the bottom of old laudanum bottles, and if this should be dropped out with the fluid, the narcotic effects will be greatly increased. A great many deaths have resulted from this cause, and Prof. Wood thinks that the cause of unexpectedly violent effects in young children from a drop or two of laudanum which is found related by authors, might, if carefully investigated, have been traced to this cause. He says of chronic opium poison, that extremely grateful effects of opium on most persons, in its first stimulant action, and in the calming influence which follows, has led to an enormous abuse of the drug, which, though less injurious either to the individual or to society, than the similar abuse of alcohol, is often very pernicious in its effects on the health of those who give way to it. If employed habitually, provided its use be restrained within certain limits, it does little apparent injury, even through a course of years, and does not seem at least to shorten life. The best British writers make the same statements relative to the abuse of the drug in their own country.

But we may ask, what medical agents have not been abused? There are times when narcotics, stimulants, cathartics, astringents, and so on to the simplest remedies are contra-indicated, and the use of a medicine *not* indicated will prove positive harm to the patient; while the careful and competent physician will recognize what his patient's condition demands and prescribe accordingly, not giving a cathartic, thinking it will do the work demanding an amputation, or an emetic to serve for a plastic operation. We have conditions demanding narcotics as well as cathartics, amputations, emetics, or plastic operations, and all these means for relief of suffering must be applied at a time demanding them or they will prove harmful.

Seeing Prof. Gallup's figures on the amount of injury which opium has done to the human family is not surprising after we consider the amount consumed by those persons who have formed the habit of opium eating, but it is surprising to see Dr. Swindall, in his article, having so much leniency for homeopathy, when he starts out with the wide subject, *Is Medicine a Science?*

After considering well the requirements

necessary to constitute it a science, I will venture a syllogism:

Science is a systematic and orderly arrangement of facts ("Webster").

Medicine is a systematic and orderly arrangement of facts (Common consent).

Therefore medicine is a science.

Let me say that I have considered the medical agents referred to in this article only in a general manner, and have not entered into their physiological action, as the gentleman to whom I reply has done likewise; but if necessary I will gladly defend, in a more specific way, any medical agents which have done the amount of good the agents that Dr. Swindall denominates *poisons* and *narcotics* have done.

Hence, in conclusion, let me hope that all workers in the noble profession of medicine will honor it by word and deed, and none of its members ever spring up with a determination of denouncing the profession as being unscientific, but let those who can see it as being a science work more zealously for its elevation, by discharging their duties honestly; while those who have not seen the scientific character of this branch of study, and wish to become members in truth, should study honestly and diligently, and this dark illusion will be dispelled; then the therapeutic action of agents will be considered in an honest criticism of a medicine, and due credit given to its medical qualities.

STONERS, Pa.

THE SUBSTANTIAL PHILOSOPHY, AS VIEWED FROM THE STAND-POINT OF A GREAT SORROW.

BY REV. H. C. GLOVER.

It has been the misfortune of the writer of this paper to pass through the saddest trial that can come upon a man in this life—the loss of a devoted wife for more than thirty-three years. Such a loss is immeasurably great, and there seems to be no relief to such sorrow save in the Christian faith and hope. I can say in strict accordance with truth, that since the 27th of June, the day of her decease, my thoughts, when not otherwise necessarily engaged, have turned toward her, and when thus occupied the interesting question of her supposed condition in the other life has been one of absorbing importance. It has been a question of no small concern to contemplate her real condition in that world to which she has gone. The mind will not rest content without a rational answer. It can hardly be realized by any one who has not passed through similar sorrow, how intense is the desire, and how imperative the demand, that will not be denied, to have some definite conception of the condition of our beloved ones in the life beyond.

It may be said that this whole subject must be placed in the category of unsolvable mysteries, and that the spirit of unprofitable curiosity must not be allowed to intrude itself into the domain of those "secret things, which belong unto the Lord." But it is not so certain that this subject lies along the road upon which the human mind is not permitted to travel. The fact is the mind *will* travel along that road, and cannot help it. It is so constituted that it cannot but meditate upon a subject of such vital interest, and it will seek and find *some* answer to its queries. It cannot be that we are to lose interest in the dear ones who

have absorbed so large a part of our best thoughts and purest affections while with us, and just at that point when, withdrawing from our view, the dark portals of death close upon them, and when their condition is no longer accessible to us through the medium of sense.

Moreover, the Bible has said so much upon this subject that it plainly invites us into this field of research and meditation. In considering the question, What is the condition in the other world of that entity which we call the *soul*, the spirit, our *real* self? it seems to us that every other view but that taught so clearly by the Substantial Philosophy is vague, and entirely unsatisfactory. Is the soul nothing more than the result of the motion of the atoms that enter into the constitution of the human brain, as modern materialistic science teaches? Then of course it would follow that as soon as the *motion* ceases, the soul, mind, and life cease to be. Such a view would launch us at once upon the dark, dead sea of materialism, on whose shore might be written, "he, who sails this sea, leaves all hope behind."

Again, if we accept the definition which others give to the term spirit, namely, *breath*, as including all that there is in that mysterious something which we call the soul, or life, or mind of man, then it would of course follow that when the breath is finally exhaled at death, the soul would no longer be a conscious entity. Taking either of the views thus far presented, it would be folly, most consummate, to think of our friends as having a conscious existence beyond the present sensuous life.

But neither of these views is held by any large proportion of the Christian world of today. What is the popular view? It is admitted that the soul is an entity—that it is conscious—but it is claimed that it is without body or form, and consequently without personality. But how unsatisfactory is such a view! With any such definition the soul eludes our grasp and becomes so vague that we lose all true interest in its existence if we reason rationally upon the subject. Without body or form or spiritual senses it ceases to be capable of mentally apprehending or of being apprehended, and the question of its immortality becomes at once enveloped with impenetrable doubt. We may well begin to tremble lest those who have fallen asleep have perished.

Now if we turn from these unsatisfactory theories concerning the soul-life, to the views presented in the Substantial Philosophy, we discover a solid foundation upon which we may plant our feet and find rest. The soul, according to that most rational view, is a real substance, as *real* and *substantial* as is the physical body or the solid earth, though not material; that it has real environment with definite position in space, and therefore form; which of course must be the *human* form.

It is the "inner man," of which Paul speaks, and which he tells us may be "absent from the body, and present with the Lord." This is Scriptural Substantialism. It was that personal substantial form which appeared to Saul at Endor and was with Christ on the mount of transfiguration, when "Moses and Elijah appeared with him in glory." This view helps both our imagination and our faith.

It is true the forms of our departed ones do not reveal themselves to the outward sensuous vision; but neither does the atmosphere nor the magnetic force. But who denies their existence on that account? and who knows what powers

may be in us,—actual organs, if you please,—unused in the present ordinary experiences of life, because not needed, but which, under extraordinary vital and spiritual conditions, may develop themselves, and uncover to us the wondrous realities of the spirit life?

We are told that Elisha at Dothan prayed that the eyes of his servant might be "opened that he might see, and the Lord opened the eyes of the young man, and behold! the mountain was full of horses and chariots of fire round about Elisha."

If the present necessary physical limitations were withdrawn but a little, who knows what beautiful visions of our departed ones might not be given to us, visions, perhaps, too bright for our contentment amidst the dull routine and drudgery of this life, and therefore wisely withheld? How satisfactory, then, is that philosophy which supplements the clear intimations of the Scriptures with considerations from physical science strong as Holy Writ that there are innumerable invisible and incorporeal entities all around us, in the heavens above and in the earth beneath, that had never heretofore been dreamt of in the schools' philosophies! And how grandly does such a substantial philosophy come to our aid with its heavenly consolation in the shadow of our greatest sorrows!

AMITYVILLE, N. Y.

MICROCOSMIC DEBRIS.

A popular cane in Maine is composed of whisky, except for a thin inclosing cylinder.

There are at present 695 potteries in the United States, half of which are in New Jersey.

Beauty soon decays, but virtue and talent remain with us and improve with the progress of time.

The wealthiest man in Oregon is living this summer for fun in the log cabin which he used to inhabit from necessity.

Oil-bearing strata exist in the neighborhood of Sibi, southern Afghanistan, and the Government will begin boring next winter.

A tramp was arrested in Nashville lying in an alleyway. Concealed in his ragged clothes was over \$1,000 in large notes and gold pieces.

At Trenton, N. J., the potters now make excellent imitations of Chinese and Japanese ware. The demand for these goods is unabated.

Bishop Spaulding says that not only are American politics immoral, but that the evidence of general moral decadence stares us in the face.

The beautiful red-and-black ores of Franklin, N. J., are cut, polished, and sold as ornaments and paper weights. The ore is a compound of iron, zinc, and manganese.

The orange tree at Versailles, known as the Great Constable, is nearly 500 years old. It was planted in 1423 by Eleanor of Carlisle, wife of Charles III., King of Navarre.

In making infants' shoes fifteen different machines are used, costing between \$250 and \$400. These turn out ten pairs in the same time as one pair made by hand.

In Trent the corn this year is streaked with red, and the polenta made from it is believed by the peasants to contain the germs of pellagra, the skin disease afflicting Lombardy.

Drunkenness, if official returns are to be relied upon, is falling off among the Irish in Ireland, but increasing in Italy and Spain and among the negroes of the Southern States.

Butterine is superseding oleomargarine. Where the latter is made from pure ox fat, the former is manufactured from deodorized lard. A major part of the butterine sold comes from near Chicago.

Solutions of chloral should be kept in dark glass bottles. Sunlight decomposes it into chloroform. The change is not easily perceived, and has caused a number of accidents in the past five years.

A horseshoe, made entirely of sheep's horn, invented at Lyons, France, is found especially useful in the case of horses unsteady on town pavements. It costs rather more than iron, but is very durable.

Recent explorations in South Carolina marl beds have disclosed the fossils of over 1,000 different species of animals. These beds now take precedence over the "mauvaises terres" of the far West.

English farmers now offer six cents per dozen for sparrows' heads, and the same price per dozen for their eggs. These prices have stimulated a raid of almost complete extermination in some counties.

During sudden changes of temperature siphons containing mineral water become dangerous. A rapid rise of the thermometer will sometimes increase the pressure 100 per cent. and produce violent explosion.

In railway building across sandy deserts the French engineers are beginning to employ iron ties. A late pattern consists of a wrought-iron bar, supported in the middle and at both ends by globular plates of cast iron.

In commenting upon the anti-Chinese scare as to leprosy in this country, the *Jornal do Commercio* (Rio de Janeiro) calls attention to the fact that the disease in a much worse form has prevailed in Brazil for 200 years.

Science is not without its caprices. Fifteen years ago, says the *Medical Gazette*, extirpation of the kidney was looked upon as a curiosity, if not exactly a monstrosity, of surgery. At present there are 250 cases on record.

The bread eaten at table in Turin is a yard long and an eighth of an inch in diameter, of a pipe-stem form, very crisp, and exceedingly palatable. It is called "grissini," after the doctor who invented it on hygienic principles.

An electric horse chronometer has been invented. The movement is controlled by a current opened and closed by the breaking of an almost microscopic copper wire stretched across the track. It is said to record to the 1-500 of a second.

Hygienic pillows are now in vogue. Three form a full equipment for a bed, of which one is filled with hops, a second with pine needles, and a third with marine moss. They are believed to cure sleeplessness and nervous disorders.

There was a time when Egyptians took pride in keeping the mummies of their ancestors out of the hands of impious infidels, but specimens can now be openly bought for \$25 to \$100, those with well-authenticated pedigrees being the most valuable.

There is one summer topic less than usual.

The bathers at the seashore are not spectacular. Last season seems to have exhausted their audacity. At Coney Island, Long Branch, Cape May and Newport conservatism rules the costumes on the beaches.

The summer's sport at Block Island is sword-fishing. Frequently the game shows fight, and in such cases the excitement is intense. The swordfish caught in those waters weigh from 200 to 500 pounds, and the swords are from two to three feet in length.

Another industry is now open to women. In an establishment on Centre street they are employed as gold beaters. The proprietor asserts that, while not equal to men in physical strength, they are superior in carefulness and delicacy of workmanship.

The authorities of Berlin are trying tile pavements for the streets. The tiles are moulded into blocks 7.8 inches square and 3.9 inches thick, and are impregnated with bituminous products up to 20 per cent of their volume. The spaces between them are filled with hot tar.

Mr. Gladstone looks worn and weary of face and very aged, but he walks with a quick, active step, dresses with more care than in his youth. In a light gray suit at this season, carries a jaunty cane, and wears, after the Palmerstonian fashion, always a flower in his button-hole.

A notable man at Cape May is Ah Shong, a Chinaman who is not squat and mean, but tall, solid, and commanding. He is a mandarin, and wealthy. He wears the dress of an American, but his body servant, ever at his heels, is all satin and embroidery in the bagginess of Oriental garb.

Jurubeba, a drug that is quite popular in Brazil, has been recently introduced into the United States. It belongs to the Solanum or tomato family, and is said to possess all the virtues and none of the vices of mercury. Dr. Carvalho of Rio de Janeiro and Dr. De Champs of Paris call it "the vegetable mercury."

The English National Gallery has just purchased from the High Court collection: Gaspar Paussin, "Calling of Abraham," \$9,000; Giovanni Bellini, "Adoration of the Magi," \$1,825; Hogarth, portrait of Miss Fenton, \$4,000; and the "Shrimp Girl," \$1,250; Stothard, "The Canterbury Pilgrims," \$2,100.

The Massachusetts Bureau of Statistics states that in 1868 the chance of a person being killed on or by steam cars was 1 in 5,026,284, while in 1882 it had been diminished to 1 in 20,297,034. This is less than the chance of being struck by lightning, and much less than that of being injured by a kerosene-lamp explosion.

The London *Truth* says that among the occupations which are doing the worst in England is that of the builders. Of the failures recently gazetted a large proportion belonged to that trade. Here, on the contrary, the builder flourishes. In New York the permits issued this year for new buildings are about 23,000; in Brooklyn, 26,080.

A Dr. Carrick has brought some Tartar mares to London, with the purpose of introducing real koumiss to western Europe. The koumiss ordinarily sold at the dairies, it is declared, is simply fermented cow's milk; koumiss proper is fermented mare's milk. Koumiss is used largely in cases of consumption and wasting diseases;

while mare's milk, unfermented, is used as a substitute for mother's milk.

A young man was killed on a railroad track near Albany. His parents had separated, his father taking a daughter and he going with his mother. At the funeral, when the coffin was opened, the father stood on one side and the mother on the other. As they raised their eyes from the last look upon their dead son, they met each other's gaze, embraced each other impulsively, and were reconciled.

Bricks made of cork now constitute one of the new German industries. The usual size is ten by four and three-fourths and two and a half inches. They are prepared from small corks, refuse, and cement, and have not only been used for certain building purposes, on account of their lightness and isolating properties, but are also employed as a covering for boilers, in preventing the radiation of heat.

Miss Anna Laurens Dawes, a daughter of Senator Dawes, advocates a Jewish State in Palestine. She praises the intellectuality of the people, and she finds that in statecraft the Jew has done brilliant things. "The time is but just gone by," she says, "when the leader of the Liberal party in Germany was a Jew, the leader of the Republican party in France was a Jew, and the Prime Minister of England was a Jew!"

The united Beckford and Hamilton libraries fetched recently under the hammer the total sum of \$432,220, of which Mr. Bernard Quaritch, the London bookseller, alone was responsible for \$220,525. Of this latter amount, again, about one half represented Mr. Quaritch's commissions on account of customers; the other half was added to his stock, and is now offered by him in a "rough catalogue," with prices affixed.

Dr. Sturge, a medical missionary to Siam, relates how a native doctor administered an emetic to a love-sick lady who had swallowed a quantity of opium with suicidal intent. The scientist of Siam took a live eel, clipped off a part of his tail to make him squirm in a lively manner, and then pushed him, tail first, down the romantic damsel's throat. When the eel returned to the stream of running water near which the girl was made to recline, the opium quickly followed him.

Los Angeles, California, has made great progress, materially, since the construction of the Southern Pacific Railroad. A population of 22,000 is now claimed for it, which, if correct, would show an increase of a hundred per cent. within a few years. The influx is reported to be so large that there are neither dwellings nor stores nor hotels sufficient to meet the demand. There is hardly a block in the town without new buildings in process of erection. The suburbs are exceptionally beautiful. Handsome villas extend for two and a half miles in all directions, and each has its vines, orange trees, orchard and flower-garden. The surrounding country is an almost unbroken tract of vineyards, orange groves and fruit ranches. The American population is of the most intelligent and cultivated class. Many professional men have settled there in fruit growing and wine making, being attracted by the well-nigh perfect climate and the fear of falling victims in the Eastern States to hereditary consumption.

WILFORD'S MICROCOSM.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE IMMATERIAL IS THE REAL.

How superficial is the grasp of the human intellect! How little the most profound thinker knows of the actual entities and realities of the surrounding universe, of which the entire human race forms but an infinitesimal speck! And how little we realize that humanity itself, in the sense of corporeality, is not even the dust in the balance compared to the invisible, incorporeal human microcosm within this physical pericarp, which incloses it for so brief a space of time here! Indeed, the material bodies of which we are cognizant through our physical senses, are only made visible and tangible to us through synthetic or concentrative processes that have proceeded by invisible and, to us, unknown agencies from the incomprehensible subtleties of the substantial universe. The fact that any tangible, material body recognized by us can be converted into its original invisible gaseous elements even by our own puny efforts, through the agency of heat or other chemical and mechanical action, furnishes strong evidence that gross matter, of whatever grade, is but a concentration of invisible, imponderable, and even incorporeal substances, by a power in Nature above and unknown to man. It is even beginning to be conceded by the ablest thinkers and investigators that the sixty or more elemental substances heretofore supposed to constitute the natural material bodies surrounding us, are reducible to four or five primordial elements by even the synthetic powers of man, using only the best and latest scientific appliances. If this be true, it only requires the thought to be extended to other synthetic processes and resources not yet revealed to the chemist and mechanician to enable us to behold mentally all the material substances in the universe primordially existing in a single material element, from which and out of which the great central intelligent creative force has manufactured all classes of material bodies and substances by a simple process of concentrating, or synthetizing, that one element in different directions. We say *simple process*, as it would be to us, could we become cognizant of the *modus operandi* of Divine procedure in the work of creation.

If this logical inference from what puny man himself has now the power to accomplish be true, then it might be rationally inferred, that the alchemistic notion of the Rosicrucians and advanced theosophists, that gold and iron are the same in their basic element, is not a dreamy fancy to be flouted and despised as the vision of a disordered brain. If gold and iron can originally have come from the same primordial element by a synthetic process carried on

in God's natural laboratory in two different directions, we only need the analytic facilities and appliances first to reduce iron back to this basic element, and then the synthetic facilities and appliances to condense it along the golden line of material construction, in order to change a ton of railroad iron into a ton of gold, or a ton of coal into a ton of diamond. If man, with his circumscribed powers and limited resources, can take a mass of common iron ore, reduce it to a molten state, and then by the aid of invisible substances change it into Bessemer steel, might he not, by first reducing it beyond the molten to a gaseous or still finer elemental condition, return it to the solid form of copper or even of gold had he but the power and processes to reconstruct such gaseous elements again into solid metal?

Is it objected that gold possesses properties entirely different from iron, and *vice versa*, and that no amount of concentration of a substance can change its nature or add to it new properties? We reply that iron takes the property of becoming permanently *magnetic* by the simple process of change which converts it into steel. Take, as an illustration, the astonishing case of platinum, a thin wire of which will remain bright and untarnished after cooling if held for hours in the most incandescent mass of molten iron; yet, if it be inserted in molten lead, not a hundredth part as hot, it will melt the same as would a wire of lead itself! Yet it is a fact that platinum and iron and lead, according to the Substantial Philosophy and all advancing scientific thought, were at one time precisely the same in elemental substance, having, without doubt, the same properties in all respects, and that they only obtained their respective peculiarities and properties as now observed through the creative process of condensing that same basic element in lines of different direction—that is, by adding and mingling with the basic material element different degrees and qualities of the force-elements of Nature which in fact constitute the true cause of the varying characteristics as manifested in gold, platinum, iron, lead, etc. What could possibly cause platinum to change to a liquid state when placed in contact with molten lead, while remaining unaffected in the slightest degree when held in molten iron of many times higher temperature, if the gross material particles were all there was involved of a substantial nature in the premises? Surely *heat* at a given temperature, either as an immaterial substance, as the new philosophy claims, or as a mode of motion, as the old doctrine insists, ought to produce one and the same disintegrating or liquefying effect upon platinum wire in both lead and iron, unless it be true that the substantial cohesive force which holds lead together

exerts in connection with the substantial force of heat a neutralizing effect upon the cohesive force in platinum which these two forces do not produce through their relation to molten iron.

A curious and instructive illustration of this interacting effect of one force upon another was brought to our attention by Prof. Joseph Goodrich in an experiment which he had frequently tried, of shooting a leaden bullet through the incandescent space of the open arch of a burning brick-kiln. Though this space is but a few feet in length, yet, from repeated trials, he declares that not a particle of the lead will pass through this heated air-chamber reaching a painted board placed at the opposite end of the arch. He asked us to explain the mystery, according to Substantialism. Our explanation, as already hinted by reference to the easy fusion of platinum in connection with melted lead, is, that the newly added force of *projection* combined with the intense force of heat must so act upon the cohesive force of the lead as to produce an instantaneous dissolution of the elements and forces combined in this peculiar metal, thus allowing it to be instantly disintegrated and transformed into a gas. As a test of the correctness of this solution, we predict that a leaden bullet, conveyed slowly through the length of this arch in a delicate crucible of fire-clay (thus exposing it a thousand times longer to the same heat), would emerge intact though fused, simply because there would be lacking the substantial force of *projection* to combine with the substantial force of heat, thus neutralizing the substantial force of cohesion which holds the molecules of the solid or even liquid mass of lead together. This solution corresponds with that given in the August MICROCOSM of a piece of silver or copper falling slowly though a dense collection of magnetic force, owing, as we insisted, to the neutralizing effect of one force upon another as peculiarly combined in certain solids. Although Prof. Goodrich did not try the experiment, it is quite probable that a bullet composed of tin and antimony, or other combined metals that would fuse at even a less temperature than lead, would pass through the incandescent arch from the gun in a solid state, simply because the heat-force and projectile force would not combine to neutralize the cohesive form of force in the molecular arrangement of such metallic molecules.

Nature is full of problems of this kind, every solution of which leads to another confirmation of the Substantial Philosophy, and goes to prove that the invisible is the real of existence, and even more substantial than the tangible.

The same intangible and invisible elements within the soil and atmosphere mysteriously

combine to produce food and poison, or the most delicious fruits, noxious weeds, and fragrant flowers side by side. The same or a similar process to that which selects and combines these invisible elements and forces from the same soil, water, and air out of which to make the golden ear of corn and the deadly nightshade, with their roots and leaves actually commingling and touching, has originally conspired under the intelligence which primordially directed the creative processes of Nature to originate all the diversities of the animal, mineral and vegetable formations of the visible and invisible universe.

It is a weak and erroneous supposition that the phenomena of material bodies, animate or inanimate, manifested to our senses, are mere qualities or properties of such matter—the results of organization or combination of its material molecules. The assumption that matter thinks and feels and acts as the simple effect of organization or combination of corporeal particles, is the essence of materialism, and the basic error at which the Substantial Philosophy strikes its most effective blows. This philosophy assures us that no combination of matter whatever can produce any phenomenon or action, only as it involves the incorporation or development of substantial incorporeal force or forces by which such phenomenon or action is manifested through such material medium. A man instantly killed by an electric shock is as complete in all respects as an organism, corporeally or materially, as a moment before, when speaking and breathing and walking. Not a fiber of his flesh has been disrupted, nor a corpuscle of his blood displaced. Why has he not now these so-called “qualities” of speech, thought, and action since the electric spark touched him, having as he has his organization in all respects corporeally perfect as before? The answer is that this immaterial, disturbing, substantial force of electricity permeated the material body, driving from its seat the substantial, vital, and mental organism which permeated, controlled, and actuated the physical structure, thus leaving the body without its normal motor-power to drive its physical machinery. As well insist that the steam engine and boiler have the “quality” of acting and performing their accustomed work by virtue of their organization or peculiar mechanical structure, and that the heat and the steam, instead of being substantial entities, are the mere “properties” of matter as the results of a certain combination of material molecules. Here is an engine working, as an emblem of intelligence itself. Open a valve and fill the steam space above the water-line with ice-water, as the living man was filled with electricity, and the engine will instantly cease

work as did the human body, though no change whatever will take place in the corporeal structure of the engine or boiler. What is the matter with this beautiful machine that action has ceased? Plainly, the cold water has neutralized and absorbed the immaterial heat-force which was the vital energy of the steam, and which enabled it to run the engine. Let this charge of cold water now escape from the boiler to the earth, as did the electricity from the human body, and it would carry with it the vital force of the heat and steam, leaving the boiler and engine a mechanical corpse. What nonsense to suppose that the mere structural organization of the material engine and boiler, however perfect, could result in mechanical action unless immaterial force in the shape of heat were also breathed into the nicely wrought piece of machinery. God had formed man, a perfect organism, of the dust of the ground, but not until He had breathed into his nostrils the immaterial breath of life, or soul-essence, did his completely formed structure amount to anything so far as thinking and acting were concerned. No organic structure, however perfect, and whatever its material properties, can result in thought, or sensation, or action until the substantial forces of life and mind are added to the corporeal structure as its vital and mental counterpart and motor-power.

A mere property of matter, as we have repeatedly insisted, is not a force in any sense, nor does it involve force, only as such power to act is added extraneously. Water, for example, changes its property of incompressibility and becomes elastic in the form of steam only when the extraneous substantial force of heat is imparted to the water in sufficient quantity thus to change its form from the liquid to the gaseous state, as it had previously, though in a less degree, changed it from a solid to a liquid. A quality of matter, while it involves no force, is simply the capability or characteristic of matter which allows force to take possession of a body and operate with it or in it in a certain way, according to the peculiar arrangement and relation of its material molecules. Nothing in nature contradicts this law, while it involves and harmonizes with the Substantial Philosophy in every particular. The force of cohesion in one body, and which holds its molecules together in a certain manner, owing to their peculiar arrangement and properties, as in the case of liquid water, if combined with that same cohesive force holding some other body together, might unite the two cohesive forces in neutralizing their power upon both bodies, and instead of cohesion as before they might change their nature, and thus be converted into the energy of heat as another transformation of the original force-element from which

all the manifestations of force known in Nature have come. Is this statement obscure? If so, here is a simple illustration that will make it plain: Pour cold, liquid water on a mass of cold, solid lime, and while the cohesion in the lime gives way, allowing it to crumble into impalpable dust, the water becomes disintegrated and disappears in vapor. The cohesive force of both bodies by this act of combination has been converted into another form of substantial force called heat, which has usurped the place of cohesive force in both bodies. And thus do we solve the intricate problem of latent heat in lime, which has so puzzled scientists, by the beautiful principles of the Substantial Philosophy. Not a particle of the lime or water has been destroyed by this combination, though both have undergone a transformation, while the heat which appears to have been created out of nothing is but the transformed force of cohesion which held the molecules of the lime and the water together. How beautiful is Substantialism in its varied applications to the mysteries of physical science!

Organization, as we see, may confer a property or characteristic upon a material body, thus permitting extraneous forces to enter and utilize it or manipulate it in a given way, and thus manifest given results through it, as in the case cited of the engine and boiler. Although such mechanical structure is totally powerless and inefficient without the aid of imparted force to run its machinery, yet its characteristics of structure are essential as the medium for such force by which to enable it to act its part and properly manifest its power to the accomplishment of given results. Take this engine apart or break it up into pieces, and though it is all there in weight of metal, yet no amount of steam and heat would make it perform the beautiful task which it accomplishes when in working order. Thus the property or quality of a body, involved in its form and structure if you please, is essential as a medium through which immaterial force may manifest its power and accomplish its results. A grain of corn, for example, planted in proper soil will sprout and grow and bring forth the stock and finally the ripe ears, because it possesses the proper specific form as well as the vital specific organism as the incorporeal pattern round which and through which the invisible elements of the soil, air, and water are attracted and woven into the final stock with its golden ears, thus constituting it food instead of poison. But break up this grain of corn, and thus destroy its specific form and thereby neutralize its force of cohesion which acts in conjunction with its vital specific organism, and no amount of soil, air, and water will cause it to vegetate though not a particle of

the material grain has been destroyed or lost. In like manner it requires the human form divine as the appropriate medium through which vital, mental and spiritual forces can achieve human results. Man could not think a single human thought if he possessed the brain of a beast, however he might be educated; neither could he have ever achieved any of the works of art, mechanics, architecture or commerce so creditable to the human race, even had he possessed the genius of a Raphael, the intellect of a Stephenson, and the cunning of a Howe combined, without his peculiar physical structure. Think of a man, however intelligent, undertaking to make a watch with a horse's hoofs in the place of his two hands; or a Listz trying to play a piano with the paws of a dog! As the human form is the essential part of man's material organism through which the soul has the facility for expressing its emotions, conveying its thoughts, and achieving its triumphs, so must this same form attach to the incorporeal organism within the physical structure, as its counterpart and as the real entity for which the corporeal body was temporarily prepared as the earthly tabernacle in which the inner man might receive its disciplinary culture preparatory to its entrance into that higher educational field for which this earthly residence was designed to fit him.

Thus we return to the heading of our present paper:—the invisible, the intangible, the *immaterial* in all existence is the *real*. The visible, material bodies around us are but the gross exteriors of Nature's system through which the real but invisible forces of the universe produce their sensible manifestations. The man who, in his narrow conceptions of Nature's domain, confines all substantial existences to the material portions of the universe, is like the anatomist or physiologist who would attempt to solve the mysteries of man's physical organism by a life-long microscopic inspection of his epidermis; while the philosopher who looks upon the corporeal body of man as the all of his substantial being has not yet seen through the cuticle of Nature's vast realm. To assume that matter thinks, and that matter is all there is in the universe, is to fly into the very face of common sense. That electricity and magnetism are substantial forces—real entities in Nature—is so plain and self-evident a truism that it would almost be illogical to prove it. That they are *immaterial substances* is equally self-evident, since they act and pass through gross material bodies in defiance of all the universally accepted material conditions of Nature. What weakness, then, to deny the substantiality of mind or spirit by calling it a material mode of motion, or a quality, property, or attribute of the material brain, while admitting the immaterial "property" of a steel magnet or the

immaterial "attribute" of a dynamo-machine to be an actual substance! The materialistic school of philosophy has yet to learn the prodigious extent of its own scientific inconsistency. To speak of man's spirit or mind as a "condition" of the brain, as some of them do, comparing it to the heated, or liquid, or gaseous *condition* of water, is sublime childishness. The brain may be in a thoughtful, or sluggish, or excited, or sleepy condition; but what is that vital and mental *force* which superinduces such conditions? Is the *force* and the *condition* it produces the same? Water may be in a liquid, or gaseous, or heated condition, but what is that substantial, active, energetic *force* which superinduces such condition? Is the *condition* and the *force* producing it one and the same? These are distinctions and questions which only the Substantial Philosophy has ever dared venture to attack.

THE WAVE-THEORY AGAINST ITSELF.

HAVING been the first to call attention to the contradictory character of the current theory of sound as recorded in the *Problem of Human Life*, we deem it only fitting that we should occasionally renew this call, and thus stir up the minds of respectable scientists by way of remembrance, lest they relapse into forgetfulness. It will be remembered that we took especial pains in that original treatise to expose the current fallacy of the so-called "swift" travel of the vibrating string, or prong, while generating tone, which has been so erroneously taught and believed by all physicists. We showed that instead of a *swift* motion through the air, in any one of its swings, it was absolutely demonstrable that the prong of a tuning-fork traveled only at a velocity of a few inches in a second when performing its largest oscillations and producing its loudest sound, and when, too, at the center of each swing, where its motion, like that of the pendulum, as Prof. Helmholtz admits, is swiftest. This discovery and announcement came upon college professors as a surprise, and "Ridiculous!" was at once heard as the unison exclamation among teachers of acoustics from one end of the land to the other wherever the "*Problem*" was read. After exhausting their vocabularies in similar exclamations of contempt at the alleged new discovery, a few of their more ambitious and courageous number, seeing the enthusiasm with which the book was received by the press and the clergy, and chagrined that an unknown layman should have made and announced such a discovery, sought to immortalize themselves by assailing the author's arguments, and thus vindicating their own claim for intelligence before their classes rather than abandon the wave-theory and acknowledge themselves in error.

These reviewers followed each other in rapid succession, hailing from different parts of the country; but as we had at that early date no medium through which to reply and set them right, except occasionally through the courtesy of the editors who printed their criticisms, the different writers followed closely in each other's tracks, repeating the same superficial criticisms, not seeing our replies to and consequent exposures of their fallacious character. In time, however, it came to pass that THE MICROCOSM was started to furnish the very medium through which to meet the assaults of all opposers. Such a medium was needed in order to let no opponent escape with the self-congratulation that he had made a hit against the "*Problem*," that would weaken if not silence its batteries. For a time, however, this fact of the existence of THE MICROCOSM did not impress itself sufficiently upon these ambitious advocates of the current theory of acoustics, and so several of their number were put forward, or went forward voluntarily, to the work of answering the dangerous book, each writer of whom, as a memorable fact, was in turn silenced by the replies of THE MICROCOSM, till they have since been *non est inventus*. We cannot here enter into an enumeration of the various philosophical heroes who were patriotically willing, for the cause of science, to run the risk of immolating themselves upon their respective altars of physical respectability, nor can we enumerate the various points they raised. A singular coincidence, however, in those early attacks was the unanimity with which each critic tried to break the force of our arguments against the "swiftly advancing" prong of the tuning-fork while sounding, as taught by all the authorities, since this point, if not disposed of, was considered fatal. To instance only two of them, Prof. French, of the Urbana (Ohio) University, admitted that if we could show that the travel of the prong while sounding was not *swift motion*, then the wave-theory had necessarily broken down; and he specifically added that a velocity of *sixteen inches in a second* would not be fast motion. (See MICROCOSM for March, vol. 2.)

Then, in due course of time, came Prof. Stahr, of the Franklin and Marshall College at Lancaster, Pa., who resolved to answer our arguments in a set review of the "*Problem*" in the *Reformed Quarterly*, apparently in retaliation for the Rev. Dr. Swander's previous favorable review of that book in the same magazine. This was, as it turned out, the fatal resolve on the part of that professor, as well as the most fortunate event for the Substantial Philosophy that has occurred since the "*Problem*" was first issued, as we will immediately show. Following the example of Prof. French in the *New Church*

Quarterly, which he had probably seen (though he had evidently and unfortunately for him not seen our reply), he made the strongest part of his attack in his effort to show that the prong of a tuning-fork does really travel "swiftly," especially at the center of its swing, and he frankly admitted that if it did not travel swiftly it could not condense the air, since, as he reasoned (correctly), the air-particles in front of a slowly moving body would slip aside and take their place behind it without being condensed. (See *MICROCOSM* for Oct., vol. 8.) This fatal but truthful admission by Prof. Stahr gave us our final opportunity on that cardinal point, and furnished the inspiring motor-force which led us to the discovery of the novel and conclusive method of demonstrating that a tuning-fork will sound audibly while its prongs at the swiftest part of their travel are moving at less than a velocity of one inch in *three hours*, and which by the aid of Capt. Carter and his superior tuning-fork was absolutely carried to a velocity of only one inch in *two years*! This *Stahr-rout* discovery was hurled back at the Lancaster professor through *THE MICROCOSM* with such stunning force and precision that it not only silenced his battery on the sound discussion, but it seems permanently to have closed the pages of the *Reformed Quarterly Review* against anything however amiable or reliable from the pen of that professor since, as well as against any mention either of the sound question or of the *Problem of Human Life*. The Rev. Dr. Apple, it seems, had received all he wanted and more than he had contracted for in the unfortunate fiasco of his profound physical professor. Yet, as we then insisted and have since repeatedly urged, the high and responsible honor resting upon the doctor as president of a great college and the editor of a great quarterly placed him under the most solemn obligations to his students and readers either to force Prof. Stahr to reply to that demonstration and answer our arguments or publicly to confess the wave-theory broken down. But the truth is the doctor did neither. If he had no power, as we presume he had not, to make him either answer our argument or confess his inability to do so, it was then the clear moral, religious and scientific duty of Dr. Apple to state the fact in the same journal that contained the professor's pretentious "Two-Edged Sword," and let his readers know the truth. The willful and persistent refusal on the part of the responsible editor of that high-toned quarterly to fulfill such an honest and binding moral obligation has not been forgiven by scores of his more intelligent subscribers who are well posted in all the facts of the case, nor will it be forgiven till his scientific conscience shall force him to

bring forth fruits meet for repentance by ample acknowledgment in the *Reformed Quarterly Review*.

After these preliminary statements we now come to our text—the wave-theory against itself—and will, briefly as may be, point out a fair specimen of the self-contradictory nature of the current doctrine of acoustics. We need not go outside of the very subject-matter we have been here discussing, namely, the supposed "swiftly-advancing" prong or string in producing tone, to find the most glaring instances of scientific incongruity. First read this brief extract from Prof. Tyndall, the ablest exponent of the wave-theory in the English language:

"Imagine one of the prongs of the vibrating fork *swiftly advancing*. It compresses the air immediately in front of it, and when it retreats it leaves a *partial vacuum* behind, the process being repeated at every subsequent advance and retreat. The *whole function* of the tuning-fork is to *carve the air into these condensations and rarefactions*."—*Lectures on Sound*, p. 62.

Look now carefully for a moment at this idea of "condensations and rarefactions," which constitute the very life and soul of the wave-theory. If the tuning-fork prong, as this great authority teaches, "leaves a partial vacuum behind" it, after moving forward to make a "condensation," the next forward movement, which instantly follows, would of course be in this "partial vacuum," and would necessarily produce a less condensation than before, having less air to condense; and on again retreating would necessarily add to, or increase, this "partial vacuum" made by the first retreat, and so on till all air should be exhausted on each side of the prong, thus leaving it performing its "rapidly-advancing" to-and-fro motions in a perfect vacuum! By this means all "condensations and rarefactions" would necessarily cease soon after the commencement of the prong's vibrations! The wave-theory thus commits scientific suicide in the hands of its foremost exponent by insisting upon "condensations and rarefactions of the air" as the only means of sound-propagation, and, at the same time, making such atmospheric condensations and rarefactions impossible by logically causing the prong to vibrate in a vacuum.

But here is the worst feature of self-annihilation connected with this "partial vacuum" claim of the wave-theory. As the condensation and corresponding rarefaction of the air constitute the sound-pulse, they must, of necessity, travel or act with the velocity of the sound; that is, they must travel hundreds of times swifter than the prong itself travels, as shown in our "finishing demonstration," October *MICROCOSM*, volume 8. Now here is the absurdity of the theory gone to seed: How can the prong

retreat to "leave a partial vacuum behind," when the rarefaction or the air itself expands after compression, at a velocity hundreds of times swifter than the prong can travel at its best? Plainly, after the prong has gone forward and compressed the air, how is it to get away from this air in order to "leave a partial vacuum behind," when this same compression must restore itself, according to the wave-theory, at a velocity of 1120 feet in a second, and especially when the prong demonstrably, as Capt. Carter has shown, *sounds audibly while retreating only at a velocity of one inch in two years? Reductio ad absurdum.*

But this is only one among many similar blows the wave-theory strikes against itself. Take the one growing directly out of these same "condensations and rarefactions of the air," called the "law of interference." No more self-contradictory "law" was ever placed on record than this, as we have so often shown, and will immediately show again. Prof. Tyndall tells us that if two unison strings or prongs were vibrating half a wave-length from each other, so that the *condensation* from one would reach the other just as its *rarefaction* was starting, the two would *interfere* with each other, producing quiescence in the air in the line of the two strings or forks, thus neutralizing each other's effects, and causing absolute silence, since sound consists only and solely of atmospheric "condensations and rarefactions." Nothing is plainer than this so-called "law of interference" as taught by all authorities on acoustics. (See *Lectures on Sound*, pp. 258, 260). Yet observation and experiment demonstrate the utter fallacy of the law, and prove the non-existence of the facts of interference as so positively alleged to exist by Prof. Tyndall, and upon which he risked his reputation in recording it without, it is hoped, ever testing it by experiment, for otherwise he recorded as scientific truth what he absolutely knew to be false. This conclusion cannot be avoided, since two equal forks or other unison instruments, placed as he alleges, cause not the slightest shade of neutralization of tone, but actually double the sound of one of the instruments alone as listened to in all directions alike. Plainly if sound consists of air-waves, constituted of "condensations and rarefactions," as the theory teaches, this "law of interference" is a necessity in the nature of things, and it is therefore not surprising that Prof. Tyndall, believing firmly in the truth of the wave-theory as he did, should state this law of interference as a necessity growing out of the coalescence of a system of "condensations" with an equal system of "rarefactions," since we all know that two systems of equal water-waves (which are of course real waves) running

together in such relation that the furrows of one system will coalesce with the crests of the other system, will substantially neutralize both systems, producing aqueous quiescence. Of course aerial waves, if they really exist as the cause of sound, should act the same precisely, and Tyndall, Helmholtz, Mayer, and the rest, knowing this, and believing the wave-theory to be absolutely true, did not hesitate to inculcate this law of sound-interference and absolute silence without waiting to test it by experiment for themselves, so sure were they of its truth. But the fact, that there is no truth at all in the law, as our numerous experiments show and as any one can prove, has utterly shattered the wave-theory, and so completely has it convinced those great scientists that the doctrine is fallacious since seeing the *Problem of Human Life*, that they dare not now write a word in defense of the wave-theory, as so clearly made manifest under the recent merciless castigation given them by Professors Rogers and Drake as published in *THE MICROSCOPIC*.

But as there is no dispute about this law of interference and consequent silence as laid down in all works on acoustics; and as there remains no longer any doubt of its fallacy, since experiment shows it to be false in all its length and breadth, we now come to the manifest self-contradiction of the law itself as demonstrated by these claimed "condensations and rarefactions" sent off in all directions from the vibrating string or prong of a tuning-fork. Here, in a few sentences, will be shown the beauties of that branch of physical science as now taught in all "respectable colleges," and of which Prof. Tyndall says in his letter to Prof. Drake—"You can go to rest with the assurance that the wave-theory of sound is perfectly secure"! Let us see how "secure" it is, tested by its fundamental law of interference:

As an admitted matter of fact, when the prong or string swings forward it produces both a *condensation* and a *rarefaction* at one and the same instant, the condensation being generated on the *forward* side and the rarefaction on the *retreating* side. Now as both condensations and rarefactions travel in all directions from the sounding instrument at the same velocity, it is plain that every condensation sent forth by a vibrating prong or string is accompanied by a simultaneous rarefaction, filling the same air at the same instant, and consequently the two must keep up the continual interference and neutralization of each other, if there be any truth in the theory. Hence, if the law of interference be true (and it must be true or the wave-theory is ridiculously false), no sound whatever should or could be sent off from any vibrating instrument, since the condensation

and rarefaction propagated simultaneously together from each motion in both directions must interfere, producing quiescence of the air and consequent silence. But as we do hear the sound of such string or prong in all directions, it follows irresistibly that the law of interference is erroneous, and with it that the wave-theory has hopelessly collapsed and broken down. Will Prof. Tyndall or Prof. Mayer muster the courage to answer this argument? If they do not, or if they refuse to attempt it, they "can go to rest with the assurance" that their reputations as great scientists have vanished into something thinner than their own interfering condensations and rarefactions.

AM I MY BROTHER'S KEEPER?

This interrogation, more forcible than the most positive assertion, comes home with a peculiarly deep significance to every reader of *THE MICROCOSM* who admits Substantialism to be the great underlying philosophy of all life and force. Recognizing it as the philosophy which has within it the germinal force to expand until it uproots the accumulated scientific errors of the centuries—and which will tend most effectively to the development and upward progress of the race—are we doing our duty, are we earnestly, conscientiously and energetically using our influence and *means* to promulgate it? Or are we selfishly content to enjoy its truths and grow with its gifts, and give no thought or care to the thousands who are groping amid the dark, cold and gloomy caverns of materialistic philosophy? Thousands of honest seekers after Truth, who long for convincing evidence of an individualized immortality—with an intensity that cannot be expressed—would find faith springing into a living power, if the truths of Substantialism were once revealed to them. I have read letters from persons of high moral endeavor, and fine intellectual culture, expressing their gratitude in the strongest terms for the good that the philosophy of Substantialism had brought to them; that it had lifted them from the miry clay of materialism and quickened their paralyzed faith into a spiritual vitality, enabling them to take hold of the future with a firm and unyielding grasp. Thus, many individuals whose education and mental constitution preclude them from being convinced of immortality through any theological disquisition could be reached through the facts and truths of Nature, which are so convincingly unfolded through the Substantial Philosophy. Knowing this fact, I feel an intense desire to see this philosophy presented to every investigating and reflecting mind: and, therefore, I most earnestly urge upon each and every one the positive, imperative, moral duty of making a persistent and determined effort to extend the circulation of the "Problem of Human Life" and *THE MICROCOSM*. Certainly, every appreciative reader could induce *one thinking individual* to become a subscriber, and, doubtless, with an effort commensurate with its importance, could secure five or a dozen. And so, instead of a few thousands, we could have tens of thousands of subscribers and *hundreds of thousands of readers*.

Think of this, friends of Substantialism!

Think of the mighty power for good—the grand and majestic wave of progressive truth—we could, by our united efforts, set in motion! Would that I could inspire every reader of our beloved *MICROCOSM* with a lofty enthusiasm, with an electric energy which would impel him to go to work with a will that knows no failure; and thus hasten the world's redemption from false philosophies which distort the mental vision; and from a materialism which, like a vampire, is drawing the spiritual life-blood from the souls of men. If we will thus labor, ours will be an elevated happiness in the consciousness of duty performed—an inspirational joy in beholding the rapid march of the vitalizing philosophy of *Truth*.

I pledge myself to secure at least *five* subscriptions for *THE MICROCOSM*. *Will every subscriber do the same?*

MRS. M. S. ORGAN.

NEWBURGH, N. Y.

MEN OF "RECOGNIZED STANDARD."

We clip the following from the *Baptist Examiner* of this city, of September 4, 1884:

"What do you think of 'The Substantial Philosophy,' as given in the August number, p. 22, of WILFORD'S MICROCOSM?" E. B. J.

"We have several inquiries like the above, to which we would file this general answer. We have examined several numbers of *THE MICROCOSM*, and our opinion of it is that it is utterly worthless. On its list of contributors we fail to find a single man of *recognized standard* as a man of science. It appears to be the organ of a coterie of 'cranks.'"

We are entirely willing to give the above to our readers, and let the intelligent converts to Substantialism among Baptist ministers judge of the stuff of which the *Examiner's* editorial corps is composed. If we had a "single man" as a contributor to this magazine who was capable of composing such a jumble of words as "a single man of recognized standard as a man of science," we should regard him as "utterly worthless," quietly dismiss him as a literary "crank," and recommend him for a situation to the editor of the *Examiner*, in full assurance of faith that he would prove a "man of recognized standard as a man of science" in that concern.

OUR GREAT ENCYCLOPEDIA OFFER.

We are pleased to announce that several persons have taken advantage of our offer, as printed on last page of cover, to send us fifty subscribers for this volume of *THE MICROCOSM*, with the money (\$50), and thus earn a complete set of "Appleton's New American Encyclopedia" as a premium, original cost, \$96. We have several sets yet remaining, and we now make the offer to include also our books, "The Problem of Human Life"; 1st and 2d volumes of *MICROCOSM*, bound in cloth; "Universalism Against Itself," and "Walks and Words of Jesus," as follows: For a sale of 25 copies of "The Problem," at \$2 each (\$50); or 20 copies 1st and 2d vols. *MICROCOSM*, at \$2.50 (\$50); or 50 copies "Universalism Against Itself," at \$1 (\$50); or 50 copies of "Walks and Words of Jesus," at \$1 (\$50); or \$50 worth of any of these books in like proportion, the money in all cases to accompany the order, we will send a complete set of the Encyclopedia, as proposed. Or subscriptions to the 4th vol. of *THE MICROCOSM*, at \$1 each,

can be mixed with any of the books at prices named, to make up the \$50, and thus earn the 16 leather-bound volumes of this greatest of encyclopedias. No offer like it was ever before made to the American public.

THE NATURE OF SOUND.

A NEW proof of the substantial nature of sound has just been brought to our notice by Dr. W. E. Sallee, of Sellersburg, Ind., discovered through a most singular accident which happened to a friend of his who chanced to be in the water during the firing of artillery near the water's edge. At the moment of one of the discharges his right ear was submerged. The sound caused such an intense concussion to that ear as completely to rupture its drumskin or tympanic membrane, while that of the other ear was uninjured. The Doctor asks: How is this to be explained? The only way to account for such a remarkable effect, as we conceive, is the following:

The immersed ear was filled with water, and as a matter of course the conducting medium was in actual contact with the tympanic membrane. It is well known that sound travels in water with four times its velocity in air, but still that there is not the slightest perceptible movement to the particles of water caused by the passage of the sound through it even if examined under the most powerful microscope. Hence the water is without physical or mechanical sound-waves, and consequently the rupture of the membrane could not have been produced by the physical disturbances of the water (even admitting that there is any such disturbance, which we deny), since less than microscopic motion could not mechanically cause such a destructive effect. Hence the conclusion irresistibly follows that the rupture must have been caused by the contact of the sound corpuscles under their fourfold velocity above that in air. In view of this solution, we do not hesitate to make the scientific prediction, if the ear were filled with iron filings, so as to cover the membrane, and if these were connected externally with an iron bar a mile long, that a slight tap on the bar with a hammer, even at the far end, would totally destroy the drumskin, since the velocity of the sound in iron is seventeen times that in air, or about four times that in water.

The reason for this destructive effect on the sense-membrane of the ear, while the same sound corpuscles would produce no effect upon an inanimate body of the same size and weight, whatever velocity they might have, grows out of the fact of the natural sympathy existing between that particular kind of immaterial substance and the auditory organs. The same

principle in physiological physics holds true of light, which may be so intense as to destroy the optic nerve, while the same luminous discharge of corpuscles would not perceptibly stir the lightest feather if concentrated upon it with many fold such intensity. Judging from this newly-discovered fact in sound, we may logically infer, if by any process light could be made to travel seventeen times swifter than it now does, that no eye could withstand or endure the contact of its immaterial corpuscles. If any other explanation of Dr. Sallee's problem can be given that will seem more rational or probable than the foregoing, we should like to give it to our readers.

THAT MISSIONARY PAMPHLET.

We have not yet commenced the plates for the pamphlet on Substantialism (though we had earnestly intended to do so before this) owing to the slowness of our subscribers in renewing for volume 4 of THE MICROCOSM. This apparent apathy, as hinted last month, we attribute chiefly to the political excitement of the country in this peculiar presidential campaign year. We really trust that after the November election a decided change for the better will show itself, and that the old readers of THE MICROCOSM will awake from politics to the interests of the more enduring realities of the Substantial Philosophy. As soon as this revival takes place we will put the plates of the missionary pamphlet in hand. We are putting every dollar received for books and subscriptions into this magazine, knowing what good it is doing in combating false science, and we dare not therefore run into debt for outside work, however important, unless we can see our way clear by the encouraging attitude of our subscribers. We propose, as heretofore, to give all we have and are to this work, but can do no more.

PHOTOGRAPHS OF OUR CONTRIBUTORS.

We have received many high commendations of the cabinet photograph of the great painting by Mr. Tiers of the editor of THE MICROCOSM and his contributorial staff. Many of our subscribers are so much pleased with it that they desire a larger copy for framing, and thus preserving it as a souvenir of their friendly relation to this magazine. We have obtained the consent of the artist to use a large negative for a picture, about 12 by 16 inches, a copy of which we will send on flexible board rolled in tube, post-paid, as a premium for three new subscribers to this volume of the THE MICROCOSM, or we will send a copy on receipt of \$1.

WILFORD'S MICROCOSM.

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SPECIAL PROVIDENCE.

BY REV. L. W. BATES, D. D.

God's sovereignty is as evident as His existence. If there be a Supreme Being He must reign; His government is necessary to His supremacy. To say there is a God who does not rule is to deal in contradictory terms.

Some, however, who admit a general providence reject all idea of a special providence; but is not a general providence without a special providence a palpable contradiction? How could God's providence be general without being special? What is general providence but the aggregate of special providences?

The fact that God has established a system of laws is unmistakable evidence that He controls every particular law in the system, and keeps it in harmony with the system. A machine is a system, and the engineer has not only the general control and supervision thereof as a system, but his special inspection and control of every screw, shaft and wheel of that machinery constitute his general control. Every whole is made up of parts. The family is composed of its individual members, and cannot be controlled in the aggregate as an organized body, exclusive of the control of its individual members. The government of the State is not simply the control of corporate bodies, but of the individual members. Your social relations are not confined to the aggregated race, but are extended to individuals. History is not simply a great aggregation, but is constituted of numerous single incidents, actions, and experiences. The mountains, the sea, the earth, are each and all composed of particles. Did God make them as a whole and not the particles of which they are composed? Did He create the human race as a whole, and not the individual members? If He had created them all at once and by the self-same act or word, that would not have precluded the speciality of the particularity and individuality of the creation.

General government is based upon particular government, and is constituted thereof; and general providence, as before intimated, is based upon particular providences, and constituted thereof. It is claimed by some, that God has established numerous laws which work in perfect harmony, constituting a general system that never varies, and is never suspended, or the whole would be thrown into a confusion that would wreck creation. But if those laws be invariable in their operations, and cannot be suspended without grave interference with the system, there are other laws that may sometimes be brought to bear upon them as a speciality, to accomplish an important purpose, without producing the least jostle or confusion.

One of the admitted laws of nature is that water will seek its level, and that the stream cannot rise above its fountain; but when you dip a sponge in water, or insert a siphon in a cask, you bring another law to bear which causes water to run uphill and rise above its source.

There is such a thing as the law of mediation, which Sueton illustrates by a steamboat ascending the Falls of the Ohio. "The principle of gravity, which acts upon every particle of water in the rushing river, operates upon every part of the boat, her machinery and all her fixtures, and even upon the fire and steam; but, by the medium of steam, she moves steadily up the foaming rapids."

A ship does not destroy nor even suspend the laws governing the tides, but by the laws governing the winds, she overcomes the tide and sails to her destined port. Providence may, in special cases, bring to bear in an unusual manner the laws of refraction, to move the shadow back ten degrees on the dial of Ahaz, or to continue the sun's light to Joshua's army, notwithstanding the continued revolution of the earth; or use the wind to drive the waters into a walled heap for Israel to pass over; or, by some other law, throw a whole army into a confusion that insures victory to the opposing band; or increase the vibration so as to cause the walls of a city to totter and fall. And beyond all these, He who created the lion, may by some unknown law so control his savage nature as to preserve Daniel from his devouring jaws. He who by some unknown law made the fire and created human flesh, may by some unknown law render the bodies of the three Hebrews proof against the consuming power of the flames.

The Rationalist has much to say about law. The Christian believes as strongly in law as the skeptic does; but law is not a mode by which things do themselves. Law is God's administration of His government in both its natural and spiritual departments. When Jesus applied the moistened clay to the eyes of a blind man, He may have put in force the same law that God did when He formed man from the dust of the earth; when He breathed upon the disciples, as preparatory to their reception of the Holy Ghost, He may have put in force the same law that God did when He breathed the breath of life into Adam's nostrils; and when He said to the stormy sea, "Peace! be still!" He may have put in force the very law that God did when He said, "Let the dry land appear."

In the gospel system, repentance is a law: the law of reformation. No man can be expected to abandon sin till he realizes its turpitude. Repentance is compunction for sin and hatred of sin, and therefore its reformatory influence qualifies to reap the full benefit of forgiveness. Faith is a law; the law of trust. No man can trust in God's promise, and apply for its fulfillment without faith in that promise; nor trust in the vicarious merits of Christ, and appropriate them to his needs without faith in those merits. It is by the law of faith that man approaches God through Christ, and is thereby qualified to receive salvation by the merits of another, the merits of Christ.

But to return from this digression. The Psalmist not only bids the earth to rejoice, but exhorts the multitudes of the isles to be glad: thus presenting the very idea of minute carefulness upon the part of God. If the hairs of

your head be numbered, and the fall of a sparrow be noticed, His government must extend to the smallest point of carefulness. We are not to suppose that God's government is like placing a locomotive upon the track, with a full supply of fire and water, and the driving-valve permanently adjusted, to draw the train to its destination, without further interference. The Great Engineer is always at His post. Although the locomotive runs by law, the engineer violates no law when he regulates the speed; and when he brings the train to a pause to avoid running over that child, he does it by law as surely as he started it by law; and instead of the pause producing disaster, it avoids disaster. God is the great motive power of the universe, as well as the Engineer of its ever-revolving machinery, and all things are under His control, an infinite, unsearchable Being, whose ways are past finding out; with clouds of darkness around about him, so that the deep mysteries of Himself and government are hidden even from the angels; yet that He does reign, and reign everywhere, and in everything, we have the fullest proof; and we may see the handwriting on the wall, even though we be not always able to read the writing, nor to tell the interpretation thereof.

In providence God rules and overrules to the promotion of His glory, and the accomplishment of His purposes, and the welfare of those who trust in Him. He utilized the stubborn cruelty of Pharaoh to magnify His name by the display of His omnipotent power. Jacob knew not that he was co-operating with God's selection when he supplanted his brother Esau. Nebuchadnezzar had no intention of executing God's judgment when he spoiled Jerusalem, and carried Judah captive into Babylon; nor did the Romans suspect that they were fulfilling Christ's sentence when they destroyed Jerusalem and scattered the Jews over the whole earth. God said by Isaiah, x. 5: "O Assyria, the rod of Mine anger, and the staff in the hand of Mine indignation. I will send him against a hypocritical nation, and against the people of My wrath will I give him a charge to take the spoil, and to take the prey, and to tread them down like the mire of the streets. Howbeit he meaneth not so, neither does his heart think so; but it is in his heart to destroy and cut off nations not a few; for he saith: 'Are not my friends altogether kings?' Wherefore it shall come to pass, that when the Lord has performed His whole work upon Mount Zion, and on Jerusalem, I will furnish the fruit of the stout heart of the King of Assyria, and the glory of his higher looks."

Good government requires that the ruling authority shall have power to protect the obedient and punish the transgressor, and we may confidently expect "all things to work together for good to those who love God," and be assured that "though hand join in hand, the wicked shall not be unpunished;" for though clouds and darkness are so round about Jehovah as to involve Him in inscrutable mystery, yet He assures us that "righteousness and judgment are the habitation of His throne," and that "he that feareth Him and worketh righteousness, is accepted of Him." He rules for His people as well as for Himself, and is fully able to protect all who put their trust in Him, and in His own good way and time, to overthrow all who oppose His administration.

CENTREVILLE, Md.

EVOLUTION ONLY A HYPOTHESIS.—NC 6.

BY REV. J. J. SMITH, A.M., D.D.

Having stated in a former article that the gulf between the highest man-ape and man, instead of being very narrow, as some would have us believe, is actually the broadest that is to be found anywhere between the several orders and species, I now propose to point out this fact more in detail. In doing this it will be seen by a glance at man's nature and endowments that God has given him a distinction in the scale of being so high and profound, that the difference between him and apes is absolutely greater than that between apes and the lowest crustaceans.

Man is erect in position, and has his erectness indicated and enforced by the form and position of all his bones; but the ape has his inclined posture, forced upon him by every bone in his body, and cannot walk uprightly without holding on to something. Man has a double curvature in his back, which a well-balanced erectness requires, while apes have but one. Another broad difference is that all healthy human brains are structurally perfect; but the highest ape's brains are structurally imperfect. The human brain is *pleno-cerebral*; while all apes' brains are *manco-cerebral*. Besides, the highest apes have brains but half the size of the lowest human savages. Man is endowed with language, while even the highest apes have not so much as the organs of speech at all. Man's varied facial expressions, and joyous laughter, while they tell of his high social endowments, show also a mighty contrast when compared with the grim stereotyped seditateness of all brutes. No ape is susceptible of human culture, while on the other hand, of that culture even small children are susceptible. Man is progressive, both individually and collectively; all animals, however, including the highest apes, are stationary. They have not made the slightest advancement in all the past. They are to-day, in this respect, just where they were a thousand or ten thousand years ago. Man has a high order of esthetical sensibilities; apes have nothing of this kind. Man is endowed with the attributes of ambition and self-culture; apes are entirely wanting in both. Man can receive impressions from the intellectual, the spiritual, and the invisible; apes can only receive impressions from the physical through the senses of seeing, bearing, smelling, tasting, and feeling. They never rise above mere physical perception. Man has desires and aspirations that the material world can never satisfy; while the highest animals are content when their present wants are supplied with the physical. Man can contemplate the past and the future; animals live only in the present.

Another difference between men and apes, and which is well nigh boundless, is the endowment of the former with imagination, while the latter have nothing of the kind. Apes only creep and chatter, where man profoundly soars. They never construct mentally. There is with them no ability for invention, or combination, or so much as methodically arranging what they see or know. But man can do all these things; can soar beyond the region of sight and sound, toward the Infinite, until he not only roams amid unnumbered worlds but scales the dizzy battlements of Heaven.

Besides all this, man has the divine faculty of *reason*, while apes have only instinct. This places man infinitely above the high-

est brute. In consequence of this attribute, look at man's progressive march, and his intellectual achievements in the fields of art and science; his numerous mechanical inventions and appliances; his high range of susceptibilities; his astonishing mental acumen and versatility, as seen in his having harnessed the forces of nature, such as steam, and the lightnings of heaven to do his bidding; his wonderful achievements in poetry, history, painting, sculpture, and architecture; his scientific researches and explorations; his profound conceptions and mental deductions; his philosophical investigations; his astronomical achievements in determining the size, distance, density, axial gyration and the velocity of the orbital sweep of each planet of our system, together with the laws by which they are governed; his still greater strides as he towers above our system to roam understandingly and at will among the suns of other systems. In a word, look at his marvelous mental powers of induction, analysis, synthesis, and generalization; his astonishing capacity for mental abstractions and elaborate processes of thought in the higher mathematics; his mental forces as seen in his logical deductions and demonstrations; together with his marvelous conceptions of space, immensity, eternity, and the unconditioned and the absolute.

Another difference between men and apes, still greater than the preceding, is found in the moral endowments of the former over the latter. Man is most emphatically a moral being, with moral instincts, the world over. "Cast your eyes over all the nations of the earth," says Rousseau, "and all the history of nations. Amid so many inhuman and absurd superstitions, amid that prodigious diversity of manners and characters, you will find everywhere the same principles and distinctions of *moral good and evil*." But what do apes know about moral good or evil? or, when did any one of their number ever experience shame or remorse? or, where is the person that ever thought that an ape had disgraced himself by any act however low and vicious?

Is it any wonder that Haeckel felt himself constrained to admit, in view of the foregoing facts, "*that not one of all the still living apes, and consequently, not one of the so-called man-like apes, can be the progenitor of man.*"

Just here meets us another fact, namely, as the intermediate types between apes and men must have been higher organized, and superior to apes, and yet they have all disappeared, while apes continue, we are hereby furnished with a most emphatic contradiction of the doctrine of the survival of the fittest.

Still another crushing blow is dealt the theory of Evolution by the well-known fact that in many instances types and orders, instead of continuing to advance, have after reaching certain points retrograded. Among vegetable forms the highest cryptogams—called Acrogens (or upward growers, as the word from the Greek signifies)—culminated in the carboniferous period; that is, the latter part of the Paleozoic time. So among animals the division of Brachiopods, Trilobites, Crinoids, and others, reached their highest forms of development in the Paleozoic era. Amphibians culminated in the forepart of the Mesozoic period. Reptiles, and Ganoids among vertebrates, and Cephalopods (the highest among Mollusks) reached their zenith in the latter part of the Mesozoic era;

while brute mammals culminated in the Champlain period of Cenozoic time.

In each of these cases, after a tribe had passed its culmination, there was, contrary to the teachings of Evolution, progress downward instead of upward, backward instead of forward; so that the survival of the fittest in each of these cases was actually reversed. Surely Evolution is nothing more than a visionary speculation, an unverified hypothesis, an unscientific theory.

TARRYTOWN, N. Y.

CAMPING TOUR TO YOSEMITE VALLEY AND CALAVERAS BIG TREES.—No. 2.

BY PROF. I. L. KEPHART, A. M., D. D.

Tuesday morning, July 1st, being the time agreed upon for setting out on our tour, we were "up and around" at an early hour. All necessary preparations had been made the day previous; and still so many little details required attention that it was 8:30 A. M. when our wagon with "all on board" drew out of Woodbridge in the direction of Lodi. Prof. Klinefelter and I seated in front, the two women and Lizzie immediately behind us and all our supplies and accoutrements intact. To some of our good friends our venture looked wild and fool-hardy. The fact that we, who had been in California less than a year, would start on such an extended tour over such dangerous roads without any old camper or mountaineer to accompany us, was matter of astonishment to not a few. But they did not know that the writer was raised on the western slope of the Alleghanies in Pennsylvania, that during the last six years of his minority much of his time was occupied in teaming across those mountains and in rafting on the Susquehanna River, and that he had undergone a camping tour of two years with the Army of the Potomac in front of Richmond and Petersburg. Nor did they know that Prof. Klinefelter had served an extended apprenticeship on an Iowa farm and in camping in Kansas. Had they known this they would have looked with less "fearful apprehensions" upon our venture.

The day was a bright, clear, sunny one, such as is common in California from June till October. A two miles drive brought us to Lodi, where we added a few articles not procurable in Woodbridge to our supplies, and then proceeded in the direction of Lockford, along the line of the San Joaquin and Sierra Nevada Railroad. The drive was a delightful one. The road was level and solid as a floor, and on either side spread out the immense luxuriant wheat-fields, just ripe for the harvest. This valley is the wheat garden of the world. For bountifulness of yield, easiness of cultivation and excellency of quality it can be excelled nowhere.

Having passed through Lockford and Clemens, the former 10, and the latter 15 miles from Lodi, we halted to feed our horses and eat luncheon, beneath the wide-spreading boughs and grateful shade of an immense live-oak. This was a new experience. Our camp-table (a folding one), our camp-stools and prepared eatables were soon brought out, water was procured from a neighboring well, and we sat down to eat, our surroundings presenting a decidedly cozy appearance. Luncheon over, while we picked our teeth, we held a council. Up to this time it was our purpose to visit, first, the Calaveras Big Trees, and then go on to Yosemite.

The result of our council was a change of programme—a resolve to go direct to Yosemite Valley, and “take in” the Big Trees on our return. We concluded that, inasmuch as Yosemite is the “biggest thing” in California, we would make *sure* of seeing that by going there direct. This point settled, 2:30 P. M. found us seated in the wagon and on the road to Wallace.

Through this village (then the eastern terminus of the S. J. and S. N. R. R.) we passed about 4 P. M., and two miles east of it we left the main road leading to San Andraes and the Big Trees, and turning south-east, took the road that leads to Jenny Lind and Milton. On this road we proceeded about five miles, to the ranch of a Mr. Whitney, when we concluded to “go into camp” for the night, it being now six o’clock. Mr. W. treated us very generously, gave us stabling and plenty of hay for our horses, and would not receive a penny from us in pay for the same, having learned that we were from Woodbridge and connected with the college there.

“Going into camp” for the first time was quite an experience. The understanding was that Prof. Klinefelter would attend to the horses, and that your contributor would be “the man-of-all-work” in the culinary department. The wagon was stationed alongside the road, a fire was soon started, water brought, stove, kettles, coffee-pot, potato-sack, provision-box, table and stools brought from the wagon, and in a short time we had a very bountiful supper spread which our keen appetites rendered doubly welcome. Supper over, the dishes washed, and things set away for the night, we began to arrange for sleeping. The evening being dry and pleasant, the Professor and I concluded to sleep under the wagon rather than remove the seats and baggage from within. Accordingly, we spread an armful of new hay on the ground, spread a comfortable on that, and so made our bed. This, however, did not prove as comfortable as we had anticipated, and for two reasons: First, the hay was just in a sweat, and the heat therefrom threw us into a violent perspiration. Second, the hay was made of “wild oats,” which grows abundantly in the “foot-hills” of California. Now this wild oats has a peculiarity of which we heretofore knew nothing. The seeds are sharp-pointed and barbed, and each individual grain has a wonderful propensity for sticking into and working *through* clothing, and wherever it goes through it pricks tremendously whatever it encounters, and when that happens to be your own sensitive skin, you do not sleep very much during the operation. Well, we had quite a time with those wild oats. We had often heard of boys sowing their wild oats, and now we wondered if this was the kind. However, we got rid of them in about three days, but we did not make our bed on wild-oats hay any more. We had enough of them.

For reasons above stated, we arose earlier than we had intended. The Professor looked after the horses, and then took the gun and looked after jack-rabbits and quail, which were skipping and crowing all around us. These abound in the foot-hills in great abundance. The jack-rabbits are, when full-grown, about a foot high, two feet long, and, next to a full-blooded donkey, sport the longest ears, in proportion to the size of their bodies, of any animal known. For fleetness of foot and jumping high, they are almost a match for the grey-

hound. When about half grown their flesh is tender and savory, but the full-grown jack-rabbit is dry, tough eating. The quail here are a little larger than quail in Pennsylvania and Ohio, and in voice and appearance they are quite different, the head of the male bird being crowned with a peculiar dainty tuft of feathers. Although the Professor’s gun “spoke” twice, yet we did not have any quail or rabbit for breakfast, and his decision was that the kind of shot he was using was several grades too fine. You know the blame of a mis-shot must rest somewhere other than on him who shoots.

Having risen somewhat early, it was decided not to disturb the women until breakfast was ready. So we busied ourselves, doing our best, and they were surprised on being invited out to what we called a grand breakfast of fried potatoes and onions, coffee, bread, butter, syrup, pickles, marmalade, and cold roast mutton. This meal was partaken of by all quite heartily. The coffee was praised, the potatoes and onions were lauded, the *et ceteras* were eulogized, and in a remarkably short time the dishes were washed, the beds made, the packing done, the wagon oiled, the team harnessed and hitched, and, “all aboard,” we moved in the direction of Jenny Lind. Our first day had been warm and dusty, and our first night cool and pleasant; and we now started on the second day of our tour, buoyant with hope and big with pleasant expectations.

THE NEW THEORY OF SOUND.

BY REV. J. I. SWANDER, A. M.

A few years ago Dr. Hall, editor of this magazine, while pressing his right ear to the bosom of Nature, detected a peculiar throbbing of her heart, and heard an inaudible utterance of a “still, small voice,” which seemed to declare that there is something more than matter and motion in the universe of God. He, therefore, started upon a new line of investigation. Investigation led to such discoveries in science as to justify him in entertaining the belief and announcing the conviction that there is, throughout this vast expansive creation, an order of immaterial being as real as the trees and rocks of the earth, and just as substantial as the moon and stars of the firmament. Subsequent investigations deepened his former convictions, and led him to apply his new apprehensions of the truth to some of the existing theories of materialistic science which were then spreading themselves like green bay-trees in the most popular teachings of the learned world. From his new stand-point he viewed and reviewed the most learned works on Evolution with such a degree of satisfaction and success as to encourage him to select a common battle-field, and stake the truth and value of his alleged discoveries upon the result of a single campaign. He therefore chose the *sound* problem, and announced that the wave-theory, founded upon the supposition that all substance is material, is a fallacy and a delusion. At this point he introduced his new theory of sound.

What is that new theory, and what is the difference between it and the opposite theories now under consideration?

The wave-theory makes sound consist in a molecular or undulatory motion of the matter through which it is conducted, or (according to Prof. Stahr and other advocates thereof) the

"sensation" produced in the brain by such alleged motion. The new theory, which is now in the formative period of its existence, holds that sound is something in itself—an element of force—a substance as different from the medium through which it travels as electricity is different and distinct from the material wires which serve as the medium of its conduction. The difference between the two opposing theories relates, therefore, not so much to the properties of sound, or the law of its travel, as to the very nature of the thing in question. *Is it something, or is it the mere phenomena of something else?* To be, or not to be, that is the question? Substantialism takes the affirmative side of the question, and, assuming sound to be a real entity, and not the mere motion of some other entity, harmonizes it with all the accepted forces of nature, as Dr. Hall has shown in his unanswerable writings upon the subject. No one believes heat to be the stove, or the air through which it radiates, or the mere sensation produced thereby. Gravity is not the earth; neither is it the pebble which the gravital force causes to fall, nor is it the motion of either of them. Magnetism, which lifts a piece of iron, is not the steel from which it emanates, nor any motion of the atmosphere through which it passes in its mysterious mission. Odor is not the rose, nor is it any part or motion of the air through which it travels to reach the olfactory nerve, neither is it the motion of the rose or of the nasal membrane. If, therefore, odor is a real substance, which produces sensation by actual contact with the appropriate sense-nerve, why is not heat and light and sound substances, though possibly more refined in their nature, analogous to the substantial currents of electricity, or rays of substantial magnetism? Thus has Wilford reasoned for a number of years, and the fact that some men are not yet convinced that he occupies the Gibraltar of physical science is an evidence either that the truth is not very mighty, or that they are destitute of the necessary faculty to discern the said article.

But is it right for Dr. Hall, or any other man, under the conviction that he has made a valuable discovery in some department of science, to announce such discovery to the world, and upon its basis advance a theory in conflict with all that has ever been taught upon the same subject? We answer unhesitatingly not only that such a course is morally right, but also that under such circumstances silence would be treason against truth, and crime against those whom the truth was ordained to make free from the thralldom of possible error. We conceive that there is such a thing as a probable preponderance of popular opinion favoring those conclusions which have been reached through the intellectual wealth and wisdom of the ages; but we are not unmindful of the fact that the accumulated testimony of those exceedingly wise ages has frequently done very little more than to make room for the verdict that "the wisdom of the world is foolishness with God." This will continue to be the case until that which is perfect is come. As long as the highway of history is strewn with the fragments of shattered theories and exploded orthodoxies, even the crowning grace of Christian charity may be permitted to shrug her comely shoulders with consistent hesitancy before she "believeth all things" and "rejoiceth in the truth." We are aware that persons who come before the schools with new ideas, and with the courage to pro-

claim them to the world, take their own risks of being convicted as fools; but it does not, therefore, necessarily follow that the light should be put under a bushel because it is new, neither does it follow that an assumed pharisaic indefectibility on the part of the scholastic world is conclusive evidence that it is either in the possession of truth or in the practice of wisdom. A thorough examination and consideration of all new theories is a duty that the world owes itself, and a respect that should never be withheld from the majesty of the truth which has frequently been found enshrined in its most seemingly absurd propositions. Talk not of "respectable" institutions in favor of this theory or that! History is full of proof that in matters of truth and right God and a few others constitute a very clear and respectable majority over all the rest. The Reformers were branded with being a set of crazy fanatics; Paul was charged with being "the setter-forth of strange doctrines," a "babbler," and a "fool;" and Jesus Christ was condemned as an innovator; yet they were all in the line of duty, and consequently on the highway to that imperishable glory which has never yet been reached, except through the persecutions of the majority. The world is more indebted to its "fools" than to its custodians of wisdom for the progress already made in the right direction. What would be its condition to-day if all its paradoxes had been strangled in their birth by the midwives and high priests of "regular" and "respectable" authority in matters of religion and science, and all its so-called innovators had been crucified? Nay, rather, what would be the condition of the world if some of them had *not* been condemned and crucified for bearing testimony to paradoxical truth? Christianity at its introduction was the most paradoxical movement that ever flew into the face of an accepted order of things, and it is still doing more toward revolutionizing the venerable fallacies and frauds of history than all other combined powers of our polluted planet.

If, then, as we have just seen, this new theory of sound, in its appearance upon the world's scientific stage, is justified by the authority of an example that came down from God out of heaven, what, under the circumstances and according to the prevailing rules of evidence in such cases, is the *presumption* for and against it? That the weight of books, the great bulk of manufactured eminence in questionable scholarship, and the wide range of its dominion, are favorable to the undulatory doctrine, we admit. We also admit that the presumption favors the old theory upon the ground that it is an establishment of long standing. On the other hand, we claim that it is this very admitted presumption in its favor that begets presumptuous arrogance and undue self-deference on the part of its leading advocates. Under this state of things there would be no hope for the world were it not for the fact that, while possession is nine points in law, the tenth point is frequently the position preoccupied by truth. Let us look at this matter for a moment. Let us examine and analyze a sample of the meat on which the old theory feeds. Let us see whether our presumptuous Cæsar is really fat, or only flabby. The town-clerk of Ephesus presumed too much in favor of an established institution, and upon the supposed indefectibility of his Diana, and therefore exhorted the people to be quiet, "seeing that these things can-

not be spoken against." So were the Pharisees too free in the use of their last argument when they presumed that Christ was to be regarded as an impostor because the "rulers" of their established theory in religion had not believed on him. In the same spirit of supercilious sovereignty, and in the same line of argument the chemical professor of Vanderbilt University disproves the reality of the rising sun by a magisterial reference to the fact that the preceding night was full of "respectable" moonshine. Such is the haughtiness of error after it has been a long time upon the throne. Contrary to faith, reason, common sense, and brutish instinct, it rejects a thing because it is new or retains it on account of its age. According to such progress, the blood of men would still be (theoretically) stagnant in human veins, the earth would be the center of the solar system, and the world would move on to scientific perfection upon the back of a mud-turtle. Religion would be confined to the traditional rut of Judaism, expounded by the town-clerk of an idolatrous city, who, like the apostles of the wave-theory, adopted and recommended the policy of silence.

What, then, is the real testimony of such silence? It signifies nothing else than inability to answer the charge preferred by the corpuscular theory, and, therefore, calls into being a legitimate counter-presumption favoring the truthfulness of the new doctrine. "On the whole, accordingly," says Archbishop Whately in his "Elements of Rhetoric," "of these opposite presumptions the counter-presumption has often as much weight as the other, and *sometimes more*." The author also affirms that the weight of this counter-presumption arises "from the circumstance that men eminent in any department are likely to regard with jealousy any one who professes to bring to light something unknown to themselves; especially if it promise to supercede, if established, much of what they have been accustomed to learn and teach and practice. There is also this additional counter-presumption against the judgment of the proficient in any department; that they are prone to a bias in favor of everything that gives the most palpable superiority to themselves over the uninitiated." Now we mention the simple fact of history that a student of Nature professes to have brought to light "*something hitherto unknown*," and upon which he has founded a theory. He has also accompanied his announcement with statements of alleged discoveries of numerous confirmatory facts which seem to place the correctness of his new theory beyond the reach of a rational doubt. Prompted by the courage of his convictions, he has publicly announced to the scientific world that Sound consists of corpuscular emissions of immaterial substance, and that, therefore, the teachings of Tyndall, Helmholtz and Mayer are radically incorrect. There is also abundant evidence that they have heard this serious charge, and that for a number of years they have studied and practised a persistent silence, and that, too, under the most destructive enflaming fires ever belched from the batteries of stubborn facts.

For the truth of the foregoing assertion the reader is referred especially to the editorials in the October number in which the old theories of sound and force are shown to be cob-houses divided against themselves. And still the silence continues. How remarkable! We accept the inspired statement that the opening of the

seventh seal produced a half-hour of silence in heaven, but we have neither the faith, reason nor charity to understand why the breaking of the seal of Substantialism on earth should produce such an eternity of silence in the painful purgatory of materialism. Taken all together, the anomalous conduct of the leading wave-theorists can be accounted for only upon one supposition, viz.: that their doctrine is founded upon a most monstrous misapprehension of the truth. True, others have broken silence in defense of their acoustical masters, but there is no evidence that these undulatory disciples have spoken by authority. Besides, their weak attempts were generally so full of fatal concessions and contradictory arguments as to lead the careful reader and close student to conclude that either the ass did not know his master's crib, or, knowing, failed to get sound corn in the ear.

There is another view under which the weight of the presumption preponderates in favor of the corpuscular theory. It is a fundamental law in religion and science that, although principles are eternal and unchangeable, old forms and imperfect things pass away and all things become new and more perfect, yet in such a way as that nothing can transcend its eternally ordained sphere. With no sympathy for that type of Evolution which holds and teaches that certain orders of being can rise above themselves, we hold that progress is a law of history which will continue in force until perfection becomes the end of the law. That, then, which appears in the direct line of progress has, notwithstanding its novelty as a theory, a large measure of the presumption in its favor, shifting proportionately the burden of proof to the other side. The line of the world's progress has been from the letter toward the spirit—from the material toward the immaterial—from the seen, which is temporal, toward the unseen, which is eternal. "Howbeit, that was not first which is spiritual, but that which is natural, and afterward that which is spiritual." There is a general truth expressed in the above quotation from St. Paul. All history confirms its truth and demonstrates its general applicability. Thus heathenism with its legions of material gods began to recede before the announcement from heaven that Jehovah is a Spirit, and that all acceptable worship must be in spirit and in truth. Next, Judaism, "not able to make the corners thereunto perfect," was superseded by Christianity as a higher and more substantial type of revealed religion. In the course of time the scholastic apprehension of Christianity, which may be denominated as the wave-theory of the Gospel, and the concomitant contrivances of the hierarchy were condemned and superseded by the Reformed theory of salvation as more spiritual and essential than that old shell of materialistic mummeries, which, for a thousand years, had been laid as an embargo of stagnation and death upon the heaven-chartered ship of Christian progress. So now the Substantial Philosophy, with the corpuscular theory of sound as one of its branches, takes its position in the line of the world's normal trend as a legitimate production of heaven, through the dynamic force of history, that grand old chariot in which Jehovah rides with truth to victory.

What, then, will be the practical effect of the change which now seems so inevitable? To calm the fears of those whose nerves may be rather sensitive, we answer: 1. There will be no change in the nature of sound as such; nei-

ther in the law of its generation and propagation. Taunter will be no louder than formerly, and music will still retain its charms. The tympanic membrane will not be changed, although it may be found necessary to abbreviate a few ears which are now of undue(?) latory length. The cricket will be deprived of his power to churn the atmosphere of the heavens into melody, but his life shall be spared because he was not willingly made subject to such vanity. In short, there will be no essential change in sound, except that the tone of the wave-theorists will be lowered to a most melancholy flat. 2. It will be the complete exposure of a ridiculous fraud in acoustics, and furnish a key for the detection of corresponding frauds throughout the entire department of physics, as well as the opening of a door for a more correct apprehension of the truth in the sphere of religion. In fact, the adoption of the new theory will lead to such a general substitution of substance for the different modes of motion, and so revolutionize the world's scientific thinking as to demonstrate the possibility of learning the soul's immortality from the oracles of God in the temple of Nature.

SIR WILLIAM THOMSON IN PHILADELPHIA.

BY CAPT. R. KELSO CARTER.

The "Second Scientist in the World" lectured in the Academy of Music, Philadelphia, on Sept. 29th. A few notes from his lecture will no doubt be exceedingly suggestive to the readers of THE MICROSCOP. His subject was, "The Wave-Theory of Light." In his introduction he dwelt at length on the wave-theory of sound as a perfect parallel, and as serving to prepare the way for the more stupendous numerical calculations and values in the movements of light. Using his hand as an illustration, he said:

"I move my hand back and forth one full vibration in a second; thus. By a violent muscular exertion I can perform five full vibrations or motions in a second; but this requires twenty-five times as much strength as to make one only. We can imagine a very strong arm making ten (this would require one hundred times as much strength, R. K. C.); and finally, an arm making thirty full vibrations in a second would produce a sound, and an exceedingly loud sound it would be I assure you." (Of course nine hundred times the strength would be required. R. K. C.)

I remark that the idea of rapid or swift motion is plainly visible in all this. But lest there should be any doubt upon this point, read the following. Sir William said:

"When I press my hand *vehemently* forward, there is formed a condensation; and when I press it again, another is formed. And each condensation is followed by a rarefaction."

There can be no dispute about the meaning of this. The "second scientist in the world" (Helmholtz is styled the first) most distinctly states that a "vehement" pressure causes a condensation. It is clear that he has not read and pondered upon the famous experiment of the tuning fork, sounding audibly while moving at the rate of only an inch in two years. He is evidently still of the impression that a sounding body must be moving vehemently, or at a very high rate of speed. Won't somebody please send him a copy of last December's MICROSCOP containing my report on the slow motion of the tuning fork? I do not like to do so myself.

Again, speaking of the "luminiferous ether," he said:

"One thing we are sure of, and that is of the existence and *substantiality* of the luminiferous ether."

This is good ammunition for Dr. Hall. It was not an isolated utterance by any means. The great scientist seemed determined that we should all understand him on this point. He referred to it again, and again, in the most positive and emphatic manner. He said:

"I am a great deal more certain about this luminiferous ether than I am about the attraction of gravitation. This luminiferous ether is an *elastic solid*. It has the rigidity and elasticity of a *solid*. Whether it ever actually yields and cracks or not, I am not certain. I have thought that lightning, and the Aurora Borealis may be simply luminous cracks in this ether; but that is not certain. I throw that out more as a suggestion from dream-land than anything else."

Now what will THE MICROSCOP say to this? * "An elastic solid!" Think of it! Prof. Tyndall hinted at the same notion when he said ether is capable of inertia; but in one sense he went further than Sir William. For if a substance is capable of inertia, it is manifest it must possess weight. There can be no inertia without weight. It is impossible, and absolutely self-stultifying to speak of the one without the other. But Sir William is hardly ready to plunge so deeply into the fog as that. He said:

"It is true that we cannot detect any evidences of the condensation of this luminiferous ether in the immediate vicinity of the sun, where, of course, the gravitation is enormously increased; yet I will not call the ether imponderable. I am not prepared to say that. I will say that we do not *know* it to possess weight. We do not *know* that; but I call it matter."

As if all this did not emphasize the matter sufficiently, he recapitulated at the close, and dwelt especially upon this point. He remarked:

"I am afraid that, after all I have left you a little in doubt as to what this luminiferous ether really is. It is matter; millions of times less dense than the air, but possessing the most prodigious rigidity in comparison to its density."

Now what does that mean? Clearly, Sir William remembered that this ether is obliged to vibrate back and forth *seven hundred million million* times in one second, in order to produce a wave of violet light. He remembered, in a hazy and uncertain way, that these inconceiv-

* "THE MICROSCOP" has simply to say that the assumption of an *elastic solid* which causes no resistance to material bodies passing through it, which circulates freely through imporous glass and even diamonds, which none of our senses can recognize, and which no chemical or mechanical test can verify, and still a *solid*, is a contradiction in terms and a stupid, puerile absurdity, only worthy of a place among the disordered imaginings of a scientific crank. To go to this extreme of assuming the existence of an *immaterial substantial elastic solid (ether)* in order to get some real substance out of which to form luminous undulations, and thus vindicate light as a "mode of motion," when the acceptance of light itself as an immaterial substance having none of the properties of matter and penetrating solid bodies in defiance of material conditions will answer every practical purpose and solve every scientific problem involved in the premises, is one of the inexplicable vagaries of modern physicists which the Substantial Philosophy is rapidly bringing to the surface. Captain Carter deserves the thanks of all independent scientific thinkers for turning this light and sound nonsense inside out, and thus aiding THE MICROSCOP in its exposure of such transparent philosophical folly as that dealt out in the lectures of Sir William Thomson, as also illustrated by his barometric sound-pulses, which are discussed in another part of this number.—EDITOR.

vable vibrations are the result of a "mode of motion," "impulse," received from the vibrating particles of the light-giving body; and he must have had a dim recollection of the fact that air, which is perfectly elastic, has not "rigidity" enough to transmit the violent, "impulse" any faster than 1100 feet in a second. He may have casually considered the fact that the most "rigid" body we have—steel—will hand over the "impulse" a paltry 19,000 feet in a second, although not quite so "perfectly elastic" as air. Putting all this together in a general, haphazard, really unconscious way, a sort of "mode of motion" in the particles of his brain, sent forth a little glimmer of light, and he dimly saw that the "eternal fitness of things" didn't exactly fit in this case. Of course he went this far; but he might have reasoned thus: If a body is perfectly elastic, it cannot be more elastic. Air has always been conceded to be perfectly elastic. But air transmits sound much more slowly than iron, wood and water. True, we have been accustomed to say that this is accounted for by the fact that "the elasticities of the metal, the liquid, and the wood as compared with their respective densities, are vastly greater than the elasticity of air in relation to its density" ("Tyndall on Sound," page 47). But this quotation shows clearly that the word "elasticity" is used out of its true meaning, and is made to refer to the quality of the resistance offered to pressure, and the rapidity of recovery when the pressure is removed. Hence we want another word—ah! I have it; let us call it "rigidity." The iron, the water, the wood, etc., have greater "rigidity" in comparison to their density, and so the "luminiferous ether" has greater, "prodigiously greater."

Let us examine this a little in the light of plain common sense, and solid facts. The iron, wood, and water send the pulse quicker because they have greater rigidity in comparison or in proportion to their density than air has. Very well; let us apply this rule all round. Tyndall says, p. 39, "The less the compressibility, the greater the elasticity, and consequently the greater the velocity of sound through the liquid." On the same page he gives the velocity of sound through lead to be 4,080 feet per second, and on the previous page, the velocity through water to be 4,714. Here then we have the velocity of sound through water and lead as the same. Now the density of lead is just about eleven times that of water; and Tyndall says, p. 20, "Other things remaining the same, an augmentation of density always produces a diminution of velocity." Hence it is perfectly clear that the velocity of sound in lead ought to be very much slower than in water. But it is the same. Now how can this be accounted for? The wave-theorist says, lead must have greater "elasticity compared with its density." Is this so? Tyndall says, p. 25, that "elasticity is measured by compressibility." Which is more compressible, lead, or water? It is a well-known fact that a leaden bullet may be molded cold in a small hand-press; and that the density of cold-pressed bullets exceeds that of those cast from a melted state. This excess is solely on account of the pressure. But what effect would such a trifling pressure have upon water? What student of philosophy does not know that water, and all liquids, are the most incompressible things we know of? And who does not know that even thousands of pounds on the square inch cannot

sensibly compress them? Prof. Tyndall gives the co-efficient of compressibility of sea-water as .0000438. How will lead compare with that? Let Sir William and Prof. Tyndall figure it out between them. But again, Prof. Tyndall gives the velocity along the fiber of pine-wood as 10,900 feet, and across the rings as 4,611. Now, in the name of common reason, is not pine-wood infinitely more compressible than water? Is it not therefore much less elastic? And is it not also only a little lighter or less dense? Well, then, put these together and see that, the densities being very nearly alike, the velocities ought to be the same. If not the same, the one showing greater velocity ought to have vastly greater elasticity in order to account for it, for do not these great scientists tell us that the velocity is greater because the elasticity is greater in proportion to the density? But here is pine-wood, with an elasticity (shown by its compressibility, or in any other way) vastly less than that of water, its density not essentially different, but the velocity of sound through it in one direction, just equal, and in another direction, two and a half times as great as in water. I might easily continue these comparisons at great length, but this will suffice.

Now, the "luminiferous ether" is assumed to be "matter." Sir William insists that it is an "elastic solid." But he tells us that it is "millions of times less dense than air." There being nothing but theory to deal with, anything can be assumed. This remarkable rarity, then, is a good argument for the propagation or transmission of a "pulse" of sound or light at a great velocity. Less density, more velocity. But even this would not be plausible enough unless the "prodigious rigidity" were added. Because Sir William sees that if a man's arm must be so rigid or strong to vibrate back and forth ten times in a second, what must be the strength or rigidity stored up in a molecule of ether to enable it to vibrate seven hundred million million times, or more? This, then, is the difficulty.

The great scientists see that, in order to yield, and in order to react such a marvelous number of times in a second, the substance so reacting must possess "rigidity" millions of times beyond that of steel. But I submit that it is impossible to imagine any "matter," any "elastic solid," as being so miraculously rigid and yet not opposing the progress through it of a material body. If the ether particles kick against each other with such a "prodigious rigidity," how in the name of reason do they allow the stars to rush along at such great speed without opposing any resistance? Sir William said that the earth meets with no more sensible resistance in rushing through ether, at the rate of 1100 miles an hour, than a bullet would feel in sinking through an inch of pitch in a year.

But there is one final and original argument which I have been holding in reserve for many months; an argument so overwhelming, and so absolutely unanswerable, that the "second scientist in the world," and the youngest student in any college, can equally feel its force. Let the skeptics and the wave-theorists, whether of sound or light, pay a little attention to this, if they fail to see anything else. Every one who has read a natural philosophy knows how the original calculation of the velocity of light was made. Jupiter's moons flash out when they emerge from behind the planet, and the time of their reappearance was noted. When the earth was farthest from Jupiter, these reappearances took place some sixteen seconds later than when

the earth was on the other side of its orbit, and nearest the great planet. Manifestly the cause of the delay was the 190 odd million miles across the earth's orbit. This gave the original calculation of 192,000 miles a second. But modern science undertook to measure this marvelous velocity by actual experiment. Machinery was devised, and a flash of light, passing between the spokes of a rapidly revolving wheel, and reflected by a mirror ten miles away, were caught upon the flying spokes upon their return, and thus their velocity accurately determined. It came near to the astronomical calculation; and, since the reduction of the sun's estimated distance, the two have closely agreed. Now for the

FINISHING DEMONSTRATION.

The light, in the first calculation, traveled over a space filled only with "luminiferous ether." In the latter case it traveled through air alone, along the surface of the earth. Its velocity through the "prodigiously rigid" ether is therefore precisely the same as through the ordinary atmosphere. The ether is "millions of times less dense than air," and therefore the velocity in ether should be millions of times greater, or at least the square root of those millions. But the "rigidity" of the ether is "prodigiously" greater than that of air; hence the velocity should be "prodigiously" increased from this cause also. But, the great, cold fact is that the velocities across the mighty void between us and Jupiter's satellite, and upon the hillside near Paris, are actually one and the same. In hydrogen the velocity of sound is 4,164 feet per second. Why? Because hydrogen is fourteen times rarer than air. In carbonic acid it is 858. Why? Because carbonic acid is somewhat denser. But light in air actually travels as fast as it does in ether, although the densities differ by millions of millions, and the elasticities or "rigidities" differ "prodigiously." Some one may say, are you not mixing sound and light? Not at all. These gentlemen tell me that light is a vibration of particles like sound; only differing in the directions of those vibrations, and that it is propagated in a similar way. In the case of sound one particle pushes the next straight ahead. In the case of light it pushes it up or down a curved incline.

Lastly. If the objector assert that the air does not vibrate at all in transmitting light, but that the ether in the air does the transmitting, I ask: Why does not the ether in porous cork, or sponge, or paper, or cloth, transmit it just as well? Why does not the ether in liquid ink transmit light as readily as the ether in water? The ink is porous, as is shown by its dissolving other substances without occupying more space; but somehow the ether seems to be paralyzed, for it won't come up to time. If the ether does all the vibrating and transmitting by virtue of being in the air, how does it manage to insert itself so abundantly, and to find room to vibrate freely in dense glass, which has no pores at all, and fails so utterly to operate in a porous, soft pine shingle? If it was light that photographed Captain Abney's boiling teakettle, in a dark room, and if this light can be called, as Sir William styled it, "radiant heat," is heat then only a motion of the particles of ether in the iron? We have always been told that heat was an actual vibration of the particles of the heated body itself. The merest beginner in philosophy knows this perfectly.

These questions can be pressed *ad libitum*, but space forbids, and I close the case with the expression of a hope that the "second scientist in the world" may find his tremendous "certainty" about the "luminiferous ether" to possess less "prodigious rigidity," and that it may not be so dense as to preclude the possibility of being penetrated and permeated by common sense.

PA. MILITARY ACADEMY, CHESTER.

UNREASONABLE SKEPTICISM.

BY REV. GEORGE SEVERANCE.

By unreasonable skepticism, I mean that cynical unbelief which discards the being of God in every theistic sense, scouting also the idea of a hereafter life. For now it is no part of my purpose to discuss the differences that obtain in relation to the divine nature, nor do I, in this brief essay, propose to settle all controversies that have arisen relative to the existence that awaits us, when mortality is swallowed up of life.

While right reasoning may demand a recognition of God's being, misconceptions touching His personality may exceed our estimation. The most grotesque views respecting the life to succeed this may prevail without invalidating the proof, if a man die he shall live again. Professions of faith may fashion the gods represented, and yet no hypothesis is so plausible as the asseveration, "God is."

Columbus' conceptions of a western continent, before starting out on his voyage of discovery, might have been vague; but a western continent awaited his discovery. We may hold to God's duality, be tri-theists, or monotheists, yet the being of God, in all His plenitude, is as valid and complete as if all were of one mind touching this momentous theme. No matter what form or shape individual speculations may take, the verdict of the mass of mankind will be, a Supreme Intelligence runs the machinery of the universe, though the skeptical query may be pressed, why do men of intellectual vigor reject the theistic view of God, repudiating *in toto* all faith in immortality, if these beliefs are founded in fact? Our answer would be, that this class of reasoners are not possessed of well-balanced minds. To reason fairly on all subjects that present themselves for reflection, all the human faculties must be developed and well rounded out.

Whether we accept the science of Phrenology or not, it has very nicely and accurately classified the human faculties. We know that in some persons certain faculties are very strong and brilliant. Those who are clear-headed and far reaching in one direction, are very short-sighted and unreasoning in other directions. If Webster, the statesman, was strong, clear, and convincing on national questions, he was utterly incompetent as a financier, and many of our able financiers lack all the requisites of able statesmanship.

Skepticism errs at the starting-point: hence the erroneousness of its bald and irrational denials in the outset. To begin with, it denies to man a religious nature, while mental science absolutely establishes the fact that man by nature is religious, and recognizes in some form a Supreme Being, venerating and worshiping one who is the Cause of causes. Veneration,

hope and marvelousness are religious human faculties. Under their influence, scores of able intellects as our world has produced have worshiped and adored outwardly and inwardly, being immersed, as it were, in God, feeling an inward consciousness of their immortality. Brilliant as may be their intellects, those not possessed of these religious faculties cannot venerate, worship and adore, because there are no skylights to their souls. They are natural-born skeptics, as some are born destitute of sight, though intellectually they cannot reason on subjects appertaining to this absent member of the five senses. How can one taste who is destitute of the sense of taste? or how can one hear who is destitute of the organs of hearing?

Without musical faculties, distinct from the intellectual, one can never become a musical expert. If the organ or faculty of calculation is wanting, no proficiency will be made in mathematical studies; for this reason such pupils should not attempt to reason on mathematical subjects, though possessed of Baconian intellect, because not mathematically equipped. Those who have no time nor tune should never aspire to teach music; for they lack the mental requisites. I once knew a very able member of Congress who could not distinguish between "Yankee Doodle" and "Old Hundred." His intellect in the abstract might have fitted him for President of the United States; but he would have shown his weakness had he entered into debate with an ordinary musician involving questions of harmony.

I have known clear-headed and intelligent merchants who could not distinguish one color from another. They might deny the possibility of any varieties of color, debating long and loud; but under the circumstances, of what value were their opinions on a subject upon which nature had not fitted them to form an intelligent opinion? John Locke, the philosopher, and George Combe, the phrenologist, could not be said to have more than a smattering of mathematics, as they were destitute of the mathematical faculty. Truman H. Safford and Zerah Colburn were enormously developed in the mathematical region and were mathematical prodigies. But as it respects pure intellect, these mathematicians were pygmies compared to Locke and Combe. In relation to a man's specialty, he may tower above most of his fellows, while sinking in comparison with their superiors where they lack.

Without fear of controversy, we affirm that the champions of Atheism and non-immortality are incompetent to reason on these and kindred topics, because of the undeveloped condition of their religious faculties. A woman destitute of philoprogenitiveness would be in no condition to give us a rational exposition of a mother's love.

What shall we think of that perversity of intellect which sees no evidence of intelligent design in the vast Universe? Were I to present a manikin, the work of human skill, perfect in all its parts, there is not an intelligent infidel on the face of the globe but would regard such a specimen as proof positive that a skillful designer and mechanic was the maker. When I produce a living, throbbing specimen of a man with all the mechanism of the human body in perfect operation, possessed of the five senses, the blood circulating, the digestive apparatus doing its work, the laws of reproduction made

plain; and a sapient atheist tells me he has no need of a creative intelligence to explain these wonderful phenomena, I can but repeat, "The fool hath said in his heart there is no God." From all possible directions we hear the atheistic assertion of the eternity of matter. What does the unbeliever know from his point of observation about matter's eternity? Can he account for matter, with all its wondrous properties, so well without God as I can with God? It is the most nonsensical of all nonsense to assert so emphatically the eternity of matter, while discarding the eternity of intelligence. The Universe is full of divine art, and somewhere there must be Infinite Intelligence to model and produce what challenges the reverence and devotion of the devout thinker. With the scroll of the heavens unrolled before me, the green earth and sea beneath my feet with all their wonders, shall it be called superstition that prompts me to assert the eternity of Intelligence when I speak of Final Cause? The fountain from whence finite intelligence sprung must be greater and higher than the stream that flows from this source.

Ingersoll, the American *beau ideal* atheist, asserts, were health as catching as disease, were Russia as well governed as Massachusetts, and were some other things to his liking, the divine Existence would be possible to his apprehension. But when in the region of causes, we may be enamored of the skill and workmanship, without knowing the precise character of the artificer. Were it settled forever that there is an Infinite Intelligence merged in causation, the character of that intelligence would be another subject for discussion. Could I perform greater wonders than any man living, my goodness or badness would still be an open subject for discussion.

Both historic and pre-historic times demonstrate the fact that man has erected his temples and pagodas, offering up prayers and incense to the Infinite One. Pyrrhonic iconoclasts may demolish existing religions, and the proof will be forthcoming: man will have some type of religion, and the prevailing religions would soon be replaced. Let our carping skeptics measurably respect the general convictions of mankind, remembering it is not the culmination of wisdom to ignore God and assert that death is an eternal sleep, for human nature will reassert itself and a rational faith will triumph, God as ever will fill His place in the realm of mind and matter, and immortality will prove triumphant.

SOUTH ROYALTON, Vt.

CHRONOLOGY AND THE ANTIQUITY OF MAN.

BY J. W. LOWBER, M. A., Ph. D.

Chronology is a science of great importance to the Bible student, for it not only assists him in understanding Scripture, but it is of great benefit in the study of history in general. The chronology generally used for all periods preceding the birth of Christ is that based on the Masoretic Text of the Old Testament. This sometimes differs from the Septuagint Text, and also from the Samaritan. It must be remembered that our chronology is human and not divine. While all the statements of the Bible are divine, the dates in the margin are hu-

man, just as are its divisions into verses and chapters. The inspiration of the Bible is not affected, although its chronology may be considered an open question. With these few remarks, we wish to examine briefly the bearings of the most recent developments in chronological science upon the credibility of Bible history.

1. It is claimed that there was not sufficient time between the Flood and the Call of Abraham for the production of the immense population on the globe when the great Patriarch came into the land of Canaan. It is generally admitted that Abraham was called about 2000 years B. C. According to the Septuagint chronology, which was universally followed by the primitive church, it was 1247 years from the Flood to the Call of Abraham. The Science of Sociology now teaches that the population of the earth doubles every twenty-five years. This removes all difficulty in reference to the population of the earth when Abraham came into the land of Canaan.

2. Some think that there has not been sufficient time from the Noachian Deluge for the production of the number of diverse languages that now exist. The Bible student has no difficulty on this subject, for he remembers the confusion of tongues at the Tower of Babel. All linguists must admit that living languages are constantly changing. In order to give us a permanent record of his will, God has deposited the Bible in the Hebrew and Greek languages, which ceased to live as soon as this was done, so that they might be the eternal depositories of living truth. Our translations undergo so many changes that a revision is necessary every few years. Sir Charles Lyell says that none of the languages of modern Europe are one thousand years old. No English scholar who has not studied Anglo-Saxon can read the laws of England written in the days of King Alfred. The same thing is true in other languages. The Germans of to-day do not understand the language of their Teutonic ancestors of the tenth or eleventh century. The French cannot, without careful study, understand the language of Charlemagne. The modern Italian cannot be traced back far beyond the days of Dante. We may safely conclude that modern Philology removes all difficulty in reference to the Bible doctrine of the development of the languages from one primitive stock.

3. The Egyptian Monarchy seems to give modern skeptical writers a good deal of trouble. They do not see how, according to Bible chronology, that Egypt could have reached such a high civilization in the days of Abraham. Mr. Poole, of the British Museum, who is considered the highest authority on the subject of Egyptian chronology, thinks that the reign of Menes could not have been more than 700 years before the visit of the Patriarch Abraham to that country. From his reign to the Flood would then be, according to the Septuagint chronology, 547 years. As the population of the earth doubles itself every twenty-five years, Egypt must have been quite a populous country in the days of Menes. It is not surprising that Abraham, 700 years after that time, found Egypt one of the most civilized countries of the world. The science of chronology, as of all other sciences, the better it is understood, the more light it throws upon the Revelation God has given to man.

LOUISVILLE, Ky.

ANOTHER VIEW OF THE GREAT PROBLEM.

BY REV. A. N. MOLYNEAUX.

MR. EDITOR,—In reading in THE MICROCOSM the articles of the Rev. Dr. Williston and Prof. Kephart, I was strongly impressed with the idea that all the dogmas about *sin* and its eternal results were equally at fault. Each dogma carried to a finality reaches about the same unworthy result as relates to the character of the Eternal One. All parties say somebody is to blame because of the existence of sin, and the critical reader is left still in the shadows of the problem of evil. Arminians say that the Calvinistic theory of *prescience* and *foreordination* writes God the *Author of Sin*—a liar in that he says he willeth all men to be saved, when he did not so will, but was a tyrant, since he created most men to become sinful, and then to be damned for what they could not avoid. Calvinists reply: Since Arminians believe in God's foreknowledge they are in the same position, as what is known to a *certainty* cannot happen *differently*, and that they who believe in God's ignorance of man's voluntary acts are with the Calvinists also, since they teach the doctrine of man's probation, which means *temptation-trial*. Thus, when God placed man in Eden, He certainly did know that probation meant temptation—he did know that a fallen Angel was cast out from Heaven and was on the earth somewhere—to deceive. He did know that the posterity of this man Adam would be like their earthly progenitor, sinful. God did know that this inexperienced, innocent man, ignorant of temptation, would be no match for the evil one. God did know that Adam's probation meant possible, yea probable, failure, for the odds were against him. The tree of life, with its luscious, tempting fruit, and the luring, intelligent, deceptive occupant of the Garden was there. God did know all this, for the angels had fallen before man was created. When man's failure became a fact, God did know that his provided redemption by Christ made man a probationer by provisions which the Infinite Mind had conceived before man was created. God did, therefore, know that these unregenerate children would be as weak as their progenitors, and that untold millions of these same children would never act on the right side of probation nor enjoy the life to come, since he knew their weakness and their danger. So much God did foreknow, at least. Admitting him to be as ignorant as you please, about certain things which he chose not to know, he still did know, or ought to have known by common reasoning, from the fate of the fallen angels and from Adam's course in Eden, that men would afterward go astray, and he proves that he knew it by inspiring prophets to foretell even the details of some men's crimes.

But here the Universalist steps between the Calvinist, the Arminian and the advocate of God's nescience and says, Gentlemen, you are all right and all wrong: God does know everything from eternity; God did ordain or predestinate everything whatsoever comes to pass; God would have been cruel, yea, a tyrant, to have known that man would sin and be endlessly miserable, and then have created him, with this knowledge, when he had the power to withhold existence from such as he knew would be the losers by their existence. I therefore agree with you all, and as the only way

out of it, God provided a universal redemption and salvation in Christ, an antidote for the sin which he foresaw as broad as the disease which he permitted to infect the race. Hence I hold that all will be saved as the only alternative of God's infinite foreknowledge and his infinite consistency.

But just here interposes a critic. Stop, he says, to the Universalist. You believe that God punishes sin; that He cannot look upon sin with the least degree of allowance. You believe also that God is unchangeable and that He is without variableness or shadow of turning. If man can and does sin against God's will here, and if God will never change, then man must cease to be a free moral agent and consequently cease to be *man*, or he will always be permitted to sin and be miserable as he is permitted here in defiance of the will of God. What proof, then, is there that an unchangeable God who knew everything and fore-ordained everything should not continue to know and ordain that man who enjoys sin and misery so well here that he will not give them up, might not be permitted to practise and enjoy them or revel in them forever?

Thus all experience, all known facts, and all moral philosophy go to show that the Universalist comes no nearer the true or satisfactory solution of the great problem than does the Calvinist, the Arminian, or the advocate of God's voluntary nescience.

Now the question arises, is there no other solution? We believe there is. It may not be quite orthodox, but we think it is rational nevertheless. The "Problem of Human Life" shows that *beasts*, when they die, give their bodies to mother earth, and that their incorporeal life-force and mental force fall back into the vital and mental fountain of the universe whence they originally came, there to remain to be re-employed, as in the wise counsels of God, for other animate creatures in the coming ages. This being so, may not wicked men, which the Apostle Peter says, are like "natural brute beasts, made to be taken and destroyed" (2 Pet., ii. 12), be treated the same as mere brutes, and "*utterly perish* in their own corruption?" They would thus, like mere animals, lose all personal or individual identity, while no part of either their material or immaterial organisms would be annihilated. We do not assert positively that this is the complete solution of the ugly problem of evil. But may we not hope for this in place of the idea of endless punishment? On this solution God could consistently make man for the general interests of free agency and moral government, knowing at the same time that certain men, as both Calvinists and Arminians believe, would abuse their free agency and be unfit to live with those who did not thus abuse it. Those who should thus abuse their noble powers would simply have to be returned to personal or individual nonentity, like "brute beasts," and thus be deprived of individuality, while relieving the character and attributes of God from the implication of cruelty. May not this, after all, prove the real solution of the great problem?

EVOLUTION AND THE WEEKLY SABBATH— REPLY TO THE REV. DR. BILLINGSLEY.

BY J. D. THOMAS, ESQ.

An article appears in THE MICROCOSM of September, under the above caption, from Rev.

J. J. Billingsley. The author assails the evolution theory. With that theory, as taught by Darwin and his school, I have no sympathy. I reject it as heartily as does Brother Billingsley. But I am not willing that the argument of Brother Billingsley should stand in THE MICROCOSM, unchallenged, as the ground, or any part of the ground, upon which the patrons of that organ reject the theory of evolution. THE MICROCOSM is the leading organ opposing that theory, if not the only one opposing it on solid ground. Its opposition is sustained by the inexorable rules of logic. It seems to me that it cannot afford to allow a false issue, or an unsound argument, to be made in its columns, on this subject. So I propose to examine, a little, into the character of Brother Billingsley's argument.

He assumes that the narrative of the creation given in Genesis *seems* to teach that the heavens and earth were made in six days of *twenty-four hours each*. I cannot see from what he derives this seeming length of the days there named. The day of twenty-four hours is the period of the apparent revolution of the sun around the earth. It is the time from sunset to sunset, or from sunrise to sunrise. It does not seem to me that there could have been any such measure of time before the sun was set to measure the day. It was not till the fourth day of the creation that "God said, let there be lights in the firmament of the heavens, to divide the day from the night; and let them be for signs, and for seasons, and for days, and years." Whatever may have been the measure of the first three days, it was not the rising and setting of the sun. I fail to find the slightest ground for an inference that they were only twenty-four hours long.

Brother Billingsley says: "I am well aware that the word 'day' is sometimes used in the Bible as expressive of an indefinite period." Would it not, then, be most likely thus used, in speaking of what occurred before there was any measurement of time corresponding to our day of twenty-four hours?

It will not do to predicate too much on this assertion of what *seems*. One thing *seems* to a man in one stage of culture, and another thing to a man in a different stage. It may seem to some men that, at the command of Joshua, the sun stood still on Gibeon, and the moon stayed in the valley of Ajalon. But to one acquainted with the Copernican theory, it seems that the sun was stationary with respect to the earth all the while. It is one of the glories of revelation that it adapts itself to all advancements in intelligence.

I confess I never conceived of what was meant by the man restored to sight, seeing "*men as trees walking*," till I had read the last number of THE MICROCOSM. It had always been explained to me as seeing *indistinctly*. But when surgery, in its wonderful progress, had succeeded in giving sight to a man born blind, lo! at first he saw objects immensely magnified. He saw men as tall as trees. The evangelist, when he recorded this miracle, knew nothing of the force of what he penned. It was left for this age to flash the light of science on the record, and show the perfect correspondence between the book of Nature and the book of Revelation. And when, in this age, geology had demonstrated that in the primary formations of the earth there was naught but dead matter; that in the next succeeding formations there were mount-

ains of vegetable remains, but no trace of animal life; that next came fossils of birds and fishes, but no beasts of the field; then all kinds of animals, and lastly, man, the great heart of the intelligent Christian world leaped with exultation at the grand confirmation of the Mosaic account of creation. Hugh Miller set it forth in his "Testimony of the Rocks." The learned Christian has ever since pointed to this confirmation as one of the most overwhelming evidences of the truth of Revelation. But all this is to be thrown away, if the days of creation are to be whittled down to twenty-four hours each.

But Brother Billingsly says of the seventh day, on which God rested, "It is a day of twenty-four hours long." And he argues that therefore the six days that preceded it were of similar length. The argument is a sound and logical argument. But what of the premise? Where did Brother B. learn that the day on which God rested was only one of twenty-four hours?

It is nowhere recorded that God rested during a Sabbath of twenty-four hours, and on Monday morning went into the work of creation again. On the contrary, the text says in six days He made it all. The day of His rest still continues. He has added nothing to His creation since. I know not how long it is to last. It is an indefinite period. Then, according to Brother B.'s argument, and it is sound, the preceding six days were also indefinite periods.

It is true we are reminded in the Decalogue that our Sabbath is a type of the rest of God, after the creation. But that is not the primary purpose of the Sabbath. The Jews were rebuked for a mistake like this, and informed that the Sabbath was made for man, and not man for the Sabbath. It was given to him because he needed it. Incidentally it was to remind him of the creation and the rest that followed. But why suppose that because man's day is a type of God's day, that it must be equal to His? Is the type usually equal to the thing typified? It would poorly serve to express the thought, if it were. In types and figures we represent great things by small, and thus open the mind to the comprehension of what it would not grasp if presented without a figure. It is thus our Lord teaches nearly all the while; He presents trivial natural things which a child can comprehend, and by them leads the mind out to the contemplation of the greatest and most glorious truths in the universe. By the mustard seed, the least of all seeds, He sets forth the glory of the Kingdom of Heaven. And by a day in a man's life, a point of time, He sets forth the grand cycles of His creation and of His rest that followed.

BRYAN, TEXAS.

CHRIST AND CULTURE.

BY REV. F. HAMLIN.

No man who thinks beneath the surface can fail to discover the motive of the unsanctified Scholarship, and the unprincipled Authorship of this age, in their almost superhuman attempts to invalidate the truths and claims of the word of God. While these endeavors find their inspiration or origin in the "carnal heart," which is "enmity against God," that which incites this ceaseless activity is a desire

to depose Christ from His seat of power in the minds and hearts of men, and to enthrone the "Goddess of Reason" in His stead. Agnosticism, supernaturalism, pantheism, rationalistic infidelity, Darwinian sophistry, Spencerian scholasticism, and all other forms of intellectual error join hands and struggle on in the hope that ere long they will act as pall-bearers at the funeral of Jesus; but despite their desperate and persistent efforts to slay and entomb Him, He yet lives and will live in all the transfiguration glory with which truth and the love of millions can enswathe Him. Now that this is a case of the "survival of the fittest," appears, if we consider that in the development of ideal greatness, even culture, so called, is not a weighty or important factor. These advocates of false philosophies indulge in such ceaseless adulation of bare intellectual attainments, that one is almost constrained to believe that without broad scholarship there can be no greatness; while the truth is—

That broad culture is not essential to true greatness. More than eighteen hundred years ago the Forerunner of Christ hurried away from the shore of Jordan, to the bank of Life's River celestial; exchanging the call "Repent ye" for a song whose surges, swelled by ten thousand times ten thousand voices, dash to the top of the throne, while the Archangel rising beats time with his scepter. Now John the Baptist was not a scholar in the classical sense of that word. In early life he attended no College of the Prophets; he sat at the feet of no Gamaliel, but "was in the desert until the day of his shewing unto Israel." Amid the rocks and caves, and solitude of the wilderness, he learned of God, and extracted his eloquence from the restless torrents that rushed down the mountains. His only preparation was the view of God's works; the study of His Word, and Communion with His person, while the Master's feet were just behind him. *Nevertheless he was great before God.* Said Jesus, "Among them that are born of women there hath not risen a greater than John the Baptist."

How striking the contrast between this John and Solomon. The latter was *intellectually great*. "He spake of trees, from the cedar that is in Lebanon, even unto the hyssop that springeth out of the wall; he spake also of beasts, and of fowls, and of creeping things, and of fishes;" such was his knowledge of Natural History; while in the field of poetic production, he was full of the fragrance of spring, the beauty of flowers, and the loveliness of love. Having less fire than David, he had more figure; the colors of his style were often rich as the hummingbird's wing. With what perfect ease he drove the flocks of loose wandering thoughts from the wide common into the penfolds of Proverbs, and then with matchless ease suffused them with a rich, slumbrous light, like that of a July afternoon, trembling amid beds of roses. "With what marvelous facility he collected images from artificial or natural objects with which to deck his bride or bridegroom. The raven's plumage is plucked from his breast; the dove's eye is extracted from its socket; perfumes are brought from beds of spices, and even lilies led drooping out of their low valleys, to garnish and glorify his one dear image."

How unlike Solomon was John. True, he was a *master*; for only a master can touch words, that are an instrument of music, and bring from them unexpected life and soul. Nor did he lack *intellect or emotion*; for "Language," says

Professor Goldwin Smith. "is not a musical instrument into which, if a fool breathe, it will make melody." The words which have universal power are those that have been keyed and chorded in the great orchestral chamber of the human heart; and John spoke such words of power. Nevertheless, he was not a man of broad culture in the generally accepted meaning of that word. His scholarship was circumscribed, as his mission was unique. But, notwithstanding this fact, Jesus could think even of Bathsheba's son, and exclaim: "*Among them that are born of women, there hath not arisen a greater than John the Baptist;*" thus teaching that broad intellectual attainments are not essential to true greatness.

It is scarcely necessary in this age of general information to state that Christianity does not underestimate, but appreciates and promotes intelligence. The chief exponents of modern culture are the Christian Nations, and very especially those among whom the Holy Scriptures have free course, that is Protestant Nations. This is not a mere accident, for by its very universality it points to an internal connection between culture and Christianity. This thought has been very beautifully and truthfully elaborated by that princely preacher, Rev. Thomas Gerard, in his lecture on "*The Relation of Christianity to the Intellectual Activities of the Age,*" a production which, for profundity of thought and elegance of diction, finds few equals, and no superiors in all the annals of literature.

Christianity only insists that culture shall stand where and seek only to accomplish what God intended.

While, on the one hand, she ignores extreme Montanism, which opposes all intellectual development, art, science, etc.; on the other she repudiates Gnosticism (that threatening danger of the Church in the second century) because it makes knowledge a *substitute* for faith, instead of its *concomitant*. In the nature of things abstract culture cannot meet the moral needs of men. Sin is not (as Rousseau taught) "the result of false culture which has forsaken the sure guidance of nature," and therefore a true intellectual culture cannot remove it. *The truth is, that such culture's mission is purely in the field of the intellectual, and not of the moral.*

The Sun cannot excise a cancer, nor can he remove a tumor. That is the work of another instrument. The Sun must be content to shine away darkness, and develop that which already lives. Go where intellectual development is limited in its field of activity, and circumscribed in the sphere of its possible influence. It may reach stars, and rocks, and laws of nature, but it cannot change moral condition. *With God it is character, not culture, which constitutes greatness.* We must not measure greatness by financial ability, for Naaman's millions could not heal him of his leprosy. No traitor is great because wealthy. Nor can intellectual attainment lift man to the desired elevation, for a vessel filled with diamonds may rush over Niagara Falls as easily as an empty craft, yea, more rapidly and furiously because of the weight she carries. God judges by character. The supreme question with Jehovah is not "What have you?" but "What are you? Is yours a Culture so narrow that only one capacity is thoroughly cultivated at the cost of the others—especially the *intellect* at the expense of the heart and will?" That is an emaculated Culture which does not render

the heart more tender, and the Conscience more sensitive, and the will more loyal to the Giver of every good and perfect gift. Dr. Christlieb never spoke more truthfully than when he said that "all true culture and science has one tendency—to make human life more God-like;" and Joseph Cooke enunciated a sentence worthy of the attention and prayerful consideration of all ethical and philosophical teachers, when, amid the thinkers of Tremont Temple, he exclaimed: "On the floor of God's House, he is tallest who is nearest to God." *Nor should men forget that the day hastens when character, and character only will have its reward.* Rambler's statement to the effect that "Virtue is the only solid basis of Greatness" finds its verification not only in the rise and fall of nations, but holds true of individuals as well. My friend planted in her garden the seed of the Evening Primrose, which, all through the first year, was only a little unpretentious plant, but after a fall, a winter, and a spring-time, there came a summer, and then appeared, even in the dark hours, when other buds were closed and withered, the fragrant flowers, all beautiful, the admiration of all who beheld them, and they were greedily seized and carried into the brilliantly lighted parlor. So in this world, amid the sunlight of prosperity, the (so-called) cultured, the wealthy, and the famous are admired; the Tyndalls, the Millses and the Carlyles attract attention; and apparently character is at a discount; but after the fall-time of chilling tides and withering leaves, after the winter hour of crushed hopes and frozen joys, after the spring-time of bursting graves and revived bodies, in the hour when human standards of greatness vanish, then comes the spring-time of true manhood; and character, all fragrant with odor sequential upon contact with the great Teacher, will be admired, and the possessor, whether he be "golden of thought and tongue" or "in learning small," will be carried by angel hands to the more substantial joys of a celestial environment.

PEEKSKILL, N. Y.

THE PHILOSOPHY OF SUBSTANTIALISM.

BY S. F. STARLEY, M. D.

The New Philosophy of Substantialism throws the only possible light upon the phenomena of mind. Upon the realization of its truth alone can we rationally account for the continued acquisition of knowledge and the permanency of mental impressions. If, as materialistic scientists assert, the force or motion resulting from molecular change in the brain-substance is the cause and source of all thought, then why is it that the thought remains after such molecular changes have been continued until that portion of the brain-substance whose function it is to bring out mental operations is reduced to effete matter and its place supplied by new material? Shall we believe that each molecule of brain-substance as it thus ceases to act functionally, imparts the quantum of thought it has just produced or received from some other molecule to its successor before being taken into the stream of venous blood that is to sweep it out of the mental workshop where it has just performed its part in the intellectuality of the individual? Now, if this be so, each such molecule must impart to its successor a vast amount of knowledge, especially in

the case of educated men advanced in age in whose minds immense funds of different kinds of knowledge are stored up. It seems to us that no greater degree of credulity could be required of a man than to believe that the knowledge and mental impressions a man has are being constantly handed over from one molecule of brain-matter to another, that this process goes on unceasingly—at least during the waking state—to the end of his days upon earth, and that then the mind that nature has so wonderfully preserved should cease to exist forever! As well might we attempt to form an idea of the limits of space as to comprehend such a process, and that too without a God to direct or control it. It is certainly more rational to believe and realize that the mind, the intellect, is a substantial entity holding the knowledge and impressions that it retains stored up as a part of its own conscious ego. Of course the mind is compelled to communicate with the outer world through the use it makes of the brain as the medium of communication with matter, and the physical changes produced in the molecules of the brain are the physiological results of the mind's action upon the material organism with which it is connected during the life of the body.

This view alone can account for the fact that when disease or injury has rendered the brain unfit for the performance of its proper functions the mind seems to be deranged or destroyed—and why? Simply because its physical means of communication with the physical world are either destroyed or out of working order, as the case may be. Now this is no more evidence that the intellectual ego has ceased to exist than the failure of a telegraph operator to transmit a message from one station to another would prove that the battery that gives out the electric force has gone out of existence when in fact the failure to transmit was caused by a break in the conducting wire at some point along the line. That molecular change takes place in the brain-substance as a result of every effort of the mind, is a physiological fact, but this does not prove that the force thus called into action to connect the intellect with the universe of matter is the mind itself. The idea that the entire intellect of man is the result of molecular changes taking place in the brain is the outgrowth of the modern doctrine of evolution, as taught by the infidel scientists who are laboring so hard to exclude the idea of a personal God from the realms of thought.

But the Philosophy of Substantialism, like a new revelation, is furnishing intellectual pabulum more solid and durable than molecular change, and is building up a tower of strength from whose lofty summit the Christian philosopher can bid defiance to every effort of this Samson of infidelity (evolution) to effect its overthrow.

May the divine light of the New Philosophy continue to spread until it drives from our earth the dark and cheerless shadow of this *upas* tree of science—so called—that chills the spiritual life out of every soul that has taken refuge under its repulsive branches.

TYLER, Texas.

CERTAINTY NOT NECESSITY.

BY D. G. W. ELLIS.

The prescience of God is, as it appears to the writer's mind, absolutely essential to His per-

fection. But His foresight of events does not make them necessary; it does not even make them certain. The Divine foreknowledge is not the cause of their occurrence. These events would have taken place just as they have, even if it had been possible for God to have closed His eyes to them. His foreseeing them has not had, in the smallest degree, any influence in bringing them to pass. Of course I mean such events as result from the free, unconstrained acts of moral agents. There are many things that occur because God has appointed them, and having appointed them for wise purposes, He brings into requisition infinite power to make them an actuality. Their occurrence is attributable to *power*, not knowledge. The sins of moral agents, though foreknown, are not appointed. God does not, as in the case of events appointed, bring into requisition His power to help moral evil into being.

The nescience of the Divine Being is the poorest of all possible explanations of the origin of moral evil. It offers an apology for the infinitely holy God at the expense of His wisdom. According to this absurd supposition, evil slipped into the universe either because God could not foresee it, or else because, having the power to foresee it, He *would* not, lest He should be held responsible for it. To say He could have foreknown it, but would not, implies voluntary choice, and choice presupposes reasons as its ground or cause, and reasons involve a knowledge of the thing supposed to be unknown. Upon the other hand, if He did not foresee the rise of sin because He *could* not, we have seated upon the throne of the universe a God imperfect in knowledge, and unfit for the government of His rational creatures. We must admit, in all consistency, that God foreknows all things, sin and its final results among them. But we need not conclude that sin and all its fearful consequences were appointed, and thereby made necessary. There is another, and a better way out of the difficulty. Surely, any one ought to be able to see a difference betwixt *certainty* and *necessity*. To say that a thing *cannot* be otherwise than as God foresees it, is not exactly correct; but if we say it *will* not happen otherwise, we express the precise fact of the case. It *will* not turn out different from the Divine foresight, not because God has appointed the event, or any of the factors to the result, nor because He brings to bear His irresistible power to make sure of the event, but because of the free, unconstrained acts of moral agents. "If God foreknows the destiny of every human being, where is the use of prayer, effort and labor, since none of these things will make one's destiny different from what it is foreseen to be?" Now there is to those who ask such questions as the above, a real trouble (for I speak from experience), and I would gladly help them out of their trouble if it were possible. Perhaps, one long accustomed to such somber reflections would find some relief if he could bring himself to realize that his fate or destiny for weal or woe is a *certainty*, one way or the other, whether known or unknown by God. If God could obliterate from His mind all knowledge of the future destiny of all souls, that would not make my destiny different from what He now foresees it. We cannot get rid of this (to some) appalling certainty by resolving that God does not know what the end shall be. The *end*, as the event shall prove it, is as certain now, even though not known to the mind of God, as if

fixed by appointment. It is not the prescience of God that makes my fate certain; it is the *certainty* of my fate, foreseen as the result of my own agency, that is the subject of God's foreknowledge. If believers in the Divine nescience get any relief from the appalling thought of the certainty of destiny, they obtain it at the expense of logical consistency.

DEKALB, Miss.

INQUIRY INTO THE THEORY OF LATENT HEAT—NO. 2.

BY PROF. E. A. LUSTER.

The last article in our first installment was on Specific Heat. We give one more example, because this supposed difference of heat in bodies is sometimes accounted for by claiming the surplus heat to have been in a latent state, there being no other means of explaining the apparent discrepancy as shown between the thermometer and the experiments.

4. If one pound of cork and one pound of water be raised to the temperature of 212° each the water is said to have far more heat than the cork. This is determined, not by actually measuring the quantity of heat in each body, but by timing the heating process. If the water should require ten times as long to heat as does the cork, the experimenter hastily concludes the former "absorbs" ten times as much heat as the latter. That this cannot be sound reasoning will appear, we think, from the following considerations:

Both bodies are bad conductors and consequently bad radiators of heat. For this single fact they will each receive heat slowly and lose it slowly. But there is one source of loss which the cork does not possess, and which the water does to a most remarkable degree—evaporation. It has been shown in the former article that by this means water loses heat almost as fast as it can be supplied. Hence it will of necessity require longer to heat than will the cork.

Some one may suggest that the test is sometimes made by immersing the heated bodies into equivalent volumes of water and noting the rise of temperature. To this it is replied that there is no more difficulty of explanation here than in the test already given, and that a little reflection on the part of the suggester will probably convince him of the truth of our remark. The same laws, radiation, conduction, and evaporation, come into play here as in the former case. However, space will not be consumed in explanation until some one seriously contests the point. The object of these articles is to present a sufficient number of the many examples and their explanations to place the matter clearly before the public. The subject is very far from being exhausted.

5. In art. 433, seventh edition of "Ganot's Physics," there is given, with illustration, the following equation to determine the latent heat of vapors:

$$Mx + M \left[T - \frac{t + \theta}{2} \right] c = m(\theta - t).$$

To understand this equation it will be necessary to have the figure given in the work referred to. Perhaps it can be found in any other editions under the title "Determination of the Latent Heat of Vapors," in the chapters on "Calorimetry." Now it will be observed by any one conversant with the language of formulæ, that the above

equation fails to take due notice of the expanded and subsequent condensed state of the steam, the loss of heat by evaporation, and even of the loss by radiation from the sides of the vessel containing the cooling water. It not only fails to take *due notice* of evaporation, but seems to ignore it altogether. It is not sufficient to reply that the experimentalists, no doubt, provided for all losses. The illustration and formula show for themselves, and forbid any such view. The equation is evidently intended to embrace every source of error, and to be a full solution of the problem. We believe that the x in the formula should represent heat *lost*, not heat *latent*.

The following equation is offered with the hope that it may prove a nearer approximation to a true one:

$$x + (\theta - t) + \frac{M}{m} \left[\frac{t + \theta}{2} \right] = \frac{1700MT}{m}.$$

Here $+$ = heat lost by evaporation and radiation, $(\theta - t)$ = heat of m , $\left[\frac{M}{m} \cdot \frac{t + \theta}{2} \right]$ = heat of

M , and $\frac{1700MT}{m}$ = heat furnished by the condensed steam. The cooling water m is taken as standard of comparison for estimating the quantity of heat. For instance, if m was ten gallons of water at 40° , and M one gallon at 100° , the heat of M would raise the temperature of m one-tenth of the whole temperature of M . The temperature of m would therefore be about 50° .

6. Freezing mixtures are often referred to as evidence of the truth of the theory of latent heat. This claim is based on the ground that "when matter passes from the solid to the liquid state, heat in vast quantities disappears, and ceases to affect the thermometer," and that "chemical affinity accelerates the fusion; the portion which melts robs the rest of the mixture of a large quantity of sensible heat, which thus becomes latent." We shall take as an example, the freezing of ice-cream. The freezing mixture is composed of two parts pounded ice and one part salt. The common explanation is, "Salt having an attraction for water dissolves the ice, and then itself dissolves in the water thus formed. In this process two solids become liquids. The necessary heat is absorbed mainly from the cream." The quotations are taken from Ganot and from Steele's "Physics."

We shall endeavor to explain this matter without a resort to the theory of latent heat. It has already been shown in Ex. 2, of former paper that the loss of heat in the melting of ice, is caused, not by the heat's becoming latent, but by evaporation and by the capacity of the ice to consume, in the melting process, the greater part of the heat received from outside sources by radiation and conduction. This consumption by the ice being, not an absorption in the latent heat sense, but simply a resultant rise of temperature in the ice, and a consequent melting. A secondary result is, that as films of water are formed on the surface of the ice, about all the added heat will escape at once by radiation and evaporation, more especially the latter. The surface of the film being exceedingly large in proportion to the thickness, this evaporation must be correspondingly great. It now remains to show what advantage the mixture of salt and ice has over the ice alone.

It will be observed that this mixture while melting has two means of losing heat—radiation and evaporation, and only one of receiving

heat—by radiation to it from outside sources. Now, the question is, which predominates, the loss or the gain, and to what extent? It cannot be denied that bodies exposed to equal temperature radiate as much and no more heat than they receive. This is evident of all bodies as have no other means of exchanging heat. But if of two bodies one evaporates and the other does not, the former will lose heat until its temperature is reduced to a point where the decreased evaporation and radiation combined are just equal to the inflow of heat from outside objects. Now anything other than an additional supply of heat that tends to increase the rate of evaporation of this body will necessarily conduct away most heat, and will therefore cool the body. The mixture of salt and ice accomplishes this very purpose. The freezing point is about 28° below that of water, and hence evaporation will be increased here without an increase of heat; for the ingredients will, when similar, at once begin to dissolve, whether heat be furnished or not. Therefore, if the ice alone, with its capacity of melting, barely keeps the temperature of the dissolved part at the freezing point, the mixture of ice and salt, with a greater capacity, ought certainly to bring the temperature below that point. Agreeably to these remarks, it is said that "the substances employed in freezing mixtures should be finely powdered, rapidly mixed, and placed in vessels with little conducting power." Lest we may seem to have put too much stress on the effect of evaporation, we quote the following from Ganot: "If, therefore, a liquid evaporates and does not receive from without a quantity of heat equal to that which is expended in producing the vapor, its temperature sinks, and the cooling is greater in proportion as the evaporation is more rapid." Accordingly, we claim, with considerable reason, we think, that the advantage of the mixture of salt and ice consists in the lower freezing point and the consequent increase of evaporation.

PERRY, Ga.

EVOLUTION, OR NATURE'S SYSTEM OF PROGRESSIVE CHANGES.—No. 3.

BY ISAAC HOFFER, ESQ.

There are some marked distinctions between the actions and results of chemical and vital forces. Chemical force, apparently, is one, and is limited and localized in its actions by favorable or unfavorable conditions; while vital forces consist of individual moulds of energy, each a complete whole in itself, with powers of development, of sustaining life and of reproduction. Material almost wholly characterizes chemical combinations, while in the organic product, the material entering into it has nothing to do with its characterization, but is itself characterized by having imparted to it vitalizing energy, and all the peculiarities of the organizing agent: showing clearly that the vital energy in each plant or animal determines the form, the nature, the general limit of size, and duration of life, and every distinguishing characteristic down to the minutest particulars. Life is governed by certain unchanging laws, and each distinct species has its own special law of reproduction, development and increase. The laws of the present were the laws of the past, and the mode of vital action is to-day

the same as when life was first introduced on the earth.

It is self-evident that vital energy must have existed before it was introduced, or that it must have been created or come into being as organic action commenced and proceeded. If it existed before it was introduced, then it most likely existed in all its forms and characteristics.

It is conceded by all or nearly all our ablest geologists and scientists that the now solid matter of the earth was once all in a gaseous state, and that this matter always existed in some state and could not have been created out of nothing. In view of these generally admitted positions, is it not perfectly sound, logical, analogous reasoning to conclude that *life also, in all its forms, existed always, and never was created out of nothing.* That the different grades of life, with all their fundamental distinctions, should have existed always, and should have been always the same and are the same to-day as they always have been, is consistent with the stability and universality of the laws of nature. The immutability of the laws—the general and universal modes of action by the forces of nature—are not questioned by those who have studied them. Even the elementary constituents of matter never lose their identity. Whether in a gaseous, fluid or solid state, they are always the same in essence, and yet *they are the elements of all change.* Susceptibility is their general and universal characteristic; while stability in modes of action is the immutable characteristic of all forces. Vital forces are no exceptions to these laws. They are the controlling power in the production, growth, and sustaining energy of every plant and every animal; and every grade of organic productions owe their distinctive forms, their characteristics and their powers to these forces. The fundamental distinctions in organic life are in the *distinctions of the vital energy*—in the organizing agent—in each case; for if these distinctions were in the kind, and proportionate combination of the materials, then a chemist should be able to make a living organism.

The fundamental distinctions that mark off the grades or species of organic products consist in the difference of structural forms, or in the relative arrangement of tissue, as supposed by some, or in both; and it is clearly evident that these structural forms and arrangements of tissue are the work of the operating vital energy in each case, and that no organic agent can produce a *representative of itself that fundamentally differs from itself.*

The difference in dogs is perhaps greater in the number of varieties, and distinctions of shape, size, and appearance, than in any other species of animals; and yet they are easily distinguished from all other animals by their structural form and canine characteristics; showing clearly that while material and conditions may affect, and even prevent, the action of organic forces, and may greatly modify the results, the *operating energy remains the same in all its powers and characteristics essential to maintain the organic distinction.*

Geologists tell us that the evidences of earlier animal life show that the specimens must have been simple in form and feeble in action, but that in the course of time animals of more complex forms and greater powers came into being, until finally physical development culminated in the production of man. That then all the

structural types of past ages had become fully developed, and the prophetic indications of perfected structures, and more complex organisms were all fulfilled.

While it appears to me to be rather a stretch of the imagination, that the two side-fins of a fish are the fundamental types of a man's arms, there was unquestionably system in the progressive changes of life, whether there were fundamental forms of structure and prophetic types of plants and animals now fully developed, that can be traced back into past geological ages or not. In looking back and examining the results of this system of progressive changes, we should certainly be able to see the steps of necessary preparation for the introduction of a fully developed intellectual power in man; to whom the progressive energy was to be transferred. And we do see these steps: in the forces of nature, from simple motion to the moving of mountains, and of the earth, and of the heavenly bodies; from simple sensation in the lower orders of animal life, to the highest powers of a thinking, reasoning intelligence in man; and we see the corresponding steps in the material world, from a shapeless and confused mass, to well-defined features and systematic order; and in the kingdom of life, from almost featureless forms to the most complicated organisms.

We see that there was unceasing action, and constant changes, and certain and specific results; and that all the special actions and results were dependent upon and limited by the conditions brought about through the general actions of the conditional agencies as already explained. Crystallization, as is well known, can only take place when matter is in a state approaching consolidation. The growth and development of plants and animals are not only greatly affected by the environment, but are as completely dependent upon, and limited by it, as crystallization.

LEBANON, Pa.

SUBSTANTIALISM—RESUME.

BY THOMAS MUNNELL, A. M.

The Substantial Philosophy, originated and supported by Dr. A. Wilford Hall of New York, teaches that there is a broad distinction between *matter* and *substance*—that all matter is substance, but that all substance is not matter; that substance is the generic term including both material and immaterial things. That is, all things material and immaterial, tangible and intangible, corporeal and incorporeal, physical and spiritual added together make up the *substantial*. Entities, or things that exist, confessedly are not all of the same nature, for in the animal, vegetable, and mineral kingdoms the variety in the *nature* of things is manifest; and rising above these coarser forms of being to the plane of the gases, the diversities in their natural qualities are too plain to require a word, and yet they are all both material and substantial entities. Nor is there any difference of opinion as to the substantial nature of electricity and its near kin, for that which can in an instant tear the mightiest oak into splinters is not a mere "mode of motion," or some other meaningless nothing. The Substantial Philosophy might have affirmed to the end of time that material substances differ widely in their natural qualities without opposition, if it

had kept quiet on the question of immaterial substances, and had it not attempted to extend the domain of the word *substance*. But as soon as sound, light, heat, life, mind and spirit were also declared to be substantial entities, the war began—began because it opposed first of all the wave-theory of sound, and through this assailed the materialistic doctrine that *thought* is only the result of mere molecular action of the brain and nerves excited by outward objects cognized by the senses, and therefore that it, like sound, is a mere "mode of motion," and will perish when the body dies. The New Philosophy requires the term *substance* to include all the great forces of nature, including even gravitation. The claims of said Philosophy may be considered rather ambitious, but having been thus briefly defined what now are some of the arguments that support the position it assumes?

1. That God is an immaterial entity will be denied by no enlightened theist on earth, and if such is His nature it settles the question at once and forever as to the fact of an immaterial entity, or, the existence of substance without matter. The grossest theist will not affirm that the Divine Entity is composed in any degree of corruptible elements, but will admit that if there be a Creator he is an immaterial substance. If so, matter is but a specific under substance the generic.

2. When a heavy charge of lightning shivers the stoutest oak or melts the lightning-rod, the obstruction it meets with in passing to the ground, if not a proof that electricity is a material substance, proves it to be, at least, a *substance*; and when two messages pass each other on the same wire in opposite directions, they seem to ignore the physical law which forbids two substances to occupy the same space at the same time. Should this be explained by the hypothesis that neither current fills the whole wire, it still remains that there is no collision or delay in the transit as would be the case were electricity a coarse material substance. Evidently, whether it has entirely escaped the frontiers of the material or not, it has gone far into the intermediate state between the material and the immaterial worlds.

However minute the molecules of electricity, if it have any, may be, those of magnetism seem smaller still, for those of the one are insulated by glass while those of the other dash right through a vitreous plate and haul up a piece of iron *nolens volens*. Compared with this ponderable metal, such mysterious force, if not altogether immaterial, must be still further on the way thereto than electricity. We could even afford to admit that these two forces are connecting links between the material and the immaterial, for all connecting links in nature, like the flying squirrel and the flying fish, imply that there is a world on each side of their intermediate positions.

3. But the fact that both electricity and magnetism produce powerful physical effects upon material bodies does not prove them to be in any degree material, for the action of the mind in moving every part of the body is evidence enough to the contrary. It is the power of mind that moves the hands and feet as certainly as that magnetism drags the inert metal, and Substantialism still puts the troublesome question: *How can anything that is not in itself substantial move a piece of inert matter?* Now the New Philosophy teaches that gravitation, light, heat, cohesion and all the other great forces of Nature

are substantial entities having the power to seize upon ponderable substances either to cause their particles to disintegrate, to cohere, to approach, or separate from each other, and that it is both unscientific and unreasonable to assume that these effects are produced by a mere "mode of motion" or any other unreal *nothing*. Each of these forces is now held to be one form of the great *force-element* found in nature everywhere—that combustion is due to the operation of that part of the *force-element* appropriated to that work, cohesion to another form of it, and light to another—and it is just as stoutly maintained that the term *substance* embraces in its meaning all these invisible forces however far they may be removed from the visible, the tangible and the ponderable.

4. That the force of gravity may appear to be substantial THE MICROCOSM holds that gravitation is not in the ratio of the quantity of matter, but in the ratio of the amount of said *force-element* in each body; and in proof of this, it shows that some of the heavier bodies are more porous than some of the lighter, as seen in comparing iron and glass; and if more porous, of less quantity of matter notwithstanding the greater weight, and this greater weight, resulting from the greater amount of *force-element* a given body contains, indicates that said force is substantial and independent of the quantity of matter in all material things. Thus the force of gravity, instead of being a mere law of nature, is, along with all the other natural forces, found to belong to the great hemisphere of immaterial entities that reach out toward vital life, soul, mind, spirit, and shows that there is no impassable gulf between the material and the spiritual universe; that no more violence will be done to our senses in passing from one to the other than is felt in the twilight between the most shadowy night and the most resplendent day.

5. The materialistic doctrine that all the "physical forces of Nature, such as light, heat, magnetism, sound, gravity, electricity, etc., are but *modes of motion* among material particles, and not themselves substantial entities," has received the heaviest blows in the "Problem" and in THE MICROCOSM that true science and sound philosophy could deal; and to break down the notion that thought, or life, is merely the result of molecular motion of the brain, Dr. Hall attacked the doctrine that sound is merely a "mode of motion" in the air, in order that, by destroying this the chief analogical argument of materialism, he might destroy the doctrine itself, namely, that all thought perishes when the body dies. He teaches that all physical, mental, and spiritual forces come from God. "Our Philosophy," he says, "teaches that but for this eternal, uncreated, central, and inexhaustible fountain of force and energy, no present form of manifested force could move itself or any material body, or produce any effect or manifestation whatever. Neither light nor heat could radiate or reflect; the sun could not shine; gravitation could not attract, and hence rain could not fall; electricity could not travel nor could sound be conducted or heard; magnetism would never leave the magnetic poles, and all Nature's realm would be dead, still, cold, barren, and silent."

Space forbids a statement of the way Substantialism explains the conduct of a copper or silver plate when dropped between the poles of the horseshoe magnet. Even those who reject the New Philosophy must, in all fairness, admit

Dr. Hall's explanation far more rational than that offered by Sir Wm. Thompson, LL.D., F. R. S., of England. The editorial in the October MICROCOSM, headed "The Immaterial is the Real," is hereby commended to all who have not seen it, as a piece of the mightiest philosophic and scientific thinking yet published—unsurpassed for depth and bold aggression upon the very foundations of materialism, and a religio-philosophic masterpiece in defense of the immortality of man.

MICROCOSMIC DEBRIS.

China proposes to adopt postal cards on and after January 1, 1885.

A stroke of lightning split open a hollow tree at Shasta, Cal., revealing a skeleton and clearing up a murder mystery.

There has been less amateur coaching in England this year than formerly. Only two coaches are now running out of London.

There is not a single prima donna or tenor of any marked merit in Italy, and the musical critics of Rome deplore the fact!

Since the development of tree culture, the forests of Europe have increased from one-sixth to one-fifth of the entire territory.

California's wheat crop has for years been more valuable than her yield of gold, which is likely to be soon beaten also by her fruit.

An English manufacturer advertises that his safety matches may be eaten by children with positive benefit to their appetite and digestion.

During the first part of this month so much snow fell on the mountains in Lombardy and Venice that Alpine clubs had to fold their tent, and go.

Army, navy, and now police in Japan are to be completely Germanized. The Japs have applied for German police officials on loan as instructors.

A German philologist has detected a strong resemblance between the language of the hill tribes in northern India and of the Basques, or Euskaldunes, of Spain.

Cryolite, a mineral which is of great value in the potash manufacture, has been discovered in the Yellowstone Park. Heretofore it has been obtained only in Greenland.

The blue pencil in journalism has more than a counterpart in China, where the red, or vermilion, pencil is synonymous with the exercise of the highest official authority.

A large whale became entangled in a submarine cable near Panama, and in his efforts to extricate himself was so severely injured by the wire that he died the same day.

Cases of metallic poisoning have been traced to cheap silver-plated pitchers. Where the lining is broken or worn, galvanic action is set up, and the base metal rapidly oxidized.

The price of cigars has been raised from a cent and a half to a cent and two-thirds by the Treasury Department at Rome, which enjoys a total monopoly in tobacco and cigars.

The Shah of Persia, in return for the courtesies shown to him while in Paris, has presented the municipality with two camels of a variety no larger than Shetland ponies.

Of all countries Germany is the one where suicide is most frequent; and in Germany,

again, Saxony takes the lead, though the people are considered remarkable for good spirits.

At Pernambuco a snake of the boa class is largely employed to drive rats out of houses. It costs fifty cents to a dollar, and requires only a saucer of milk once or twice a week.

The owners of large stock farms find it more profitable to raise hogs that grow rapidly rather than those that fatten easily. Western pork, in consequence, is becoming younger and leaner.

An article adjudged "disrespectful to the person of the King" of Spain has cost the editor of *El Porvenir*, a Republican journal, eighteen years' sentence of imprisonment and \$800 fine.

By Russian imperial order, the delivery of the works of 125 different authors, native and foreign, to libraries and public reading rooms is strictly prohibited, as well as of eight Russian newspapers.

The latest discoveries render insulation so perfect that to-day there is less loss of electrical force between the United States and England than there was formerly between New York and Brooklyn.

Toy dioramas are popular in Paris. They consist of microscopic views photographed on tiny magnifying lenses. These are set in a handsome decorated card, and are comparatively inexpensive.

It would seem as if religions were dying out in China, judging from the fact that a large number of temples in Foo-Chow are leased by the priesthood to Europeans for dwelling or business purposes.

Boiled peanuts are a favorite dish with the Chinese. Long cooking beneath water extracts all the oil and flavoring principle, and leaves a dough that can be used in the same manner as that made from flour.

Several French papers announce that the real object of the King of Sweden's visit to England was to settle the preliminaries of a marriage between his second son, Prince Oscar, and the Princess Louise of Wales.

Underground telegraph conduits become dangerous when struck by lightning. A heavy current is suddenly started that in several instances has destroyed switch boards and injured bystanders in the operating room.

Cholera is ruining the Parisians and making the fortune of the London hotel and boarding-house keepers. Altogether there were 14,000 more visitors in the gay city in July last year than in the same month this year.

Painted fans are losing their popularity in Europe. At a sale in Madrid a Watteau fan, formerly belonging to the Princess of Savoy, brought only \$740. In London, fifteen years ago, one of no greater beauty sold for \$2,550.

Large beds of gold ore have been found near Ouro Preto, Brazil. Its average richness is \$40 per ton. Nearly all of the territory has been covered with "concessions," which correspond to recorded mining claims, but are far broader.

In excavating a well at York, Me., the roots of neighboring oaks and hickories were found embedded in the rock forty feet below the surface. From either pressure or absorption they had in many instances formed cylindrical channels in the stone.

Explorers have discovered petroleum in Formosa, about twenty miles to the south of Ke-Lung. At the latter place are the richest mines of bituminous coal in the Chinese empire. Thus far the Government has refused permits for the sinking of wells.

In regard to the discovery of silver ore in New York and other Atlantic States, Prof. Newberry asserts that silver is not uncommon along the Appalachian range, but seldom occurs in paying proportions. Nine-tenths of the mines in these districts fail.

Of 270 fulminate factories started in Europe during the present century 261 have disappeared by explosion. Fulminates are now made in small quantity at a time in low sheds. These are so arranged that an explosion throws them over, and little damage is done.

To meet the demand for milk, cream and butter, a number of Florida farmers last year imported Jersey and Alderney cows. Nearly all have since died from eating poisonous grass. Calves are now being tried in the hope that they will learn to discriminate.

Large numbers of dried and smoked lizards are imported by the Chinese physicians. They are used in cases of consumption and anæmia with considerable success. Their virtue seems to lie in the large amount of nitrogenous compounds and phosphates they contain.

Black walnut sawdust, formerly thrown away, is now mixed with linseed gum and moulded into heads and flower pieces for the ornamentation of furniture. When dried and varnished it is as handsome and much stronger and more durable than carved work.

The twenty-six public libraries of Paris circulated last year 550,000 volumes and 306,000 were novels. If poems and plays be added, it is found that 377 books of light literature go out for every 97 treating of history, geography, and travels, and every 56 on science and art.

In Vermont lithographic prescriptions for cocktails are by drinking men. They read as follows: "R.—Spir. Frument. 2 fl. oz.—Ext. Angos 1-3 dr.—Syr. Simp. 1-2 fl. oz." They are put up by druggists, who charge from twenty to fifty cents a prescription. Much sickness is said to prevail.

Loco, a Western weed, acts upon horses and cattle just as alcohol does on man. They lose all appetite for normal food, become apparently intoxicated at times, and finally die from a disease strangely like delirium tremens. From the vice comes the California expression, "as bad as a locoed horse."

The remarkable petrified forests of Arizona are being worked by a Western stock corporation that manufactures jewelry, mosaics, and other ornaments from the siliceous wood. The colors include black, white, red, green, yellow, and brown, and can hardly be distinguished from moss agate or onyx.

Ten and fifteen year old girls, who are great singers at their work, earn twelve cents for a day's work of seventeen hours in the silk factories of Italy; by a frugal system of co-operation they expend only one-half their daily income, and so manage to lay up money in the savings-bank against a rainy day.

A Chinese orchestra rehearses daily on Mott street preliminary to giving a series of concerts in neighboring cities. A remarkable instrument is the trumpet. It is of Tartar origin,

and produces a noise like a bagpipe, but much louder. The rehearsals are described as "dismal din" by those who heard them.

Miss Bertha Higgins has been investigating samples of American and foreign iodide of potassium, as sold in New York, and finds that none of the specimens is up to the requirements of the Pharmacopœia. It is an important matter, both from a commercial and a medical point of view, as enormous quantities of the drug are consumed.

Paul Eudel, the French exposé of art frauds, assures amateurs that it is no shame to them if they are now and then taken in, for there is no cabinet of curiosities without its false pieces. The provincial museums of France, and even those of the capital, contain them. The grand cabinet of medals of the National Library holds a certain number of notorious frauds.

Sir F. Leighton's waxwork show at the Royal Academy exhibition, called "Cymon and Iphigenia," has twice changed hands already. It was bought by the Fine Art Society, and sold by them at an advance to a collector the day of the private view. Mr. Millais has received \$25,000 for the wonderful white gaiters that are so showy in the picture he calls an "Idyl."

Tuscon is the pride of all Arizonians. They even claim it to be the oldest city in America, and declare that its origin antedates that of Santa Fe. Before the advent of Americans it was a Mexican hamlet, and still earlier it was an Indian village. No traces of its first occupants are to be seen to-day, but the adobe houses and narrow, winding streets are Mexican.

Mr. Carlyle's house in Cheyne Row, Chelsea, is still to let. A tenant in the person of a Mr. Haweis was soon found for Rossetti's home, with its dark passages and gloomy rooms; but as yet no hero worshiper has been found ardent enough to take possession of "the famous tenement," as we have heard it called, in which the dyspeptic seer grumbled away so many years of his life.

The New England Historic Genealogical Society has received a complete set of the *New Hampshire Register* from its first number in 1772. The collection was made by John Wentworth of Chicago, who intended them for the New Hampshire State Library, but the trustees did not respond to his suggestion, and he changed the destination of his gift. There are only five complete sets of the *Register*, one of which is going to London, one to Paris, and one is in Chicago.

They are progressing in railroad management in England. An innovation on the Brighton line is set forth in the advertisements: "In addition to the ordinary refreshments that may be had at most railways, passengers will in future be able to procure cool and fresh water at the rate of a penny per glass. At certain stations the water will be carried along the platform, so that thirsty travelers may be supplied with the cooling beverage without leaving their seats."

Three women are making more money this season on the American stage than any ten men. It is impossible to get at the precise figures, as the pay of performers is so exaggerated, but it is asserted that Patti receives \$4000 a night. As she is to sing thirty times during her tour through the States, she will therefore re-

ceive \$120,000. Nilsson will get about \$100,000 for fifty concerts. Mrs. Langtry is said to receive one-third of the gross receipts, and will get about \$75,000.

The London *Standard* says: "The doctors have made life almost not worth living with their precautions against its being prematurely cut short. The air is laden with germs, the earth exudes poison, the sixpences we handle contain the seeds of zymotic plagues, the very cat that we stroke may have passed from a typhus patient's bedroom to bear on its fur the messenger of death next door. And now we are told that we smell a Gloire de Dijon at our peril, and that the azalea in our buttonhole may in the course of half an hour impart hay fever to a carriage full of railway travelers."

M. Pasteur's investigations in relation to rabies and hydrophobia have given a fresh spur to the activity of the anti-vivisectionists. On June 5 a meeting was held at the Salle des Fêtes in Paris, with the object of organizing an international congress on the subject. It was resolved to hold a congress at Paris in 1885. M. Pasteur has been furnished with an opportunity of testing his theories concerning rabies upon a human subject. One of the servants of the Paris and Lyons Railway at Tarascon-sur-Rhône, having been bitten by an undoubtedly mad dog, has placed himself in M. Pasteur's hands.

"I have often wondered," remarked a gentleman who recently returned from Brazil, "why importers of tropical fruit never made an effort to introduce the delightfully cool and refreshing caju of Brazil in this city. One variety of the garden caju, when ripe, is as large as a Bartlett pear and shaped something like it. Some varieties are bright yellow, some deep red, and others yellow, with pink-colored cheeks. The flesh, or pulp, of the caju is more tempting in appearance than that of any fruit I ever saw, but it is never eaten. It is for the juice alone that the caju is prized. In this it is much more prolific than the juiciest orange. It is the custom of the Brazilians to suck a caju before breakfast, but at any hour of the day the juice is delightful. It is sweet and delicious, slightly astringent, and a wonderful allayer of thirst. The juice of one caju is more grateful to a thirsty person than a goblet of the purest water.

—The street known as the "Victor Emmanuel Gallery," in Milan, is protected by a glass roof, which includes a large dome at a considerable height from the ground. This at night is lighted by gas. To overcome the difficulties and danger connected with the lighting of the numerous jets, the following arrangement has been introduced: A tramway has been laid parallel with the gas-pipe supply; on this runs a little electro-motive engine, such as may be purchased as models at the shops of philosophical instrument dealers. The miniature engine carries a spirit-sponge lamp, with a burner standing at right angles to the side, of such a length that the lighted wick passes over the up-standing gas jets. On the gas being turned on to the supply tubes the engine is started on its journey around the dome, and as it progresses the escaping gas is lighted.

London, Oct. 15.—Prof. Thomas H. Huxley has been ordered by his physicians to take an absolute rest from all literary labors for several months. In accordance with this advice the Professor will retire to Venice.

WILFORD'S MICROCOSM.

23 Park Row, New York, November, 1884.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

CABLE ROADS—THE FUTURE OF CITY TRANSIT.

Few persons outside of our great cities have more than a faint idea of the progressive strides now making in street conveyances for accommodating the continually moving populations; and but few, even within these great commercial centers, have more than a superficial conception of the changes in progress, and soon destined for rapid accomplishment.

The first omnibus-line was started in this city in 1880, which was considered a wonderful advance over no conveyances at all, as it really was; and it soon became such a rage as a business enterprise that, in twenty years or so, thousands of these lumbering vehicles filled Broadway and the principal adjacent streets, to the complete blockade of city traffic on frequent occasions.

A few years later the first line of street railroad track was projected and laid, with the cars to be drawn by horses. These proved so much superior to the omnibus for convenience and speed, that they rapidly became popular with all classes, leading to the laying out of new lines through various streets, which as rapidly brought omnibuses into less and less repute, reducing their number year by year, till now there are but three lines remaining, with only about 125 vehicles all told. Two of these lines, we understand, are soon to be withdrawn, to make room for the greater improvement of street railways, and we predict that in a few years more the last omnibus will be seen to pass down Broadway.

With the decadence of these notable stage-lines the horse-car lines have gradually extended, till at present there are in New York and its dependent cities not less than 850 miles of such roads, on which thousands of cars, teams, drivers, and conductors are employed, and which carry annually more than 500,000,000 passengers.

But an evident check to the horse-car extension was felt when a dozen years ago the first elevated steam railroad was constructed in Greenwich street and Ninth avenue, and which immediately led to those lines now running successfully and prosperously in Sixth, Third, and Second avenues, like so many main arteries of the city. This was the inauguration of real rapid transit from end to end of Manhattan Island, a need so long felt in this city, and which will be soon extended to several similar lines in Brooklyn, thus connecting the New York and Brooklyn systems by means of the great bridge which a year and a half ago linked the two cities together as practically but one metropolitan center of commerce and trade.

But it is proved by experience to be impossible for elevated steam roads, with their maxi-

num speed of travel, to meet more than a fraction of the great want of the moving population which constitutes this monster hive of humanity. People want and need to move on the ground, without being compelled to ascend and descend stairways, and will prefer to do so provided a speed can be secured approximating that of the elevated roads. The horse-cars already answer this purpose fairly, though they move too slowly for this fast age. But the chief objections to the horse-car system of travel is the humanitarian aspect of the case—the annual slaughter of thousands of the noblest of dumb animals on earth, besides the most cruel treatment of tens of thousands of others which are annually worn to the point of death by the cruel drudgery of constantly slipping on pavements in their efforts to start and draw the heavily overloaded cars. On a single day last September, during the heated term, thirty-three dead horses were seen along the Third Avenue line of road alone, to say nothing of the scores sacrificed along other city lines. It is simply an outrageous and barbarous use of this noble brute to serve man's selfish convenience, which could heretofore only be tolerated and excused by the plea of unavoidable necessity. The various horse-line companies felt keenly the truth of this charge of cruelty to animals, since their officers, many of them at least, are Christian men and not without the finer sensibilities of human nature; but what were they to do? They have made innumerable experiments and attempts to use steam and compressed air dummies or small locomotives, but without success, considering all the circumstances of the case, including discouraging city legislation, and have continued to use and cripple and murder the poor horse, under mental protest at the crime they were committing, not knowing what was to be done to avoid it.

At length a solution, or at least a partial solution of the difficult problem has been worked out in the novel invention of the cable-road system which is now in successful operation in some of the streets of Chicago and San Francisco, and which is also being introduced in several other cities, including Philadelphia, New York and Brooklyn. No wonder that Mr. Lyon, the president of the Third Avenue horse-line in this city, has resolved to put an end to the brutal use of horses on his road in view of this plausible mode of escape, and has commenced the reconstruction of his entire line for six or seven miles of double track into the latest improved system of what is now known as the *cable-road*. A word of explanation in reference to this novel and revolutionary system of rapid transit for cities may not be uninteresting to our readers at a distance, as it must of necessity be new to most of them, ex-

cept what little they may have read in the papers, and up to the present time we have failed to see in print a single satisfactory or intelligent report upon the subject. To begin with the structure itself: Imagine rail-tracks, similar to that of a double-track horse-car road, running through some straight street of a city for a distance of five, or six, or more miles. Central between the two rails of each track, sunk level with the surface, runs a trench of cast-iron framework filled in with concrete, the cross-section of which might resemble a capital U turned upside down, with a slot in the center, at the top, thus (1). This slot, about five-eighths of an inch wide, runs longitudinally the entire length of the road, the top of this trench, as just stated, being level with the surface of the track. This trench is designed as a channel through which an endless cable for propelling the cars is to run up one track and down the other. The cable is composed of a twisted rope of steel wire about one and a half inches in diameter, with a center core of hemp rope of about half an inch in diameter, to give flexibility to the cable, so that it may pass freely around the pulleys and drums of the driving machinery at the two ends of the road. This cable is first stretched along the two tracks within these trenches and then spliced so as to form little or no enlargement of the rope at the place of the splice. In order to allow the cable to travel without abrasion, there are what are called line-pulleys or sheaves set in frames at the bottom of the trench about 30 feet apart for supporting the cable. These sheaves run on spindles with journals at their two ends, which have to be oiled frequently to lessen the friction which would otherwise occur. To accomplish this work of oiling, there is a man-hole provided into the trench over each pulley, which can be opened and closed for this purpose.

A very desirable improvement in connection with this system of road, as will at once be seen, would be some kind of anti-friction journal device for the line pulleys that would avoid the necessity and expense of oiling, and the continual labor of opening and closing these man-holes. Such a device has been invented, and is now being successfully tested on the line of pulleys which supports the cable for drawing the cars on the New York and Brooklyn Bridge, and has been pronounced a complete success. These anti-friction bearings must, it is thought, come into use generally at no late day, not only for cable-roads, but for all horse and steam cars and for other departments of machinery where the overcoming of friction and the cost of oil is a considerable item.

Perhaps the most mysterious thing to the uninitiated, in connection with this novel sys-

tem of propelling cars, is the method by which the car takes hold of the continuously running cable located as it is below the surface of the track. Let us see if we can explain it intelligibly: Imagine two broad, thin steel bars, both together, not so thick as to fill the slot dividing and extending along the top of this trench. These are called grip-bars, and are attached firmly to the bed of a car, which takes the place of the dummy of a common street railroad. These grip-bars pass down through the slot in the trench, having connected with their lower end the grip-jaws proper, consisting of two brass bars grooved longitudinally to fit upon the two opposite sides of the cable. By moving a lever upon the car in a certain way, the manager slides these bars, one up and the other down, thus closing the jaws and pinching the cable which slides between them till the grip-car and its train of passenger cars attached get under way, and move at the same speed as the cable; the steel grip-bars in the meantime passing along the slot in the trench as the car moves. To stop the train, the manager reverses the lever, thus opening the jaws and allowing the cable to slip loosely between them while the train is stopped by applying brakes in the usual way.

Although it has been proved by practical experiment that cable-roads, with all their present drawbacks and imperfections, are a great saving in first cost and running expense over a horse railroad of the same carrying capacity, yet it is a fact which stares these companies and their engineers in the face that the steel cable, one of the chief items of expense, ought to and would last at least twice as long as it now does but for this slipping process in passing it between the brass jaws of the gripping device in getting the train in motion from a state of rest, which has to be so continuously repeated, and as now done on all the cable roads yet constructed. The careless habit of inexperienced grip men in bringing down the lever suddenly, thus causing the jaws to seize the cable with full force, necessarily produces a great strain upon the strands of wire, abrading and frequently breaking them; and in this way it not only causes delays to traffic but often seriously damages the cable. This wear of the cable increases in direct proportion to the rate of speed adopted for the cars to travel. At the rate of ten miles an hour, the speed of travel now adopted on the East River Bridge, it is not possible for the best cable to last more than six months with such a positive gripping device in use, and we are informed that on one of the San Francisco roads, even at a considerable less speed, the cable was used up and removed in about six months.

This leads us to conclude that the only truly

mechanical and economical method for gripping the cable while it is in motion and thus starting the cars without shock or strain, is that now in use on the bridge between this city and Brooklyn, namely, a set of grooved rollers or sheaves applied to the opposite sides of the cable and allowed to roll against it while being gradually checked up by brakes, thus allowing the cars to start very slowly at first and gradually to increase in motion till their speed equals that of the cable, when the grip-rollers of course cease to revolve. By this method of starting no perceptible abrasion occurs to the cable, while any sudden strain upon it is impossible owing to the easy revolution of the grip-sheaves by the cable's contact with their grooved surfaces, while the train starts so softly that persons inside would scarcely know that they were in motion without observing outside objects. By actual experiment this cable has been in active use for fifteen months, much of the time night and day, and at a speed of ten miles an hour, while it seems, from observation, nearly as good as new, and will no doubt be in good working condition for another year. It is positively safe to assert that the roller-grip will cause any cable to last twice as long as will the positive gripping device before referred to, under the same circumstances of speed and carrying capacity. This being true, it is plain that the cable-road companies now in operation can still improve their facilities and lessen their running expenses immensely, including wear and tear, by taking advantage of the saving devices that are being continually invented and offered.

Another improvement which it has been found necessary to adopt is to have each trench provided with two parallel cables, each stretched over its own line of supporting sheaves, one to be ready for use in case the other is disabled by wear or accident. This precaution, though involving considerable additional first cost, is quite important, since an accident happening to a single cable might require hours to repair it, thus impeding traffic and otherwise damaging the road to the amount of thousands of dollars—enough, soon, to equal the cost of a supplementary cable. Whereas, in case of such accident, the damaged cable is dropped, and the supplementary cable is at once lifted to the gripping device (which is made double for that purpose), when traffic is resumed throughout the entire line with but a few minutes' detention, while the damaged cable can be repaired at leisure.

Of course there are many incidental mechanical details connected with the various operations in successfully running such a complicated system of city transit as here outlined, which we have not space to explain, but which

the ingenious reader's mind will naturally suggest as he goes along. Suffice it to say that with all the unfavorable features and still crude appliances of the underground cable system, and its apparent great first cost, it has been, as before hinted, proved, both in San Francisco and Chicago, to be nearly twice as profitable an investment of capital as a horse-car road fully equipped of the same length, besides furnishing comparative rapid transit for cities, the cable cars traveling at least one-third faster, including stops, than those drawn by horses.

With the cable under ground, and the slotted trench and track level with the streets, there is nothing to hinder teams and vehicles from driving across these roads, though much greater care will be required on the part both of the drivers of vehicles and the managers of the grip-cars than with horse-railroads, to avoid accidents.

That this cable system is destined to extend widely and rapidly through all the cities and even large towns and villages of this country, in consideration of its great economy of cost and running expense over any other system of equal facilities to transit, there is now no doubt, since vast improvements in lessening the expense of wear and tear are undoubtedly in immediate store for such enterprises in the shape of various improvements as already hinted. What then is to be the probable future of this rapidly improving system which even now in its infancy is proved to be so much more economical and money-making than the horse-car systems which have made fortunes for those monopolies? We predict as one philosophical result of this innovation that the system of cable roads will tend in time greatly to change the present shape of growing towns and cities, giving them the form of a cross, after first making them into the form of a lengthened continuous line, and that the present plan of building circular or square masses of dwelling-houses, making a village as broad as it is long, will economically and philosophically go out of use with the general introduction of cable roads. The reason for this singular prediction is as follows:

One of the first and main features for the economy of this system is to have as great a length of cable in a straight line of street as possible, with a single depot of driving machinery and other necessary appliances at one end of this line, or at the radiating center of two, three or four similar long lines. With the advantages of such a cheap system of rapid transit in a young and growing city, a cable corporation could at an early date of its development shape the city of the future to their fancy and pecuniary advantage first along the line of a single street for six, eight, or ten miles into the coun-

try, or to the convenient length of a single cable, with a single line of buildings naturally growing up on each side, where every resident could not only enjoy all the facilities of pure country air and large grounds at low price, but immediate and easy access to the business part of the street, which would naturally form itself at or near, or around, the great motor-power or heart of the transit system, and which would necessarily constitute the business nucleus of the town. When this single street should become lined with its residences, with possibly also two or three parallel streets on either side, all of course convenient to the cable-cars, the company could shoot out another line of cable tracks from the same focal point in the opposite direction at a trifling cost compared to that of the first line, having its plant already established, thus opening up another line of streets for another six, eight, or ten miles, thus making a city of small comparative population from twelve to twenty miles long, while each resident would be many times nearer the central or business portion of the place in point of time, ease, and cost of travel, than would the same number of inhabitants be in a city formed into a dense, unhealthy circle around such a nucleus in the old way of laying out cities, and with a dozen different lines of street railroads.

Of course as the population would still continue to increase, new lines of cable would be shot out to the right and left from this same focal center, each to the convenient and profitable length of a single system of cable traction, and each at still reduced cost over the first or second, allowing with each new extension a general reduction in fares for the whole population, while the combined systems would yield equal if not increased profits to the enterprising company, owing entirely to this philosophical conformation of the shape of the city to the peculiar mechanical nature of this most economical system of city transit. Such a living municipal cross, as seen by a balloonist from the clouds, swarming with its human denizens, is not the dream of a visionary, but a future commercial problem carefully worked out by the same philosophical and mechanical ratiocination that would construct a complex mechanical invention, and see it work successfully in the recesses of the brain, before a drill or file or other tool had been brought into use.

According to this philosophy, instead of the system of street-railroads being obliged, under serious engineering difficulties, to conform to the accidental shape of the town, and on this account be long delayed in aiding its development and growth, the town itself will necessarily and naturally conform in shape to the method of transit, and by so doing will assist

its own growth, healthfulness, and various other advantages.

We have written this paper with the firm belief that many of our present readers will live to see these hints at city outline and growth realized, as the result of the system of cable roads here described.

REVIEW OF SIR WM. THOMSON'S ADDRESS.

NO. 2.

THE LAST DITCH OF THE WAVE-THEORY.

In our first paper, reviewing the address of Sir William Thomson, delivered before the Midland Institute, at Birmingham, England, as printed in the August number of this volume of *THE MICROCOSM*, we considered his critical discussion of the five senses, and especially his novel and somewhat forced assumption of a new sense, which he termed the sense of *force*. We now propose to consider his elaborate discussion of the sense of *hearing*, in which he makes a most labored and entirely novel defense of the current theory of sound, presenting the subject in such a plausible and original light as strongly to antagonize the positions we have taken against that theory, and sensibly to weaken our reasoning, unless we are able to neutralize the force of his assumptions by exposing their fallacy. This we hope to be able to do by the aid of sober scientific facts and experiments, and to the reader's entire satisfaction before closing this paper. Previous, however, to entering upon such a very critical discussion, or before attempting to consider the novel presentation of that theory as so ably done by this distinguished and representative physicist of England, let us give him the advantage of allowing the reader to see his arguments and positions as fully expressed in his own language, and which we will now quote so largely as to do him ample justice. Let every reader first carefully examine these extracts:

"Well, now, let us think what it is we perceive in the sense of hearing. Acoustics is one of the studies of the Birmingham and Midland Institute, of which we have heard many times this evening. Acoustics is the science of hearing. And what is hearing? Hearing is perceiving something with the ear.

"What is it that you perceive ordinarily by the ear—that a healthy person, without the loss of any of his natural organs of sense, perceives with his ear, but which can otherwise be perceived, although not so satisfactorily or completely? It is distinctly a sense of *varying pressure*. When the barometer rises, the pressure on the ear increases; when the barometer falls, that is an indication that the pressure on the ear is diminishing.

"Well, if the pressure of air were suddenly to increase and diminish, say in the course of a quarter of a minute—suppose in a quarter of a

minute the barometer rose one-tenth of an inch and fell again, would you perceive anything? I doubt it; I do not think you would. If the barometer were to rise two inches, or three inches, or four inches, in the course of half a minute, most people would perceive it. I say this as a result of observation, because people going down in a diving bell have exactly the same sensation as they would experience if from some unknown cause the barometer quickly, in the course of half a minute, were to rise five or six inches—far above the greatest height it ever stands at in the open air.

"Well, now, we have a *sense of barometric pressure*, but we have not a continued indication that allows us to perceive the difference between the high and low barometer. People living at great altitudes—up several thousand feet above the level of the sea, where the barometer stands several inches lower than at sea-level—feel very much as they would do at the surface of the sea, so far as any sensation of pressure is concerned. Keen mountain air feels different from air in lower places, partly because it is colder and dryer, but also because it is less dense, and you must breathe more of it to get the same quantity of oxygen into your lungs to perform those functions which the students of the institute who study animal physiology—and I understand there are a large number—will perfectly understand. The effect of the air in the lungs—the functions it performs—depends chiefly on the oxygen taken in. If the air has only three-quarters of the density it has in our ordinary atmosphere here, then one and one-third times as much must be inhaled, to produce the same oxidizing effect on the blood and the same general effect in the animal economy; and in that way undoubtedly mountain air has a very different effect on living creatures from the air of the plains. This effect is distinctly perceptible in its relation to health.

"But I am wandering from my subject, which is the consideration of the changes of pressure comparable with those that produce sound. A diving bell allows us to perceive a sudden increase of pressure, but not by the ordinary sense of touch. The hand does not perceive the difference between 15 lb. per square inch pressing it all around and 17 lb., or 18 lb., or 20 lb., or even 30 lb. per square inch, as is experienced when you go down in a diving bell. If you go down five and a half fathoms in a diving bell, your hand is pressed all round with a force of 30 lb. to the square inch; but yet you do not perceive any difference in the sense of force any perception of pressure.

"What you do perceive is this: behind the tympanum is a certain cavity filled with air, and a greater pressure on one side of the tympanum than on the other gives rise to a painful sensation, and sometimes produces rupture of it in a person going down in a diving bell suddenly. The remedy for the painful sensation thus experienced, or rather I should say its prevention, is to keep chewing a piece of hard biscuit or making believe to do so. If you are chewing a hard biscuit, the operation keeps open a certain passage, by which the air pressure gets access to the inside of the tympanum, and balances the outside pressure and thus prevents the painful effect. This painful effect on the ear experienced by going down in a diving bell is simply because a certain piece of tissue is being pressed more on one side than on the other, and when we get such a tremendous

force on a delicate thing like the tympanum, we may experience a great deal of pain, and it may be dangerous; indeed, it is dangerous, and produces rupture or damage to the tympanum unless means be adopted for obviating the difference in the pressures; but the simple means I have indicated are, I believe, with all ordinary healthy persons, perfectly successful.

"I am afraid we are no nearer, however, to understanding what it is we perceive when we hear. To be short, it is simply this: it is exceedingly sudden changes of pressure acting on the tympanum of the ear, through such a short time and with such moderate force as not to hurt it, but to give rise to a very distinct sensation which is communicated through a train of bones to the auditory nerve.

"Now, what is the external object of this internal action of hearing and perceiving sound? The external object is a change of pressure of air. Well, how are we to define a sound simply? It looks a little like a vicious circle, but indeed it is not so, to say it is sound if we call it a sound—if we perceive it as sound, it is sound. *Any change of pressure which is so sudden as to let us perceive it as sound is a sound.* There [giving a sudden clap of the hands]—that is a sound. There is no question about it—nobody will ever ask: Is it a sound or not? It is a sound if you hear it. If you do not hear it, it is not to you a sound. That is all I can say to define sound. To explain what it is, I can say, it is change of pressure, and it differs from a gradual change of pressure as seen on the barometer only in being more rapid, so rapid that we perceive it as a sound. If you could perceive by the ear that the barometer has fallen two-tenths of an inch to-day, that would be sound. But nobody hears by his ear that the barometer has fallen, and so he does not perceive the fall as a sound. *But the same difference of pressure coming on us suddenly—a fall of the barometer, if by any means it could happen, amounting to a tenth of an inch, and taking place in a thousandth of a second—would affect us quite like sound. A sudden rise of the barometer would produce a sound analogous to what happened when I clapped my hands.*" Etc., etc.

Much more, all of a similar character and tediously repeated and elaborated, was added to make up that part of this address as it relates to sound. It centered in and embraced this one cardinal idea and proposition that sound consists solely of rapid barometric changes of pressure, or, expressed in the old nomenclature of the theory, that it consists solely of "condensations and rarefactions of the air" which bend the tympanic membrane in and out as each sound-wave passes, or as each rise and fall of the barometer occurs. So enthusiastic was Sir William Thomson over this new departure on barometric pressure, as a startling explanation of what sound really is, that he seemed never to weary during nearly an hour's repetition and elaboration of the novel discovery, even however wearisome he might have been to his audience of students. We have called this, as we think appropriately, the *last ditch* of the wave-theory, for if this plausible resort to the well-known action of the barometer

under varying atmospheric pressure breaks down as an argument for the wave-theory, its advocates may well hoist the white flag as a signal for surrender.

We now propose to storm this final intrenched position of the theory, and to take it at the point of the barometer, which will serve better than the point of the bayonet. Here is the way this commander of the ditch is compelled to capitulate:

It is a positive fact, as experiment shows, that no barometric change whatever takes place even in a closed room, under the action of the loudest sound, or the most powerful air pulses, or atmospheric condensations and rarefactions that can be produced by moving a broad, flat disturbing body to and fro by a man's strength. To demonstrate the total fallacy of this barometric explanation of sound, and thus to let the bottom out of this latest, and we believe last argument for the wave-theory, we now proceed to give the results of special and elaborate experiments which we have made in the presence and with the assistance of careful scientific witnesses. We used a regular barometer tube, with its sensitive column of mercury completely exposed to the air of the room by removing the cork from the enlarged portion of the chamber at its base, so that the slightest change of atmospheric pressure might be instantly observed in the rise or fall of the top of the column. This tube was secured against the wall of the room at convenient height for close observation with a powerful magnifier, while an assistant produced atmospheric pulses or air-waves a few feet away by various means such as the rapid movements of a powerful fan; but not the slightest motion could be observed in this very sensitive column of mercury. The motions of the fan were then extended through swings of several feet, to and fro, to give full time for the mercury to respond to each condensation if any effect on the column should be produced by this vibratory or wave-motion in the air. But still no movement whatever took place at the top of the column. These experiments of producing so-called "condensations and rarefactions" were then repeated directly at the base of the column of mercury with its open mouth still exposed to these pulses, but still no effect was produced, showing conclusively that no vibratory motion of the air tends in the slightest degree to produce barometric pressure right in a room where the air is confined, and where the most powerful pulses that a man's strength can generate are driven directly against the base of the mercury. We invite any scientific investigator, who may have access to a barometer, to repeat and thus verify the results of our experiment as here given as the most conclusive evidence of the fallacy of

the wave-theory, Sir William Thomson himself being judge.

As a matter of course, whatever may be said or taught about the number of such pulses or vibrations in a second being necessary to produce sound, it is plain that a single long and powerful pulse should raise the barometer, or else it is a scientific truth that no vibrations in the air, rapid or slow, can produce any barometric effects, such as Sir William Thomson assumes to be the solution of the sound-problem. The fact is, this great physicist fortuitously stumbled upon the idea of the barometer, as a lucky solution, since it was in harmony with the theory of "condensations and rarefactions of the air," and, like his predecessor Prof. Tyndall, jumped at the conclusion that a vibration of any body in the open air which would send off a pulse or air-wave would produce such a general effect on the atmosphere as to affect the pressure in the cavity of the ear, or, in other words, produce a barometric effect on the atmosphere; and without going to the trifling trouble of trying the experiment with a common barometer, which he no doubt has in his study, he gravely taught and elaborated one of the most preposterous principles of science ever promulgated by an intelligent man, when a moment's reflection, even, would have shown its fallacy. Had he tried the experiment he would have learned to his confusion if not to his edification that no vibratory motion of a body in the air of a room (much less in the open air) produces the slightest barometric pressure, not even a microscopic effect upon the column of mercury, simply because (and here is the true secret) *such aerial disturbances, let them be caused by slow or rapid vibrations, do not change the weight of the air in the room, which change of weight is the sole cause of changes in barometric pressure!* Thus the barometer explanation of sound hopelessly breaks down, and with it the wave-theory falls into ruins, as we shall show further on.

To carry our experiments from these slow and continuous atmospheric pulses to rapid vibrations, and thus test their effect on the column of mercury, we had an assistant to sound a powerful whistle within three inches of the exposed base of the column, then to sound a low and heavy note with the voice, long continued to aid our observation of its effect on the column of mercury if any such effect were produced; but our experiments were all abortive, except so far as to expose the total fallacy of Sir William Thomson's latest and greatest effort to sustain the wave-theory. Not the slightest tremor was caused in the upper surface of the quicksilver by these deep and powerful sounds as closely observed through the magnifying glass,

even when the sounds were produced right at the exposed base of the column of mercury. Plainly if sound, as Sir William taught the Midland students, consists alone of rapid barometric changes, which only take place by changes in atmospheric *weight*, and that we hear sound only as the effect of the rapidly varying barometric pressure on the drumskin of the ear, similar to that experienced in going down in a diving-bell, where the *weight* of the air is evidently augmented, then there certainly ought to have been some slight tremor to the mercury by the powerful sounds thus produced right at the base of the column. It must, therefore, seem supremely absurd to insist that a locust, more than a mile away from the ear in open space, actually produces the sensation of sound which we hear, by a barometric change in the whole four cubic miles of air—increasing and decreasing its entire *weight* enough to bend the thousands of millions of tympanic membranes, that could perceive the tone, in and out 440 times in a second—when the most powerful note of a strong-lunged man, or the most energetic motion of his arm upon the air, cannot affect the barometer at all, sounding and swaying within three inches of its exposed column! Is it possible that such men as Sir William Thomson, Lord Raleigh, and Professors Tyndall, Helmholtz and Mayer, cannot grasp the overwhelming conclusiveness of this refutation of the wave-theory, and thus be led to embrace the beautiful principles of the Substantial Philosophy as applied both to sound and to all the other forces of Nature? Yet these great men, who are put forth as scientific guides to the young students of this land, and who hold forth at great convocations such as those convened recently at Montreal and Philadelphia, send out their authoritative fulminations which we common people are expected to accept as philosophic truth without questioning or gainsaying. How do we know, in view of such teaching as now under review, that any single paper read by those eminent savants at Montreal or Philadelphia contains a grain more of scientific truth when focused under the electric light of sound philosophy and experiment, than this same widely copied address about barometric sound-pulses?

It is absolutely enough to dizzy the head of credulity itself to be compelled to accept the fact that so distinguished a physicist as Sir William Thomson up to this late date has not been able to grasp the true cause of barometric changes—that it results alone from varying changes in the *weight of the atmosphere*, and not at all from any local disturbances of the air such as waves, pulses, or vibrations caused by a body moving through it. We trust that some

one of our subscribers in England who read this article will call Sir William's attention to it, and thus set him right on the true cause of barometric pressure, as well as the true doctrine of acoustics.

We have just intimated that this exposure of the barometric fallacy of Sir William Thomson has completely shattered the wave-theory. Here is the rough syllogism which does the work, based on his final solution of the sound-problem as taught in the wave-theory:

1. We can only hear sound, according to the current theory, by the same action or effect upon the air which causes barometric changes.

2. No vibratory or wave-motion of the air, caused by a moving body, let the disturbances or pulses be slow or rapid, produces the slightest effect upon the barometer even in a closed room, and directly at the exposed mercury, as demonstrated by experiment.

3. Therefore, sound is not produced in our sensations by air-waves or atmospheric pulses sent off from a vibrating body, and consequently the wave-theory breaks down in the hands of its greatest modern champion! How is that, Sir William?

But here is another form of the syllogism which that eminent physicist may be better able to grasp, now that he has been enlightened as to what really does produce barometric changes, namely, changes in the weight of the atmosphere instead of local air-waves.

1. If the barometer rises one "tenth of an inch," it shows that the weight of the atmosphere has actually increased 84 grains to each square inch on the surface of the earth at that locality, in order to produce such change.

2. Sir William Thomson tells us that one "tenth of an inch" barometric change, if rapidly repeated, is the process of producing sensible sound by a vibrating body.

3. A locust can be distinctly heard over 4 square miles of the earth's surface, or over an area of 15,844,448,400 square inches; and since, according to Sir William Thomson, the locust can only produce sound according to the law which changes barometric pressure,—that is by changes in the weight of the atmosphere,—

4. Therefore, this insect has the mechanical strength, by moving its vibratory apparatus, to add 60,000,000 pounds, in round numbers, to the weight of the atmosphere! Is not this a sufficient demonstration of the absurdity of the current doctrine of acoustics?*

* The reason why the atmosphere changes in its weight, and thus affects the barometer, is probably owing to the great aerial undulations which pass over its upper surface, possibly many miles from crest to furrow, thus causing variations in its general density and depth, with corresponding variations in weight. These undulations start corresponding waves and wind-storms in the lower atmosphere which in passing beneath the troughs of the upper waves alternate-

ly lift and lower them, producing rarer and denser areas of air, thus often causing rapid alternate changes of barometric pressure, which are still nothing more than rapid changes of depth, density, and consequent weight of the atmospheric ocean at any particular locality. But no such barometric effect can, as we have seen, be produced by any local movement of a vibrating body, such as a tuning-fork or string, which of course does not affect the general density or depth and consequent weight of the aerial ocean. This superficial misapprehension of physicists, as so clearly exemplified by Sir William Thomson, that a vibrating body can produce distant, or even contiguous barometric pressure, and thus bend the tympanic membrane in and out, by "condensations and rarefactions" of the air, is, after all, the fundamental error of wave-theorists, which we hope this article will forever set at rest. The real solution, therefore, of what our locust has to do according to the wave-theory, and as now so clearly admitted by this highest living authority, will prove an ample revenge for Elder Munnell upon the office editor of the *Standard*, whose entire stock in trade consisted in the erroneous supposition that the locust has nothing to do since the air weighs nothing at all, from the fact that it presses equally in all directions.

Now, the question is, does our distinguished physicist really believe that the insect, by its act of stridulating, causes a tenth of an inch change in the barometer throughout four square miles, thus adding 60,000,000 pounds to the weight of the air permeated by its music? He must believe it, or else his entire address before the Midland Institute, so far as it relates to sound, vanishes into the most ethereal nonsense.

But the strangest thing in this famous departure of Sir William Thomson, on changes in barometric pressure as the real cause of sound, is that the eminent scientist, in the same address, flatly contradicts his own great principle of natural philosophy, and deliberately proceeds to demolish barometric pressure as the cause of hearing sound, by specifically urging the well-known fact, that men totally deaf to air-waves, and, as we know, entirely without external ears, can hear sounds by pressing the sonorous body against the teeth! How are barometric changes to occur in the auditory nerve with no outside opening or air-passage, and with nothing but the solid teeth touching the sounding instrument? Sir William Thomson coolly instances a case of a deaf man hearing music by holding a stick between his teeth pressed against the piano while he was playing it, not seeming to recognize the fact that this conduction of sound to the auditory nerve by means of the solid bones of the head, was a flat overturn of his pretentious barometric philosophy. How simple and beautiful is the substantial theory, which makes the substantial pulses of sound travel through the solid bony structure of the head to the sense-nerve of the brain, just as substantial pulses of electricity will course through a suitable conductor to a distant telegraph station. So, also, it is as clear as sunlight, that the air, like the bones of the head, also conducts the substantial sound-pulses to the ear-membrane,

ly lift and lower them, producing rarer and denser areas of air, thus often causing rapid alternate changes of barometric pressure, which are still nothing more than rapid changes of depth, density, and consequent weight of the atmospheric ocean at any particular locality. But no such barometric effect can, as we have seen, be produced by any local movement of a vibrating body, such as a tuning-fork or string, which of course does not affect the general density or depth and consequent weight of the aerial ocean. This superficial misapprehension of physicists, as so clearly exemplified by Sir William Thomson, that a vibrating body can produce distant, or even contiguous barometric pressure, and thus bend the tympanic membrane in and out, by "condensations and rarefactions" of the air, is, after all, the fundamental error of wave-theorists, which we hope this article will forever set at rest. The real solution, therefore, of what our locust has to do according to the wave-theory, and as now so clearly admitted by this highest living authority, will prove an ample revenge for Elder Munnell upon the office editor of the *Standard*, whose entire stock in trade consisted in the erroneous supposition that the locust has nothing to do since the air weighs nothing at all, from the fact that it presses equally in all directions.

where they are distributed and graduated in proper quantity for reception by the filaments of the auditory nerve, and thus conveyed to the brain, causing the sensations of tone. How simply and beautifully this substantial view agrees with the now well-known fact that the tympanum is not a stretched membrane at all, and not intended by Nature as a vibrating instrument as erroneously supposed, but is an untensioned mass of tendinous matter whose office, as just intimated, is only to distribute sound and protect, as a sensitive partition-wall, the more delicate parts of the inner ear! The very fact that persons whose tympanic membranes have been totally destroyed, or who have been born without them, can hear as sensitively as those having these organs complete, is proof positive that physicists and anatomists have wholly mistaken the character, form, and office of this membrane, and consequently that they are just as badly mistaken concerning the theory which has so erroneously been based upon that fundamental mistake of tympanic vibration as the cause of hearing sound.

One of the most conclusive proofs that the wave-theory is false is the fact (not before referred to in our writings) that persons with tympanic membranes and other portions of the anatomical structure of the ear perfect, are totally deaf, *except through the teeth*, thus proving that the auditory nerve is normal and all right, and that the only impediment is the membrane itself, which stops the hearing instead of causing it. Whereas, if sound is really caused by air-waves and tympanic vibrations as a simple "mode of motion," no person should be deaf who has a mechanically perfect membrane and a physiologically perfect auditory nerve since hearing could not fail if the membrane vibrates, as it should, mechanically and necessarily, according to the theory. The real cause of deafness, where the membrane is perfect in form and the auditory nerve sound, is plainly *the paralysis of the membrane*, thus causing it to become insensible to the contact of substantial sound-pulses, just as a paralyzed nasal membrane becomes insensible to the contact of the substantial corpuscles of odor. Will any rational physicist say that a man becomes insensible to odor because his nasal membrane has ceased to vibrate? We now record the anatomical and physiological prediction, as the result of the foregoing scientific ratiocination, *that deafness can be entirely cured (wherever the auditory nerve is proved to be sound, as tested through the teeth) by simply rupturing the tympanic membrane*. What surgeon will be the first to demonstrate the correctness of this prediction?

The mechanism of the inner ear, such as the

stirrup, hammer and anvil bones, supposed by some to favor the wave-theory as a mechanical mode of motion, will give no aid or comfort to that now dead and buried hypothesis. We do not know the object or use of those little bones in our organic economy, since many such organs supposed to be mechanically essential to hearing in man, are admitted by Prof. Helmholtz to be entirely wanting in some lower animals whose hearing is even more acute than in us. As to attempting to account for the physical structure of the details of the ear, what more apparently absurd shape could be imagined than that of the external ear of man, with its grooves and ridges, hollows and gristly projections, oblong form and flabby flap, when a smooth half-funnel shaped organ would have been so much more effective for gathering sound? That it is really beautiful no one having esthetic taste pretends to believe. In concluding this review of Sir William Thomson's address, it is marvelous how every turn of the scientific wheel grinds out cogent considerations against the current theory of acoustics; and what is most marvelous in the premises is that the great physicists themselves, in attempting to explain acoustical science, are constantly furnishing the means of using these destructive arguments most effectively against their own favorite theory. It only requires one competent to sift and analyze their loose philosophical arguments to find all the weapons ready made that are needed for their total discomfiture. In view of such reasoning as we have here been enabled to bring against the very ablest defender of the current theory of sound, is it at all surprising that these distinguished physicists are as silent as the house of death whenever urged to defend the wave-theory? Such a state of facts ought to speak volumes, as it doubtless will, to the young scientific students of this country.

THOMAS MUNNELL IN THE "CHRISTIAN QUARTERLY REVIEW."

We do not know when we have been more interested in reading a magazine article than the one entitled, "The New Heavens and the New Earth—Scientifically Considered," in the October *Christian Quarterly Review*, by our esteemed contributor Thomas Munnell, A. M. The entire drift of the scientific portion of his paper harmonizes in all respects with the Substantial Philosophy as urged in this magazine, and also presents a theological aspect and exegesis of numerous texts of Scripture relating to his subject which are as beautiful as they are novel. He does not hesitate to adopt the position we have ventured to announce, that it is both unscientific and irrational, not to say unscriptural, to suppose that God made the

material world out of nothing rather than out of the invisible things of God—the finer elements and forces of nature. He says:

"It is undeniable that when God 'framed' water. He made it out of oxygen and hydrogen. These elements must have had an existence before ever there was a drop of water in the universe anywhere. They are older than water; and so with all other components of all other material substances; and it is unscientific for the Westminster Confession to say that God made water out of nothing. The question, then, would rise whether He made these elements of water out of nothing? And we will allow those to prove that who can.

"The purest diamond is but pure carbon, sometimes found in the form of charcoal; and He who can so readily flash a piece of charcoal into a diamond, will find no trouble in converting the most ponderous material substances into perfect homogeneity with our heavenly state. So, then, there shall be 'no more sea,' for its continued existence would imply the continuation of the present heavens and earth, with all their death-bearing elements, as it is this day. Since 'flesh and blood cannot inherit the kingdom of God,' it follows that everything related thereto must, for similar reasons, be disposed of also, in order that Christ may be able to 'subdue all things unto Himself' in an indestructible and spiritual homogeneity."

His conclusion from the cogent reasoning and logical principles which he brings to bear upon his theme, must strike every Christian theist as irresistible. It is in these words:

"It is remarkable, and must be gratifying to every believer in the Bible, to note the unconcealed phenomenal friendship that exists between Nature and Revelation in all the eschatological teachings of both; and no real student of these two great witnesses for God, ever fears a collision between them, or quakes at apparent discrepancies developed by incipient studies in either."

After alluding kindly and approvingly to the Substantial Philosophy, he closes his able paper with the following beautiful paragraph:

"Finally, the tendency of all things earthly seems to be to something finer and higher,—to the spiritual and incorruptible. We are not to have harder rocks, denser water, nor heavier soil. All the finer substantial entities are in the lead, so that if material things were condensed or synthetized from God's 'exterior Being,' His purpose seems to be to turn everything back again toward Himself, and to verify the saying that, 'Of Him, and through Him, and to Him, are all things.' The unseen elements of matter are the enduring and indestructible bases of all future forms, for, as the things which are seen come out of invisible things, so they seem destined to be returned to invisibility, in which they will be of closer kin with mind, thought, and spirit. Then 'the flesh shall no longer strive against the spirit and the spirit against the flesh,' but the flesh itself, being spiritualized, the heavens and the earth regenerated, and the soul made 'partaker of divine Nature,' all will be subduced into heavenly homogeneity, and Christ will be all in all."

We do not try to conceal the fact of our intense gratification at the unequivocal indorsement and defense of the New Philosophy by

such pens as those of Munnell, Swander, Carter, Lowber, Kephart, Hamlin, Hand and others of our able contributors. Specimens of this noble defense will be seen in the present number, in the articles of Swander, Carter and Munnell, to which the reader's attention is particularly invited.

MRS. ORGAN'S ARTICLES.

We regret to learn that our able and versatile contributor, Mrs. M. S. Organ, M. D., has been too ill from over literary work to continue her series of articles on "Drug-Medication" unbroken. She is now better, however, and expects not only to continue her contributions to THE MICROCOSM, but also to deliver a number of lectures for lyceums and literary societies in different parts of the country. Such societies would find it a first-class attraction for the public to secure this very talented lady for a course of lectures or readings. Address her at Newburg, N. Y.

REV. PETER RABY.

We regret to announce the death of the Rev. Mr. Raby, of Kimberton, Pa., one of the noblest of THE MICROCOSM's many friends. He was a prominent Lutheran minister, a highly educated and earnest Christian man, loved, as we learn from his intimate acquaintances, by all who knew him. Since he first saw the "Problem of Human Life," and learned of THE MICROCOSM, he has been an untiring advocate of the Substantial Philosophy, and has missed no opportunity to commend these works to his friends. He has thus been the cause of securing many readers to this magazine, and of selling several dozen copies of the "Problem." He has proved himself the friend of Substantialism, in which he so firmly believed, by his works, and we have not the slightest doubt that our noble co-worker now knows of the doctrine that it is of God by his own personal consciousness in another and a better life. He departed this life Oct. 4th, 1884. We condole with his many friends.

A LETTER FULL OF SUGGESTION.

Eld. Wright, M. D., of Kahoka, Mo., sends us a long private letter ending in these expressive words:

"THE MICROCOSM makes its appearance regularly. I regard it and the 'Problem of Human Life' as doing and calculated to do more good in counteracting infidelity in all its phases than all other publications on earth combined. I have been a reader of the Scriptures for forty-five years, but since reading the 'Problem' and MICROCOSM I can much better understand the sacred teachings than ever before. Five hundred dollars would be no consideration could I have had the 'Problem' and MICROCOSM to read

when I was a young man, for verily they open a new field of thought to every rational mind. *Substantialism* as taught in these works entirely harmonizes, as I now see, with God's word, and beautifully confirms the real entity of the immaterial soul of man. This new philosophy is so transcendently grand, far-reaching, and comforting that I cannot see how any intelligent man, professing to believe in the New Testament, can withhold his enthusiastic assent, or fail to render all possible encouragement to its universal spread. I pray for the success of *THE MICROCOSM*, and for long life and abundant health to its Editor.

"Your Brother in Christ,
" J. C. WRIGHT."

A VACATION FINALLY DECIDED UPON.

By advice of friends, including a trusted physician, it has been decided that the Editor of this magazine must have a couple of months' rest for recuperation and relaxation from his mental and physical strain. For more than eight years he has worked without a single day's vacation, and during much of this time late into the nights, often till after midnight. It is a wonder to all who have known of the facts, that he has been able to bear the pressure of such incessant mental and bodily application; but for some purpose he has been sustained, and he is still believed, at least by himself, to be yet good for a number of years of solid work, with this little change, even if the intended vacation does not amount to absolute rest.

But here occurs a difficulty. Up to the present time he has been unable to secure competent editorial assistance to carry forward *THE MICROCOSM*, independent of his own personal supervision, just because such help requires cash payment for services rendered, while this magazine does not yield a single dollar of revenue in a year over expenses, even with the entire work of editing done free, as it has been done from the commencement. With the purpose alone of doing good by giving the journal the widest possible circulation, it was put at \$1 per volume, while its actual cost is nearer \$2. This fact must have swamped it long ago but for the means obtained from the sale of our books, and which were used to sustain the magazine. Hence, if the Editor rests, *THE MICROCOSM* must also take a corresponding vacation, and the indulgent reader must put in the time some way during the *interim*, thus allowing the next number (No. 5) to bear the date of February, which will make the volume close in September instead of July. This will bring the next volume two months nearer to January, where it must ultimately come, and where it should have been at the start to avoid such fatal juxtapositions as the present vitiating but absorbing political

campaign. In the mean time, while the Editor is recuperating for a renewal of the attack upon the enemy's lines, let each friend of *THE MICROCOSM* interest himself in obtaining new subscriptions for the magazine, and orders for books, as a partial atonement for the non-renewal of thousands of last year's subscriptions. Whether such delinquencies are the result of intellectual indigestion from excessive indulgence in microcosmic food, or the stupefying effect of the free indulgence in current political campaign literature, the deponent sayeth not. Whatever the cause, such subscribers would not of course object should *THE MICROCOSM* die; while we feel sure that paying subscribers will not grudge this our first vacation, and what we hopefully expect to be our last, till we have finished our work. Whenever that time shall come we trust the verdict will be that, under all the circumstances, our labor has not been entirely in vain.

OUR GREAT ENCYCLOPEDIA OFFER.

[From last month.]

We are pleased to announce that several persons have taken advantage of our offer, as printed on last page of cover, to send us fifty subscribers for this volume of *THE MICROCOSM*, with the money (\$50), and thus earn a complete set of "Appleton's New American Encyclopedia" as a premium, original cost, \$96. We have several sets yet remaining, and we now make the offer to include also our books, "The Problem of Human Life;" 1st and 2d volumes of *MICROCOSM*, bound in cloth; "Universalism Against Itself," and "Walks and Words of Jesus," as follows: For a sale of 25 copies of "The Problem," at \$2 each (\$50); or 20 copies 1st and 2d vols. *MICROCOSM*, at \$2.50 (\$50), or 50 copies "Universalism Against Itself," at \$1 (\$50); or 50 copies of "Walks and Words of Jesus," at \$1 (\$50); or \$50 worth of any of these books in like proportion, the money in all cases to accompany the order, we will send a complete set of the Encyclopedia, as proposed. Or subscriptions to the 4th vol. of *THE MICROCOSM*, at \$1 each, can be mixed with any of the books at prices named, to make up the \$50, and thus earn the 16 leather-bound volumes of this greatest of encyclopedias. No offer like it was ever before made to the American public.

PHOTOGRAPHS OF OUR CONTRIBUTORS.

[From last month.]

We have received many high commendations of the cabinet photograph of the great painting by Mr. Tiers, of the Editor of *THE MICROCOSM* and his contributory staff. Many of our subscribers are so much pleased with it that they desire a larger copy for framing, and thus preserving it as a souvenir of their friendly relation to this magazine. We have obtained the consent of the artist to use a large negative for a picture, about 12 by 16 inches, a copy of which we will send on flexible board rolled in tube, post-paid, as a premium for three new subscribers to this volume of *THE MICROCOSM*, or we will send a copy on receipt of \$1.

The months of December and January were omitted on account of the Editor's vacation.

WILFORD'S MICROCOSM.

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EVOLUTION, OR NATURE'S SYSTEM OF PROGRESSIVE CHANGES.—No. 4.

BY ISAAC HOFFER, ESQ.

If we look back at the conditions that must have existed when life was first introduced, we can readily see that for a long period only water-plants and animals could exist; and at first those only which could live in a high temperature; and these, judging from specimens found in the waters of warm springs, must have been of a tender and perishable nature. But as the temperature of the waters diminished, other inferior species could be introduced, such as crinoids, corals and mollusks, which purified the waters by the absorption of calcareous matter and other impurities, and made it possible for the existence of higher marine species; until the increase of land, the gradual purification of the atmosphere, and the cooling of the earth admitted the growth of amphibious plants and animals. After this, the further purification of the waters and the atmosphere must have been more rapid, and the introduction of land-plants and animals must have followed. And as the way was prepared, so followed the introduction of higher species suited to the varying conditions, until the system of progressive changes in life culminated in the introduction of a fully developed intellectual condition in man. Conditions made the first introduction of life possible; and every important change in conditions is marked by the appearance of some new species. So completely were all species dependent upon conditions, that the periods, and even the epochs, in geological history must be determined by the species of life that prevailed in each.

Professor Dana tells us that "The progress in climate and other conditions involved a concurrent progress from the inferior living species to the superior." He tells us, too, that "The earliest species under a type are not necessarily the lowest. The highest types of Radiates existed long before the inferior types of Polyps, huge crocodilians before snakes, and ground pines before mosses;" and that "the transitions between species, genera, tribes, etc., are with rare exceptions abrupt." This shows that there is no universal law of development from lower to higher types, and no general law of gradual and continuous upward development from one species to another; and the most rational explanation to account for these cases is that *the order of appearance of the different types and species was determined by the progressive changes in the conditions of the earth, the waters, and the atmosphere.*

That the different orders of life, or of living things, appeared in accordance with the modifications of the conditions, and the preparation of the necessary provisions is unquestionably true; but that the conditions formed the structural types, and caused the development from the simple to the more complex in organic life is not sustained by known facts.

The theory that all the different grades of living things should have been developed from one or a few primordial germs is a beautiful one—a profound conception—and not in the least derogatory to the character of a Supreme Intelligence and a Supreme Power as some writers think; and if the facts of our present experience and the records of the past history of organic life would sustain this theory, I could cheerfully accept it. But I cannot find in all the researches of the past, and the experiments of the present, any satisfactory evidence that one species was evolved out of another. All the experiments and researches of our ablest scientists have failed to produce a single well-authenticated case of transmutation in species; and have thereby established the fact that the law of Stability in species is the Supreme law in organic life.

If geologists are correct in their history of life, that "transitions from one species to another were almost without exception abrupt, and that the higher order of types at times appeared first," it is evident that there was either no system of development in organic productions—no evolving of one species out of another—or that the system was not developed on the earth, but that it existed in a fully developed condition before it was introduced here and materially represented; and that this introduction and material representation was not in the order of the system, but in the order of the progressive changes in the conditions of the earth. *That favorable conditions, and necessary provisions, fixed the time and order of appearance for each and every grade of organic life.*

The laws of matter require proper and special conditions for the consolidation and crystallization of each particular elementary substance, or for every combination of different substances; and so the laws of life require special conditions and special provisions for the growth, the development, the functional actions, and the reproduction and perpetuation of each and every grade of organic products, which the grand and comprehensive system of life contemplated.

That the progressive system of life reached its completion, and structure its highest perfection, and fundamental types their full development in man, can hardly be questioned; and if that is true, then we may rationally conclude that in man are concentrated all the typical characteristics of the different grades of life, which appeared during the progressive changes in organic productions; so that man not only stands at the head as the ultimate purpose of this grand system of life, but is the embodiment of all its structural types and all its general characteristics. This position is fully sustained by naturalists, who even contend that man in his embryonic development passes through all the forms of the general types of structure in the different grades of life, and that in his developed state all these types are completed and brought to the highest state of perfection. And it is a well-known fact that in man are indicated and manifested, in some degree, all the

natural instincts, the physical energies, and general characteristics of animal life, so that *man is the embodied representative and head of all organic development, and of all animal life.*

If man was the ultimate object of the whole system of progressive changes he was undoubtedly the constant object of *every part* of the system: and if he had to become the embodiment of all the general features and characteristics of *one part* of that system in order to be its head and true representative, it is but a reasonable conclusion that he became the embodiment of the general elements of *all the parts* in the system. Thence it would appear that the material part of man is so constituted as to require and contain all the different elements of matter; most likely in definite proportions, not inconsistent with the ratio in the whole; and that all the forces engaged in these progressive changes were also brought into a union of action in man, so that all the energies of nature are combined and represented in him.

While it is perhaps impossible, in the present state of scientific knowledge, to show that all the different elements of matter are essential to man's existence, sufficient is known to show that a large number of these elements are contained in the human body and needed in sustaining life. This fact considered in connection with the whole system of progressive changes in the material world and in vital action—that man stands at the head of this system as the completion and perfection of organic and physical development—furnishes such a chain of evidence as would seem to justify the conclusion that man requires and contains all the different elements of matter.

That all the forces of nature are, in some form, represented in man can hardly be doubted, but to give a comprehensive explanation, and make an intelligent comparison, would be as difficult as to give a rational explanation as to what physical powers are, and to define the process of their exertion.

We have seen that during the first period of progressive changes the tendency and direction of the general advance was toward a concentration, combination and consolidation of matter, and toward a forming and shaping of the same. During the second period the tendency and direction of the advance was toward a concentration of the forces of nature into self-sustaining, self-developing, self-perpetuating, and self-acting *forms of energy*, of innumerable varieties and orders, until finally all the forces of nature became embodied in one form of energy in man.

So that in man are combined and represented all the forces of nature, all the elements of matter, and all the types of life.

Throughout the whole system of nature's progressive changes, there was clearly indicated, in all the operations and results, a controlling and directing power of unmistakable superiority over all the manifested agencies at work—such power as can only be found in a fully comprehending intelligence; and this indicated power was brought into a *self-manifesting condition in man*, and assumed the control and direction of all his energies, showing that man in his whole composition is not only a complete representative of nature in her material part, and in her energies, but also in that *Superior Power which sustains, directs and controls nature in all her activities.* In man, therefore, intellectual energy, physical and vital forces and matter, are all represented and

united in one interacting personality; and in this personality the intellectual part supplies that which gives apprehended and known existence to the activities and works of nature; it gives conscious power and active energy to man, and enables him to assume control of matter and life and of the forces of nature, and makes him the proper custodian and competent agent of nature's system of progressive changes. He is the last link in the system of evolution of the past, and the first link in the chain of progress in the opening future—the connecting link between the past and the future. In his material body and physical powers are represented and embodied the essence of past existence and past activity; and through his intellectual energy the past, the present and the future are brought together in review; and the past is made the guide for the future. The present is made the field for the continuation of progressive changes in the material world and in all the varied institutions of man, such as agriculture, mechanics, commerce, government, art, literature, science etc., and for the culture and development of intellectual energy—the great energizing and impelling power in all the progressive changes of the present period. The present sphere of progressive changes is no longer confined to advancing operations in the material world, and the world of life, but includes human operations in the material and immaterial world; in converting the forces of nature into subservient agencies and in taking charge of matter and life and managing and controlling the same for man's *physical* comfort and satisfaction: in the establishment of human institutions for man's *social and mental* comfort and satisfaction; and in the culture and development of intellectual energy, as the means of a more perfect understanding of all things, past and present, and for a clearer apprehension of the unknown future, and especially as a means of necessary preparation for continuing the march of progress. For if the facts of the past history of progress are any data for future calculations—that is, if the *persistence* in the activities of the past can be relied on in the future, then progressive changes cannot come to a stand, and *the present period of intellectual advance, in its present sphere, will not be the last.* Man has become the embodied representative of the advancing powers manifested and indicated in nature's system of the progressive changes of the past; the whole advancing tendency having been transferred and committed to him, he is the sole agency, and in him is the only power for continuing this great system of progress in the future. In him the cycle of tangible and material operations is completed and the sphere of intangible and immaterial actions is opened, and mental operations and intellectual developments are inaugurated. We see that in the present period his intellectual part has become the sole progressive power and the only self-developing energy. *Every individual man is a perfected product and complete representative of the past system of progress, just as the evolved seed of a particular plant is the product and representative of that plant; and in him, as in the seed, is the progressive energy, and the sure promise of continued future development and perpetual advance. In his physical composition is the seed of the past, and in his intellectual energy is the germ of the future.*

LEBANON, May 6, 1884.

UNITY OF TYPE.

BY REV. F. HAMLIN.

Lionel S. Beale tells us that "there is a period in the development of every tissue, and every living thing known to us, when there are actually no *structural* peculiarities whatever; when it is impossible to distinguish the growing, moving matter which is to evolve the oak from that which is the germ of a vertebrate animal." Subjected to the highest power of the microscope or to the closest scrutiny of the chemist, the ovule of worm, hawk, camel or man are utterly undistinguishable. We are told that protoplasm is the structural unit from which all organisms start in life, and are built up. "Beast and fowl, fish, mollusk, worm [says Huxley] are all composed of structural units of the same character, namely masses of protoplasm *with a nucleus*." Now what determines the difference between animals, or the difference between plants? What causes fundamental agreement in the structure of organic beings? What makes one little speck of protoplasm grow into an oak, another into a willow, another into a cow, and another into a man, when in the embryo they are undistinguishable? What causes unity of type? Mr. Huxley tells us that protoplasm "is the *clay of the potter*." But does not a potter in making even the commonest stone vessel have a *mental form like a block of gypsum* about which he throws the plastic clay? And is not the vessel dependent on that pattern or form for its shape? And from Huxley's stand-point of observation, does not the very variety of form in the material world argue for variety in an original intelligent pattern? Indeed, what does he mean when he speaks as above quoted of "*protoplasm with a nucleus*"? Surely by "*nucleus*" he cannot mean a purely material nucleus, for that would be useless. He must mean, according to Webster, "a central mass, or point about which matter is gathered, or to which accretion is made." Now, whatever its essence, it is *something*, and it is evidently unlike the matter which gathers about it, and is practically a pattern or form, even though incorporeal, about which the material substance gathers. How strange that this thought never occurred to Mr. Darwin, as an explanation of the otherwise mysterious! Doubtless Mr. Huxley is correct in saying "that under the microscope the steady activity of the protoplasm in the formation and elaboration of a material body is like that of a *skilled modeler* on a lump of clay;" but that "some more subtle aid to vision than an achromatic would show the *hidden artist with his plan before him*," we doubt; for "the clay of the potter" (as Huxley calls protoplasm) is not so much dependent for its form upon an *external* model after which the potter works, as upon an *underlying form over which the clay is shaped*.

Nor can we admit with the scholarly Henry Drummond that as there is only one clay, and yet all these curious forms developed out of it, it necessarily follows that the difference lies in the potters, and that there must be "as many potters as there are forms." The truth is, there need be *but one potter* if there be *as many models as there are forms*! It is not necessarily true that "one potter makes all the dogs, another all the birds, etc." Given the varied forms, and one competent artist can make all. In truth, the doctrine of "Invisible outline patterns," as explained by

the Substantial Philosophy, is the only and all-sufficient hypothesis that is presented to the world to-day. With every embryo is originated the working model or "outline-pattern," and as the extremity of the magnet compels the steel filings to adopt its form as they cluster about it, so the immaterial entities of the universe control the location and form of the material particles which environ them. *Until Science shall present some valid objection to this theory, and in the absence of any other, reasonable men will accept it as the only true explanation of the Law of Unity of Type.*

PREESKILL, N. Y.

CONSCIENCE.

BY JUDGE G. C. LANPHERE.

Rest, peace, is the normal condition of human, as of animal life. Human nature cannot stand the strain of constant excitement. It may enjoy it for a time, but in the main, and as a rule, it craves rest. The deep cry of the heart is, "Give us peace." Even those who are most active and restless, whose lives are full of struggle, look forward to a period of rest as the crown of all their toils. Excitement cheers for a time; but it is never the ultimate object of men's ambition, the summing up of their hopes. It is but the means to an end, and that end is peace, rest.

And so with the moral sense, "Conscience makes cowards of us all." While conscience condemns, no position in life, no power, no possessions, can give us peace. The life is like "the troubled sea that cannot rest: whose waters cast up mire and dirt;" and the only road to peace and rest is to gain, or regain, a quiet conscience; and there are only two ways to do that. Like the physical sense of pain that warns us of harm to our physical bodies, conscience is the sentinel on guard to warn us of danger to our moral nature. While conscience speaks there can be no peace. Its voice is ever that of warning, or of condemnation. It never speaks peace. It is our true friend who never flatters, never misleads, and never disturbs our peace without a cause. Conscience is God's voice speaking to the soul. It is his witness for righteousness, and is itself a witness for God. Men speak of a perverted conscience. The conscience is never perverted. It is ever the voice of God; but its voice is often smothered, silenced, by passion, by prejudice, and by a perverted judgment.

As I have said, there are only two ways of silencing the voice of conscience. One is to conform our lives, our thoughts, and affections to principles of rectitude. To not only do but love the right, bringing our lives into harmony with the Divine life. Then we shall not be disturbed by conscience. Its voice will be stilled, because its mission will have been accomplished.

But there is another way of stilling the voice of conscience; and that is by a constant, persistent course of evil: a total disregard of and contempt for its admonitions; a persistent effort to stifle its voice, and to drive from the mind all sense of shame and of guilt, and thus obliterate all love of justice, truth, and right. So far as we can see and know, the human character may become, little by little, thoroughly bad. All our observation proves this. The restraints of society, and the influ-

ence of friends, do much to hold men in check, and to compel them to conceal their vices; but with many there is an under-current, dark and turbid, leading to the extinction of all that is good and noble in the character. It cannot be doubted that some men and women become evil through and through. This is the logical conclusion from the proposition, "The second step in sin is easier than the first." The individual has steadily repressed the voice of conscience until it is no longer heard. While man has conscience there is hope. It is evidence that he has not gone so far in the downward path as to be wholly indifferent to the right, and still has strength, if he would but exert it, to retrace his steps. But when, as I fear is too often the case, men, through a long course of selfishness, vice, and crime, cease to respect the right, and come to love evil for its own sake, delighting in it, then the voice of conscience is stilled, then nothing but the fear of suffering or of punishment, or of the loss of property, power, or reputation, can restrain them. While conscience is heard there is a constant struggle in the mind between right and wrong, good and evil, truth and falsehood. Selfishness in some form tempts, and conscience warns and condemns. But when the voice of conscience is stilled by a course of evil, the struggle is at an end, and the peace of death prevails. There is no conscience in hell. This results from the nature of things, and from the operations of the human mind: and the absence or silence of conscience is a great mercy to those who have made that dark abode their final home. The war in the mind between good and evil is ended, and the victim is at rest.

I say nothing of the condition of that man who through evil courses has smothered, deadened, and silenced his conscience. That is a subject for other and abler pens. In conversation, the other day with an orthodox clergyman, I said, "There is no conscience in hell." "That," said he "would be death, death eternal." And hence it is the "second death" of Scripture.

We speak of a "hardened conscience." It is rather a hardened mind, soul, or character, insensible to, and deaf to the voice of conscience. It is a state of insensibility to the demands of justice, equity, and humanity. This common expression "hardened conscience," is a world-wide acknowledgment that some characters become dead to conscience, and unalterably fixed in evil.

GALESBURG, Ill.

CAMPING TOUR TO YO-SEMITE VALLEY AND CALAVERAS BIG TREES—No. 3.

BY I. L. KEPHART, A.M., D.D.

Our route for the second day of our tour lay in a south-easterly direction, among the lower foot-hills of the Sierras, at an average distance of about thirty miles east from Stockton. The surface of the country here is very broken. The hills are covered with a growth of shrubbery, mostly chaparral and some manzanita, the botanical name of which is *Arctus taffalaus glaucus*. Both the chaparral and the manzanita grow in thick clumps or clusters, and to the height of about five feet. Of the chaparral there are two kinds—the one having a small oval green leaf bearing a varnished-like luster, and the other having foliage which re-

sembles the cypress. The manzanita resembles the low mountain laurel of the Eastern States, except that the color of the bark is a beautiful reddish brown; and the bark is remarkably smooth and shines as if varnished. It is found in abundance among the foot-hills and all along the western slope of the Sierras, and even in the Yo-Semite Valley. The straightest shoots, if cut during the winter season, make very handsome canes, and are in demand, as relics, by tourists.

The foot-hills in this part of the State are being very rapidly settled up. Here there is an abundance of rain during the winter season and as late as the middle of June. Hence, fair crops of wheat, oats and barley are grown, also potatoes and vegetables of all kinds. Then the streams and the general descent of the country afford facilities for irrigating the gardens and orchards, by means of which fruit and vegetables are grown in paying quantities. Grapes especially, do very well, and the time is not very distant when this "western slope" will be one vast vineyard excelling the "vine-clad hills" of France and Italy.

About eight A.M. we passed through the little, humble, unpretentious village that sports the name of the world-renowned vocalist—Jenny Lind. It is simply a quiet post-office town that is favored with mail twice a week. At ten A. M. we arrived at Milton, the eastern terminus of the Stockton and Copperopolis Railroad. This is a village of some five hundred or more inhabitants, from which stages run to the Calaveras Big Trees, Sonora, and (via Copperopolis, Chinese Camp, Priest's, Big Oak Flat, and Crocker's) to the Yo-Semite Valley. Having watered our horses and made some inquiry respecting the road, we left Milton, via the stage road to Copperopolis, and soon struck the "Gopher Hills." These are a well-defined and continuous range of hills whose summits are about one thousand four hundred feet above the level of the sea. Just as we struck these hills, the stage, driving like Jehu, passed us. It was full of passengers on their way to Yo-Semite, and was drawn by five horses, three of which were driven abreast "at the end of the tongue," and the other two "at the wheels." And by the way, a word respecting the driving of these stage-drivers may not be amiss. Seated in his high seat, the reins well drawn up, the right foot on the brake, and a long whip in the right hand, they "put the horses through" on a full trot, up hill and down, spinning around fearful curves at this "break-neck rate," over narrows where a divergence of six inches from the track would hurl horses, driver and passengers down hundreds of feet into a yawning gulf and to almost instant and certain death. But with all that, they are so expert in the business that you never hear of an accident.

About six miles north-east of the Gopher Hills, and running nearly parallel with them, is Bear Mountain, the height of which is about two thousand feet. The once celebrated town of Copperopolis lies at the south-western base of this mountain. Here copper mining flourished for several years and was in the height of its glory in 1864, during which year about twelve thousand tons of ore, valued at over \$1,000,000, were mined and shipped from this region. Two parallel veins of ore extend from the Calaveras to the Stanislaus River, the one along Bear Mountain and the other along the foot of the Gopher Hills. The ore from these

mines was at first hauled in wagons to Stockton, and thence shipped by water to points where it could be worked. But this proved so expensive that the business has been wholly abandoned, and the once flourishing town that prided itself on its large stores, immense hotels, and extensive hoisting works, has dwindled into an almost lifeless country village, where, but for the want of rain, grass would grow in the streets. However, the richness of the copper deposits gives assurance that at some future day this mining industry will be revived, and again "the city that" (once full of people) "now sits solitary" will glory in her prosperity.

Having crossed the Gopher Hills we descended into Salt Spring Valley, so named because there are several alkaline springs here. This valley is about one thousand feet above the level of the sea, and is from four to six miles wide. Its southern terminus is a little beyond Copperopolis, and its northern near to Calaveras River. From the summit of the Gopher Hills we had a fine view of the town of Milton and the surrounding country. The hills are sparsely covered with the nut pine, which is noted for its large cones and the edible seeds or nuts they contain. These seeds are larger than the common white bean and are very palatable. It is said that the Indians subsist largely on them; the trees are not tall, but have wide-spreading branches and beautiful foliage.

Having entered the valley, the first and chief object of interest we see is the Salt Spring Valley Reservoir. Here, opposite a wayside hotel, we draw up under the wide-spreading branches of several oaks and halt for dinner. All the supplies necessary were taken from the wagon, a table arranged and a bounteous lunch spread, of which all partook heartily. Several men were around the hotel, from whom we ascertained a few facts respecting the reservoir. It is owned by a chartered company, and when the dam is raised to its full height, will cover about one thousand six hundred acres and will be about thirty feet deep. The object of this artificial lake is to collect a large quantity of water during the rainy season to be used for mining and irrigation purposes.

Luncheon over and all things in readiness, we set out across the valley. It is an arid region, and every here and there is traversed with regular rows of argillaceous slate rock projecting to a height of two or three feet above the surface. In some places the slate is hard and capable of being utilized for roofing purposes, and will doubtless, in the not distant future, be mined for that purpose. This valley seems to have been scooped out by the action of the melting ice during the geologic period of erosion, and the material carried down into the San Joaquin and Sacramento valleys, which were at that time a great inland sea.

Beyond Copperopolis we pass through Tower & Bisbee's ranch, an extended tract of well-improved land where hay, barley and stock are extensively grown. This is by far the most fertile portion of the valley, the most of the other portions being covered with quartz pebbles. Ascending Bear Mountain, we have an extended view of the country, and on reaching the summit we could look clear over the Gopher Hills in our rear, down into the immense San Joaquin Valley, and looking to our front and either side, we saw spread out before us a grand view of the distant snow-capped Sierras, and the intervening pine clad hills and ravines; and, towering above all, Cloud's Rest at the

base of which is the world-renowned Yo-Semite Valley.

Continuing our journey, about five o'clock we descended the great hill to the Stanislaus River, and crossing at Union Bridge, we went into camp for the night on the southern shore of this dashing, foaming mountain stream. The evening was pleasant, and a hearty supper and the weariness occasioned by a long day's travel through heat and dust, thoroughly fitted us for enjoying a good night's rest.

THE DIFFERENCE.

BY DR. A. L. COLE.

In the scientific—more correctly, speculative—realm, there is much written that confuses rather than enlightens, simply because "the difference" is not regarded. There is more light in a sentence or two by W. H. Clark, in the March MICROCOSM, than in many a volume I have read, simply because he regards "the difference."

"If an event has happened millions of years ago, as we count years, or should it happen millions of years hence, in either case it has happened at the center of eternity; and, as that is where God constantly is, therefore either event has happened in His perfect wisdom, and to Him *just now*. So that, though in man's finite ideas the events are separated by such inconceivable intervals, yet, to God's infinite mind, there is no interval at all, but an eternal *now*. * * * To man's mind He foreordains and foreknows; to His own mind He neither foreordains nor foreknows, but simply ordains and knows in His own absolutely, always present *now*."

The Bible reveals God as existing independent of time. With reference to Him we cannot properly say *past*, nor *future*: these tenses are inapplicable to Him, strictly speaking. When such terms are used in the Bible with reference to Him, it is solely for man's benefit: that is to say, man could not understand unless the language were human. In revealing Himself, God *accommodates* man by the use of *finite* methods of speech. All this dispute about "foreknowledge of God," "predestination," and the like, would cease at once if the *finite* standard were not used to measure the *Infinite*. Science and Philosophy must necessarily be not only at sea, but always foundering, in so far as they insist upon subjecting the abstract to the laws of the concrete—the greater to the less. While yet in the Theological Seminary, nothing made me more impatient with metaphysical authors than the point now under review; and now for more than twenty years I have insisted upon the distinction so clearly made by Mr. Clark. This gentleman will have the sincere thanks of every clear-headed man who reads his article; and Dr. Hall will have the profound gratitude of all coming generations for the part he is playing in the metaphysical drama, for *his work will live*.

Right or wrong in the details, it may be quite confidently said, that the "Problem of Human Life" and WILFORD'S MICROCOSM are right in their general drift; at all events, they have done more toward satisfying my speculative faculty than all other human writings combined that have come to my notice; and as no man can demonstrate his absolute knowledge of the speculative realm, I am not afraid of being laughed at by candid men for this avowal.

Let men speculate as much as they please, but let them never forget that after all "we walk by faith, not by sight," if we walk well.

SANTA ANA, Cal.

AN INQUIRY INTO THE NATURE AND CAUSES OF WIND.

BY R. VAN HORN.

Wind has been defined as "air in motion." But how is air put in motion so as to become wind? The popular and universally received answer is, by gravitation as the ultimate and rarefaction as the immediate cause.

In all works which I have seen on the subject, it is explained after this fashion: The air in one place becomes heated by the rays of the sun or by some other means, possibly by electricity; and being thus heated becomes lighter than the surrounding atmosphere and rises to seek its equilibrium in the higher regions.

By this means a partial vacuum is formed and the adjacent air by the force of gravitation rushes in from all sides to fill the space, leaving another vacuum to be filled by still remoter portions of the ever widening area; and thus a current is established:—and this is wind.

The theory thus briefly stated is taken as the base line upon which are drawn all the details of explanation accounting for all kinds of wind, from the unvarying trade-winds of the equator and the land-and-sea breezes of the coasts, down through the whole list of siroccos, monsoons, tornadoes, storms, gales, gusts, breezes and zephyrs of the temperate zones; and also the fierce blizzards which pour down from the inhospitable regions of the poles.

That air *can* be put in motion in the way above indicated is not denied. Indeed it is proven and illustrated before our eyes every day, in the draught of our chimneys: in the outward current at the top, and the inward current at the bottom of our opened windows, and in many other ways. Neither is it denied that the trade-winds, and the land-and-sea breezes are caused, at least in part, in this way. But how about the ordinary variable winds and gusts with which we are familiar in the temperate zones? Do the conditions and the accompanying phenomena of our winds harmonize with the phenomena and conditions of currents produced by rarefaction and condensations of contiguous portions of the atmosphere? We claim that they do not. And now for the proof. Before entering upon the solution of this problem, let us get distinctly before our minds what things will necessarily be found true of every current of air formed upon the received theory. And in order to do this let us illustrate by some familiar objects.

First,—We will take an inclined plane, with a groove running lengthwise, and place in the groove any number of marbles, thus:

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Now we will lift the marble at the foot of the plane, and thus create a vacuum. The marble next to it having now no support, and being acted upon by the attraction of gravitation, rolls in and occupies the place of the first; and the third in like manner takes the place of the second, and so on to the last. Here we have a *continually receding* vacuum, beginning at the

bottom of the plane and moving toward the top as each marble changes its place; and if the plane has but a very slight dip there will be an appreciable difference in time between the lifting of the first marble and the starting of the last one. Now the point in this illustration bearing upon our subject is that the receding motion of the vacuum is the *reverse* of the motion of the marbles when rolling—the marbles move toward the bottom while the vacuum recedes toward the top. Please bear this in mind.

Illustration Second: Here is a body of water, say a dam, ten feet deep and forty rods long. It is full of water, but not running over, and, there being no wind, it is perfectly still—no motion, no sound. Now, let us take a skiff, and row to a point midway between the foot of the dam and its head, and there wait results. Suppose that by some means, no matter what, the whole breast of the dam gives way suddenly, and the water goes thundering down through the breach. Here we have the vacuum, caused by a removal of a portion of the water next to the breach, as in the case of lifting the first marble. We notice that the water next the breach begins to move *some time* before there is any motion at our point of observation; and, if we watch carefully, we will notice that the vacuum, as indicated by the beginning of motion at each successive point, is receding toward us, while the water itself is running away from us. And now we begin to feel our boat move down stream. But we will tie it fast, and watch a little longer.

Looking up stream we see the point where the water *begins* to move still receding, inch by inch and foot by foot until it reaches the head of the dam, and the whole body of water is in motion. The *beginning* of motion runs backward while the motion itself is forward; and in this respect both experiments agree. But there is another point in the last which was not noticeable in the first. When the breach was made in the dam there was a *sound* from the rushing of the water which we heard very distinctly some time before the water began to move at our point of observation; and the fact which bears upon our subject is that the sound came from the direction *toward* which the current was about to move, and not in the opposite direction; please bear this also in mind.

And now I hope we are prepared to understand what will be said on the subject of wind. And first let us take and examine a case of wind caused by rarefaction. Our place of observation is in Northern Ohio, about fifty miles west of the Pennsylvania line. The air is now perfectly calm, but it has been cloudy for some days as far east as the State line. But during the same period the sun has shone brightly without an intervening cloud on a large tract in Western Pennsylvania bordering on the State line.

Now, according to the received theory the air in Western Pennsylvania has become heated and rises, forming a partial vacuum; while the air in the adjoining region of Ohio, having been under a cloud, is cooler and heavier, and rushes in to fill the vacuum. Now, the same thing is occurring in the air which we noticed in the case of the marbles, and of the water in the dam—there is a receding vacuum which travels westward, while the air, as it begins to move at each successive point, travels eastward—that is, we have west wind, but its cause

being in the east, it begins to blow there before it begins to blow here.

The wind also, like the rushing water in the dam, makes a noise which can be heard at any given point before the still air at that point begins to move. Consequently, when the receding vacuum has traveled to a point, say within half a mile of our place, we will begin to hear a sound of wind and see the trees moving. But mark it, although the wind will be a west wind when it begins to blow here, the sound heralding its approach is heard in the east, and not in the west. I think that every person who has sufficient scientific turn of mind to be a reader of the *MICROCOSM* will perceive at once that every current of air caused by rarefaction as above explained, will and must of necessity conform to these conditions.

But our ordinary winds do *not* conform to these conditions; for every person knows that an approaching wind, if strong enough to make a sound, and a motion among the trees, this sound and motion are always observed in the direction *from* which the wind is to blow. That is: a wind in which the air is to move from west to east is always heard first in the west, and not in the east, as in the case of wind caused by rarefaction.

Therefore the conclusion is forced upon us that wind, except in rare instances, is not caused by rarefaction, and consequently the received theory is defective, if not entirely false. And we venture to write the Q. E. D. of geometrical demonstration.

NORTHFIELD, Ohio.

A NEW THEORY OF EARTHQUAKES.

BY REV. A. S. LOVELL.

DEAR DR. HALL,—An esteemed friend has furnished me with a novel theory, which I forward to you for publication in the *MICROCOSM*, if you deem it worthy.

He heads it "Earthquakes, Volcanoes, etc." His theory is as follows:

Our earth is composed of two magnificent parts, namely—an exterior crust, or shell, some forty miles, more or less, in thickness, and an internal nucleus, nearly eight thousand miles in diameter, and consisting of dense matter in a state of "fiery fusion."

These two immense bodies are, in a measure, independent of each other, each revolving on an axis of its own. The two axes may, or may not, be parallel. Probably they are not parallel, and their relation to each other varies as their circumstances vary.

There is a space between the two bodies of greater or less dimension; not very great, however, and quite indefinable.

That there is such a space is a matter of necessity. In ancient ages the whole earth was in a condition similar to that of the nucleus now. A cooling process ensued, and continued until the whole crust was cooled and solidified down to its present depth. Solidification implies shrinkage, shrinkage is contraction, and contraction is yielding up of space. Therefore there must be a space between the nucleus and the shell. And now the question may arise—do these two bodies revolve in equal times? Whether they do so now we cannot say, but evidently there was a time when their periods were unequal, the shell, in a given time, making the greater number of revolutions. To il-

lustrate: Take a common pencil and tie one end of a short string firmly to it. To the other end of the string attach a small weight, say, a bullet. Now, holding the pencil horizontally, whirl the bullet in such a manner that the string will wind around the pencil. Do not alter the degree of force applied, and it will be observed that, as the string shortens, the revolutions of the bullet will be more frequent. The reason is so obvious that I do not stop to give it.

Now, apply this to the earth. The shrinkage of the shell caused its exterior matter to pass in toward its axis, and the result was more frequent revolutions in a given time.

Again, these two vast bodies—the shell and the nucleus—are not at rest in relation to each other, but undergo a perpetual, but irregular, oscillation. Why? It is doubtless true that there is more solid matter in some portions of the earth's crust than in others; and if so, the more massive portions would be more strongly attracted by the nucleus toward itself than would the less massive, and the result would be a motion of the heavier side toward the nucleus, and finally, actual contact with it.

Again, masses of the interior shell, of various dimensions, are occasionally falling into the fiery fluid below; and we have only to suppose a mass of some millions of tons so to fall, thus vastly changing the status of attraction, to see the opposite side of the shell advance toward the nucleus, and finally meet it with all the force of a mighty world. Also, this immense mass, like an iceberg falling from a height into the ocean, would at first sink far beneath the fiery ocean, and then, recovering itself, would rise to and far above the surface, and if any portion of the shell were within reach, it would be smitten with terrific force. In such a case, the stroke and the abrasion attending it would cause at the surface of the earth both the shock and the rumbling of an ordinary earthquake.

Thus we have one probable cause of that phenomenon.

Another is when the shell and the nucleus come in contact with extraordinary force. At such a time there may be a multitude of minor crackings (like the firing of musketry) on the interior of the shell, those of heavier caliber in the middle portions, and finally, fissures of greater or less magnitude, on the surface of the earth.

All this is the result of the stupendous pressure exerted by these vast bodies upon each other; a pressure sufficient to out-bend the solid crust of the earth to the extent of bursting it asunder.

And now we have the volcano in a nutshell.

It has been a question of the ages:—What is that power or force which has proved itself adequate to elevate a vast column of the dense melted matter of the earth's interior through so many miles of perpendicular lifting, even to, and far above the surface? One has suggested gas, another steam, and another I know not what. But it is evident that nothing of the kind is competent. Such pressure would hold steam in a fluid state even at a red heat. None of the more ordinary powers of nature could perform such a miracle.

Now let us suppose the contact of the earth's shell and nucleus to occur directly under the vent of a volcano. We need say no more. We have here the pressure of a world, and at

the same time, the very force for whose competence we have been inquiring.

Here also we have an explanation of the tidal wave; the same occurring whenever the contact of the two bodies takes place under the ocean's bed with sufficient force to bend the crust of the earth outward.

Addenda:—If the above theory be true, then, firstly: the interior space may be a grand laboratory for the evolution of unlimited quantities of electricity; a species of evolution which even that uncompromising iconoclast, Dr. Hall, might not feel called upon to annihilate. And on the approach of the two vast bodies within striking distance, there might occur such terrific and shattering discharges as would be heard and felt at the earth's surface; thus furnishing those minor earthquakes with which almost every one is familiar.

Secondly: We have an explanation of the existence of the vast mountains and mountain chains that ornament the world; the same, in very ancient ages, having been thrust outward by the resistless contact of the nucleus and the shell. Fissures in the rocks have been filled with a variety of melted matter by the same agency, and even the trend (north and south chiefly) is elucidated.

Thirdly: We perceive a possible cause for the rising or subsidence of land in different parts of the earth at the present day.

Fourthly: As there are continually occurring, periods of contact and no-contact of considerable duration, and as the vast amount of heat communicated to the shell by long contact would certainly pass through to the surface of the earth, even though it should require years to do so, and would then affect the outside temperature, we have a probable reason for the slight variations observable in the seasons of the year, and in different years.

Fifthly: If there is more solid matter in the northern than in the southern hemisphere—and this is not improbable—the nucleus would naturally be found nearer to the north than to the south pole; and this would account for the superior cold of the antarctic circle. And have we not volcanoes further north than south?

Sixthly: If the axes of the nucleus and the shell slightly diverge, it may possibly explain the reason why the magnetic pole and the true earthly pole do not coincide.

Seventhly: If the two axes are not parallel, and one of the bodies moves faster than the other, the effect would be, slowly, but surely, to change the direction of the earth's axis.

Eighthly: As our earth is absolutely "out in the cold," it is obvious to science that the amount of heat furnished to it by the sun is by no means commensurate with its wants; and were it not for the heat which passes continually from the center to the surface, the world would have perished with cold ages ago.

Ninthly: The original space between the nucleus and the shell has been, by supposition, greatly enlarged by the numberless outpourings of melted matter, both under the sea and on the land, as also, by the sum total of all the out-pushed mountains on the surface of the globe.

Tenthly: To a possible objection, that the two great bodies, once in contact, would remain so forever, it may be replied, that the attractions of the opposite hemisphere, after the rebound, are nearly sufficient to effect a separation, and that the resistless inrushing of the out-pressed

fluid matter to regain its former position, would be quite sure to complete it.

Finally: We see (and this to the believer in divine revelation is both important and significant) how stupendous and portentous a power the Almighty Creator holds in his hand, with which to shatter the entire fabric of the world, let forth its central fire, and bring about that final catastrophe when the elements shall melt with fervent heat, and the earth and its works shall be burnt up together.

ANDOVER, Conn.

A STRANGE CASE OF PETRIFICATION.

BY REV. D. OGLESBY.

In about the year 1851 or 1852, in St. Clair County, Ill., a girl of about twelve years old died and was buried in a neighborhood burying-ground. Six or seven years afterward it became necessary to take up the bodies and move them to the public cemetery. When they came to this one of the little girl (Harriet Scott) they found it very heavy, and upon examination found it had turned to stone. The strangest thing about it was, that she was a very fleshy girl, and had died in hay harvest, when the weather was exceedingly hot and dry, after only a few days of sickness, so that the body had not become emaciated at all. The writer's brother, who helped dig the grave, said the clay was almost as hard as a stone and as dry as dust. Under ordinary circumstances decomposition would certainly have begun in twelve or twenty-four hours at furthest. One who examined the body told the writer that he took a knife or hatchet and found the body to be about as hard as chalk and quite as white. All the body was perfectly petrified except the parts that were covered thinly or not at all by clothing—*viz.*, the face and hands. These were partly gone. And another strange coincidence or circumstance connected with the case is this: when in her romps and plays she became defeated she sometimes would say, "Never mind, I'll turn to a rock when I die anyhow." These facts could all be substantiated even yet by scores if necessary, as her mother and one sister and many of the neighbors still live. The writer boarded in the family a few years before she died, and has dandled her on his knees scores of times. Now what could have caused this petrification? Could it have been the effect of some medicine administered shortly before death? Unfortunately for the interest of science perhaps, the physician who attended the case died before the facts of petrification were known.

RICHFIELD, Ill.

Conception, Chili, Jan. 28, 1884.

DEAR DR. HALL.—I was highly gratified indeed by the publication of my article in the June number of your paper, and greatly entertained and elated by reading your remarks upon the subject. As I told you in my private note sent with the article for publication, the thought therein was not original with me, but rather it is that of the great church of which I am a member. Your exposé seems to be very rational, indeed; and I can see no reason why any body of sensible men should declare God to be an *existence* "without form or parts."

I herewith send you another small article

which will explain itself; and, if your judgment deems it of sufficient interest, is intended for publication. Should it be crowded aside my feelings will not be injured. *Let the good work of the Microcosm go on forever.*

I am again reviewing the *Problem*, and will soon venture to send you a criticism on your *corpuscular emissions*, which I think will only help make *Substantialism* the plainer, and which may serve to amuse you, if it does not add to your most valuable of all works ever published.

Sincerely, your pupil and fellow student,
J. M. SPANGLER.

A REMARKABLE TRADITION—FOR ETHNOLOGISTS.

BY PRES. J. M. SPANGLER, A. M.

The Araucarian Indians, occupying the beautiful territory of Araucaria in Central Chili, are in many respects a remarkable people. When the Spaniards under Almagro undertook the subjugation of this country in 1535, they met with terrible resistance and were at length driven away. Valdivia, with a large army of natives of Spain and Peruvians, succeeded in subduing the northern tribes, and in founding a number of cities; but all attempts to conquer the Araucarians, or induce them in any way to accept the Spanish yoke, were in vain. The ground was made rich with human gore, and every rivulet and stream in the land was tinged a thousand times with human blood; but it was not until one hundred and eighty years of almost constant warfare had passed, that the Indians in treaty were granted their independence, with stated territory, which they have maintained ever since.

Unlike the Indians of North America, the Araucarians are heavy-set, black, have large square foreheads, and are by no means inclined to roam from place to place.

One most remarkable thing about these people, for which I am indebted to a work in the Spanish language called *Reino de Chili*—accepted as authentic in all the land—is that from time immemorial these people have had a tradition that clearly carries them back to the deluge. They believe that the earth was once destroyed by water, and that a few persons only were saved of all the people then living; that these were saved by fleeing to a high mountain called *Tenten*; that the people had been warned of the approaching destruction by a good man, who went about advising them all to flee to that particular mountain for safety. But few heeded the warning.

Their tradition, furthermore, teaches them that on *Tenten* was a large animal in form of a serpent, bearing the same name, very good and wise, that undertook the protection of all who fled to him and his mountain. But another serpent, very ugly, fierce, and wicked, whose home was in the great deep, and whose name was *Cici*, was fully determined upon the destruction of all men. While *Tenten* was assuring the people, through his ambassadors, that destruction was coming upon them, *Cici* was no less busy in persuading them that it was all a delusion, and finally, when he succeeded in getting the largest possible number within easy reach of his great net, he suddenly caused the sea to overflow and catch them, and forthwith proceeded to change them into demons like himself, to do his bidding and serve his

evil purposes forever. He even purposed destroying those who had fled to *Tenten*, and to that end pursued them vigorously; but as fast as he pushed up the waters, good *Tenten* raised up the mountain. The battle raged long and furiously, and all the evil hosts exerted their greatest powers to help make the destruction complete. Onward and upward rolled the furious billows; upward, higher and still higher went the mountain and the redeemed people. Finally, after the battle had lasted for many, very many moons, the mountains and *Tenten* reached the sun, when the warfare came to a singular termination; for among the happy throng one was found worthy of making a great sacrifice. It was his son. Singularly enough, when he had been slain and his blood spilt upon the waters, *Cici* lost all his power and was compelled to retreat, when the elements assumed their normal conditions.

There seems to be no doubt whatever concerning the existence of this tradition among the aborigines of Chili, as it is a matter of history, believed in by the best men of the nation, and is also currently reported by word of mouth by those who have frequent intercourse with the Araucarians. From whence originated these people? AMERICAN COLLEGE, CONCEPCION, CHILI.

PRIORITY OF MATTER TO MIND UNSATISFACTORY TO REASON.

BY W. H. ROWLETT.

The finite mind can apprehend but not comprehend the infinite. We cannot so much as run imaginary boundary lines around infinite space, nor conceive that eternity had beginning.

The finite mind, in its effort to comprehend the absolute—the infinite—either as to space, duration, force or intelligence, becomes bewildered; it is estopped.

The atheist, in his eagerness to dispense with the God of the Bible as the Creator of the universe, asks: "Why insist that there is an intelligent first cause uncased? Why not stop with an infinite universe—with infinite matter, since finite mind is incapable of comprehending the infinite?" Simply because reason, finite as it is, recognizes matter as inert, and declaring its inertia perfect—complete—decides that it is an effect and that it must have been caused; since there cannot be an effect without a cause.

Inasmuch as reason peremptorily refuses to rest satisfied with infinite matter, or an infinite universe, it becomes necessary to inquire further, and if possible attain to that beyond which reason dare not ask to go. Then, is there a point where reason must stop?—must rest satisfied? Can ultimate ground—adequate cause for all that is recognizable, be found? Let us see:

I hold in my hand a watch. Whence came it? I did not find it growing from a branch of the majestic oak; nor from the limber bough of the weeping-willow. It did not spring spontaneously from earth's richest field, nor drop from the lurid clouds above us. I found it not in the rolling river; nor in ocean's silent depths. I did not find it in Silurian stratum; nor on the distant Alps whose heights are "wrapped in eternal snow." Whence, then, came it? It is here beating, as it has done with marvelous accuracy for half a century, the moments, as into the eternal past they fly. Whence came it? Self-originated? Reason

revolts at the idea and declares that it is an effect—that it was *made* and that it must have had a maker. Who, or what, then, designed and effected with such perfect adaptation to each other, the several parts of the structure? An answer satisfactory to reason cannot be found until we trace back to the mind of the inventor; to the mind of man, its maker. And though this mind is finite, yet therein reason finds adequate cause for the ingeniously constructed mechanism, and rests satisfied. Beyond this she has no disposition to go. For her to inquire further would be irrational—unscientific.

In like manner *reason*, imperially enthroned, recognizing matter as an effect, consequently not eternal—not uncaused—refuses to be satisfied until she has reached infinite Intelligence, infinite Mind—the mind of God—the God of the Bible,—and there finding adequate cause for all that exists, rests satisfied,—just as she was satisfied when she had traced the origin of the watch to the mind of man, its maker.

Here, then, in Infinite Intelligence, the chain of reasoning—the chain of causation is anchored. Here is the Infinite Fountain of causation. And as reason declares that “eternity had no beginning, infinite space no boundary, infinite force no limit,” so she decides that this Infinite Fountain of causation is *without antecedent* and is that in which originated all *things*, all substantial entities, whether material or immaterial, tangible or intangible, physical or psychical.

HODGES, S. C.

DR. KIEFFER ON REVELATION AND SCIENCE.

BY REV. J. I. SWANDER, A. M.

The *Reformed Church Quarterly* is no mere sounding board among the American magazines of literature and science. It originates much of its own contents, and echoes largely the principles of the peculiar system in which it stands, and of which it has been for thirty-five years the able and consistent advocate. Its corps of contributors are held responsible for the views advanced and maintained in their respective papers; yet, as a rule, their vigorous thoughts move forward with a slightly converging inclination, on a line nearly parallel with the progressive apprehension of the truth as held by the Mercersburg School of Philosophy. As such it has a distinct mission in the world—a mission which will probably not be fully accomplished until the second advent of Him who is the personal embodiment of the truth, and whose goings forth have been from of old, from everlasting.

The July number of the above-named Review was fully up to its usual standard for ability and freshness of vigorous thought. The article which we have read with special pleasure and profit, and which has called forth the merited encomiums of others, is from the pen of Reverend M. Kieffer, D. D., former Theological Professor in the Western Seminary of the Reformed Church. The venerable professor was our teacher in some of the branches of Philosophy, including that of Theology, as taught in the seminary at Tiffin, Ohio, more than a quarter of a century ago. Well do we remember sitting at the feet of our beloved Gamaliel attempting to crack some of those troublesome nuts in the sacred sciences—nuts

which will continue to be troublesome to others until a more general dissemination of the principles of the Substantial Philosophy and a more earnest inculcation of the same on the part of our divinity schools shall soften their materialistic shells and make their hidden kernels of truth more easy of access. We always admired the Doctor's method of imparting instruction to his class. If he was inclined to be a little speculative, the students all agreed that a warm breakfast on fresh speculation was better than a cold supper on stale hash. He aimed not so much to supply his disciples with a stock of knowledge already at hand in the books, as to incite their hearts and minds to search for purer streams nearer the fountain-head. And we desire to say right here, in a somewhat parenthetical undertone of emphasis, that if we possess any power whatever to do the world a little good by making it a little more trouble, we acknowledge ourself, under Providence, largely indebted to Dr. Moses Kieffer. We also notify him that it is our present intention, when we meet, as we fervently pray and fondly hope, in the realms of a glorious hereafter, to rise up in Heaven and call him blessed for the valuable help he offered us in our earlier, earnest searchings after something better than the dry bundles of negative abstractions so generally palmed off in popular craziness as gospel and theology. And if, before he reaches that celestial palace beyond the stars, he should see a few substantial chickens coming home to roost, he will not need to be informed that they are of the very breed and brood of poultry which, in the process of incubation for a quarter of a century, are now being hatched from some philosophical eggs laid in the Theological Seminary at Tiffin, and which would have added in the last stage of development had it not been for the timely arrival of the New Philosophy with its quickening principle of Substantial vitality. We look back with gratitude and pleasure to that important period of our life. We call into vivid recollection one of the venerable Doctor's characteristic exhortations: “Young Gentlemen: As you go forth into the world of theories, you will behold what the apostle saw in vision—all manner of four-footed beasts, creeping things, and fowls of the air, and I say unto each one of you: Rise, Peter; slay and eat.” In obedience to such advice, we have been slightly in the slaying business ever since, and find a little job of that kind on our hands at this present writing.

The paper now under review is on “Revelation and Science.” It is no dead sacrifice upon the ruins of an old altar, but a most valuable discussion of a living, leading question now agitating the minds and claiming the attention of the world's most advanced Christian thinkers. The article gives evidence that the writer thereof is not very far from that kingdom which possesses the power and glory of true philosophy. He has foretasted the grapes of Canaan, and now seems to walk in the vineyard with a keen relish for the substantial clusters that grow upon the vines of God. The following may be taken as a synopsis of Dr. Kieffer's article as apprehended by Timotheus, his son: “The great conflict of the age is a battle fought by starlight. The issue is not clearly defined, and the line is not well drawn. Friends are, therefore, not always distinguished from foes. It will ever be thus until the final engagement takes place under the central sun of the uni-

verse. The Christ of God is that central sun. He shines through 'the volume of the book,' the written word, and also through the volume of nature, the demonstrated word. He is the alpha and omega of both, as well as the entire fullness of their inner glory. Revelation and science are a complementary twofoldness of the same thing. Rightly understood, there is no contradiction. Contradiction is the result of arbitrary separation, and the effect of starlight apprehension. Christ must be recognized as the Sun of the universe, and the key to the full and final solution of all its mysteries. In Nature, as well as in the Bible, 'there standeth one among ye whom ye know not.' The cardinal mistake is made in taking the mere *archive* of Revelation for the revelation itself, and in a corresponding substitution of the outward material form of Nature for those inward immaterial force-elements which in their common ground of union constitute the veritable and abiding substance of a volume no less canonical than the received scriptures of God. Bibleolatry is one form of materialism in religion, and materialism in science is a worshiping of the letter which killeth. The one searcheth the scriptural letter thinking that therein it hath eternal life, and the other looketh into the motions of the air for the fecundous womb of sound. Under this view, both religion and science have neither genesis nor exodus. Let there be light! Let all be seen in the effulgence of Him who lighteth every man that cometh into this grand world and glorious periphery of truth. Here science appears no less divine than Christianity—both are answerable to their common archetypal source. Thus apprehended, truth gives eternal freedom, and opens the pearly portals to imperishable glory."

The venerable professor's paper is a very strong arraignment of dualism in much of our modern philosophical thought, perverting the most popular religious and scientific sentiment of the age. Much of the theological world, including a few of our personal acquaintances, seems determined to keep out of the pantheism supposed to be found in the Substantial Philosophy, even if they should be obliged to go to the very devil of dualistic heterodoxy for a safe retreat. "What right," says Dr. Kieffer, "have thinkers to separate the things which God hath joined together? It is helpful to distinguish, indeed that is necessary, but to separate is always destructive of life." The foregoing contains much truth; yet we doubt whether even such separation is "destructive of life." In treating of the "natural and supernatural," "physical and metaphysical," "mind and matter," his several classifications of the different orders and departments of the universe seem to us as not always on a line parallel with the distinctions which ground themselves in the constitution of things, while the terms he uses are not sufficiently comprehensive to embrace all which the ordination of God places under their respective categories. The terms "natural" and "supernatural" are not only allowable, but also needful in the school of revealed religion to keep in proper distinction the respective spheres and functions of *faith* and *reason*, but there is really no ground for such distinction in the objective constitution of the universe. The distinction relates rather to the present limits of the human understanding, and the present boundary line between the *comprehensible* and the merely *apprehensible* entities of one stupendous whole.

We remember distinctly how the professor used to assist his class in viewing with solemn ridicule the manufactured distinctions contained in some of the formularies of the church; e. g.: "the visible church" and "the invisible church." He told us that two bodies for one head was just as much of a monstrosity as two heads for one body. The church, like the universe, is *one*, with an outward, visible form, and an inward, invisible, plastic force which the New Philosophy is pleased to call Substantial in distinction from the more material side of the same thing as organically constituted during the formative period of its existence in time and space.

Dr. Kieffer speaks of the "life union," which, "according to all sound philosophy, subsists between the universe of mind and that of matter." We like his views of the life union. They remind us of that beaten oil of positive truth with which our feasts in the Seminary at Tiffin were so much enriched. Yet his present classification of things under the respective departments of "mind and matter" is, in our judgment, a use of terms not sufficiently comprehensive to embrace all the entities of God's great creation. "According to all sound philosophy," there are some things which come under the category of neither mind nor matter. Sound, heat, gravity and magnetism are neither mental nor material, and yet, in the light of "all sound philosophy" they have an entitative existence in the world. With full confidence we predict that our venerable teacher will: 1. Not deny their existence. 2. He will not admit their existence and yet exclude them from the compass of that mystic arm which encircles the entire creation in the unity of one embrace. 3. He will not say that they are mere molecular motions of matter and belong, therefore, to the "material universe." Fact is, all sound philosophy had but little to do in classifying the manifold works of God as "universe of mind and that of matter." Whatever has being is entitled to room within the compass of being, and should be classified accordingly. There must be accommodations provided somewhere for those invisible entities and force-elements whose veritable existence is now giving "all (un) sound philosophy" so much merited trouble. If there is not room in God's creation for all of his creatures, a third department must be constructed to order, to be known as the "substantial universe." The latter suggestion, however, is not necessary; and any attempt to actualize the same in a practical way would not be "according to all sound philosophy," because Dr. Kieffer's "universe of mind" is substantial in its nature, and calls for nothing more than a proper classification. Besides, there is not room for another universe without enlarging the bounds of unlimited space, and as this last intimation involves an absurdity which could not possibly be accomplished without the aid of the wave-theorists and their omnipotent little cricket, we suggest a general reconstruction, not of God's works, but of those silly theories which ignore the most real entities of the universe. The classification of all things into *material* and *immaterial* makes a distinction that grounds itself in the dual constitution of nature, and is in exact accordance with the eternal fitness of things. This is sound philosophy. Let THE MICROCOSM keep it before the people; and let all the people say, Amen. Praise ye the Lord.

INQUIRY INTO THE THEORY OF LATENT HEAT.—NO. 3.

BY PROF. E. A. LUSTER, A. M.

Our next example is the experiment used by Black, the discoverer of the theory, to find the latent heat of ice.

7. In this "experiment he suspended in a room at the temperature 8.5° (C.) two thin glass flasks, one containing water at 0° , and the other the same weight of ice at 0° . At the end of half an hour the temperature of the water had risen 4° , that of the ice being unchanged, and it was 10-12 hours before the ice had melted, and attained the same temperature. Now the temperature of the room remained constant, and it must be concluded that both vessels received the same amount of heat in the same time. Hence 21 times as much heat was required to melt the ice, and raise it to 4° as was sufficient to raise the same weight of water through 4° . So that the total quantity of heat imparted to the ice was $21 \times 4 = 84$, and as of this only 4 was used in raising the temperature, the remainder 80 was used in simply melting the ice." Therefore the latent heat of water is 80° . This experiment is found recorded in Art. 492, of Ganot, Seventh Edition.

We shall attempt to show, in the first place, that this test was based on a wrong supposition, and then carried out by false logic. If we can thus dispose of the first experiment accepted as proof of the existence of latent heat, we think we have a right to expect that suspicion should rest on all the remainder.

Black claims that as "the temperature of the room remained constant . . . it must be concluded that both vessels received the same amount of heat in the same time." Of course, in the terms "both vessels" he means their contents. We deny that both vessels will receive the same amount of heat in the same time. Of two bodies, one a good conductor of heat and the other a bad conductor, the former will, in a given time, evidently receive more heat than the latter. So certain are we that no one will dispute this that no pains are taken to prove it. This is a general truth—an axiom. Now water receives heat from outside sources by radiation, conduction, and convection, almost wholly by the last mode, for it is well known that the two former have little power to heat water. Ice can receive heat only by radiation and conduction. Now both bodies appear to be equally bad conductors, hence water has much better facility than ice, for receiving heat and will therefore receive more in a given time.

If a red hot plate of iron be placed over a column of water, and another equally hot plate placed under a second equal column of water, both columns will be exposed to the same amount of heat, but it will not be necessary to state that in a short time the water of the first column will be hot while that of the second will scarcely be warm. Both columns received the same amount of heat, but both did not distribute it, and therefore retain it. The heat on the top of the column escaped in steam, while that applied at bottom of the other column was distributed through the water by the law of convection; conduction having little or nothing to do with the matter.

In the case of the two flasks, heat radiates to them on all sides. Convection will at once set in from the bottom of the flask containing

water and slowly raise the temperature. In the ice-flask there will at first be no convection, nothing but conduction. As soon as a little ice is melted and water formed, convection will set in, but will not equal the rate of convection in the first flask until all the ice is melted, because it does not contain so much fluid. Hence the rate of convection for the ice-flask may be put at 0 in the start, and then assumed to increase regularly until it equals that of the water-flask. Now, supposing that the rate of increase of heat is in proportion to the rate of convection, it may be assumed that the ice will receive about half as much heat as is imparted to the flask containing water. Therefore the ice-vessel does not receive as much heat as the flask of water, and so Black's whole experiment appears based on wrong data, and must accordingly be false.

Now we shall attempt to show the fallacy in his logic. He says "21 times as much heat was required to melt the ice and raise it to 4° as was sufficient to raise the same weight of water through 4° ." Even if the same quantity of heat went into the vessels, this assertion could not be true, for the manifest reason that the different quantities of ice do not consume a constant quantity of heat. Ice being a non-conductor, must melt in proportion to the amount of exposed surface, and not inversely as its solid contents. If this be true, more ice will melt in the beginning of the experiment than in the end, and Black's reasoning is wrong.

Again, supposing the same amount of heat to flow in, and that this heat is employed "to separate the molecules composing the ice," even then Black's argument is wrong. Will a grain of ice require as much heat to dissolve it as a pound? Will any one contend that one cubic inch of ice melts four times as fast as four cubic inches? Is not the reverse rather nearer the truth? In what sense, then, can Black's assertion be taken so as to have the least appearance of truth? We see none whatever. We now beg to submit the following attempt at an explanation of the phenomenon.

Water exposed in a glass flask to constant temperature is affected in five different ways in respect to heat: radiation, conduction, convection, evaporation from the surface of the water, the evaporation and non-conducting condition of the dew or moisture always formed on the vessels when the difference of temperature is sufficient. Now the question is, why don't the ice in the one flask increase in temperature just as rapidly as the water in the other? We shall assume that the flasks were air-tight and that there was therefore no evaporation from the water inclosed. Suppose the two flasks filled, stopped up, and suspended ready for trial. A film of water will at once form on the outside surface of both flasks. The only heat to enter is that radiated from surrounding objects to the flasks and then carried by conduction and convection into the water, but only by conduction into the ice. The water has greatly the advantage, for by conduction very little heat enters the ice or the water either, but convection heats water rapidly, and is the only way water can be practically heated.

The heat radiated to the flasks must pass through the dew, but as water is a poor conductor and freely evaporates when exposed, much of the heat will pass away in vapor. We may suppose a very small gain to take place, however, for some heat will reach the contents

of the flasks. This heat in the case of the water will slowly raise the temperature, the dew will diminish, and the inflow of heat become more rapid by this diminished state of dew and the increased convection. When heat strikes the ice flask it meets with the same obstacles it met in the flask of water—the dew and non-conducting capacity—and does not receive the aid of the law of convection. The reception of heat by the ice will therefore at first be exceedingly slow, and hence much time will be needed to dissolve ice enough to form water sufficient for free convection. And as long as there is any ice undissolved, convection will be retarded that much. The heat therefore acts slowly and will be radiating off all the time, according to the accepted theory of radiation of bodies. The little heat that enters suffices only to melt the ice, which it does by acting on the surface alone. The temperature of this surface is simply raised a fraction of a degree, and being then above the freezing point, the ice will dissolve.

Hence it stands to reason that in the nature of things, regardless of latent heat, ice ought to require much longer to heat than does water. Our next paper will close this series with an examination of the modern definition of heat in its bearings on the theory of latent heat.

PERRY, Ga.

CAPTAIN CARTER'S FALLACIES.

(From the Christian Standard.)

The water-wizard with his wand verily believes that he can locate the water point; he has proved it by many experiments. But test him by blindfolding, and all his science vanishes. He never knew the real factors of his art. The lunatic farmer is convinced by many experiments that the moon exercises a potential influence over his crops, although such an opinion may clash with the well-known facts of science. Thus it has ever been that the credulous readily accept fallacies based apparently on experiment, when the exercise of a little common sense and reason would show these to be impossibilities.

The experiments in sound by Captain Carter, so confidently thrust into the face of scientists by the followers of Mr. Wilford Hall, are noticeable only on the grounds that some may be innocently deluded by these plausible fallacies.

Captain Carter has discovered by actual experiment that which no living scientist has ever doubted, namely, that the aggregate space passed over by the vibrating prong of a tuning-fork in a given time is very little, even so little as one inch in an hour. Hence he concludes the velocity of the prong too small to produce sound on the plan of the wave theory. Just how it happens to produce sound on his or any other theory he fails to inform us. Here lies a very subtle fallacy, and one that is calculated to capture the unwary. It is true that the aggregate space passed over by a sound-producing instrument may be exceedingly small, not even an inch in a day, and yet this same instrument may be moving with even lightning rapidity. If the reader will follow us attentively, he will perceive the entire correctness of this assertion. It virtually admits of a mathematical demonstration.

The ocular demonstration of this fallacy should satisfy any fair-minded person. Let the

reader vibrate the chord of a guitar. At the extremes of vibration there is a well defined outline of the chord, yet intermediate or between these extremes the closest vision cannot detect the moving chord. The conclusion is inevitable that the time of vibration is consumed mainly in stopping and starting.

Every one has observed the loss of time in movements of this kind in stopping and starting. A man can run a mile on a continuous line in five minutes. On a line of twenty steps it will probably require twenty minutes to travel over the same distance, though he use the same speed; or he will travel over only one-fourth the distance in the five minutes, by repeating on the short line, that he did on the continuous line. And the shorter the line the less the distance in a given time. Two axioms must be observed here: 1st. *That the stops and starts are a fixed quantity in the ratio to space passed over, or that the time consumed in each stop and start on a one-inch line is precisely the same as on a one-mile line.* 2d. *That velocity cannot make the slightest difference in the ratio of the two factors.* With these premises, let us vibrate a musical chord. The amplitude of motion is from maximum to minimum, or the chord from the greatest swing gradually reaches a state of rest. Thus the stops and starts being a fixed quantity, and the space a varying quantity, the former becomes infinity and the latter zero. Now, let the original amplitude of the chord be any distance per second, say ten inches, from this to zero, *velocity not affecting the ratio in the least*, a point of motion can be found where, although the chord move with lightning speed, the aggregate space will not amount to an inch in a day.

Now, grant that a musical chord passes over one inch of aggregate space in a second or an hour; yet it has to stop and start in this period four hundred times, and deliver four hundred strokes. Can this be slow motion? Verily, the man that can believe such stuff can—!

Any one understanding the science of sound, perceives in these short, quick pulses the very thing requisite to condense the air, and produce that action necessary to the production of sound.

Aga'n, Captain Carter has determined, by actual experiment, that sound does not decrease inversely as the square of the distance. Precisely what this has to do with the Substantial theory of Wilford Hall, is difficult to perceive. If Captain Carter will now disprove that a straight line is the shortest distance between two points, or tear down the *pons asinorum*, his reputation will be fully made. It is self-evident to any observing mind that sound, like heat, light, etc., emanates from a center equally in all directions. Hence it moves on the order of the sphere, and must obey the rule of the sphere, as mathematically demonstrated. Thus Captain Carter's boasted experiments clearly conflict with actual observation and mathematical demonstration. The proof that this is so is simple, and lies in the reach of every one. Place a lamp two feet from the wall. Now hold a book half way between and outline the shadow. This will be found four times the size of the book. Hence the light on the book is four times as intense as that on the wall. Now let the voice be substituted for the lamp. It is perfectly apparent that the result must be the same. The sound, falling on the book, must be distributed over four times the space

when it reaches the wall, and hence is only one-fourth as intense.

So confident have been the disciples of Mr. Hall over these pretended demonstrations of Captain Carter, that they persistently thrust them into the face of Tyndall, Mayer and others, and seem surprised and confirmed by these great scientists deigning no reply. These disciples have never read the fable of the ox and the gnat, or they do not consider that these scientists are courteous gentlemen, not given to profanity, and hence are restrained by literary etiquette and the barrenness of the English language from a full expression on such double-refined nonsense.

MT. VERNON, Ky. J. S. REPPERT, A. M.

THE SUBSTANTIAL PHILOSOPHY, No. 1—AN ADDRESS.

BY PROF. G. R. HAND, A. M.

Delivered, Sept. 26, 1884, before the Annual State Meeting of the Christian churches of California, convened at Wheatland, and by unanimous vote, a copy requested for publication in THE MICROCOSM.

"In the beginning was the word, and the word was with God, and the word was God," John, i. 1."

Seeing by the programme sent me, that I had been selected by the committee to address the State Meeting on the new Philosophy of Substantialism, without indicating whether an oral address or a written essay was expected, I have deemed it prudent to prepare a written discourse. I say the *new* philosophy, for I believe its name is not yet recorded in any dictionary.

I purpose commencing at "the beginning," since beyond, or anterior to that period, possibly there might not be found *substance* for a foundation on which to build.

Here the *Logos*, translated "the Word," is affirmed to have existed at "the beginning," beyond which our research does not penetrate. This *Logos*, it is affirmed, existed in connection with the *Theos*, translated "God," and it is affirmed that the *Theos* was *Logos*, or, as transposed, that *Logos* was *Theos*.

Clearly, then, *something* was co-existent with God, and that *something* is called the *Logos*, whatever that may be, and by which, or with which, "all things were made," and without which "was not anything made that was made."

We are anxious to know what this *Logos* is, which was co-existent with God, and a co-operant, or means, by which God created the heavens and the earth.

Pickering's Greek Lexicon defines *logos*: "The outward form by which the inward thought is expressed." The same Lexicon defines *theos*: "A causer, or maker, a god." Then, God is "the inward thought," or self-existing intelligence, "the I am," and "the maker," or creator. But with Him existed "the outward form," and that, or any outward form, must be a *substance*, and not a *nothing*, or nonentity.

Webster defines *substance*: "That which underlies all outward manifestations." But, "the outward form," the *logos*, must be one of the "outward manifestations," and substance must have existed underlying the *Logos*, else there could have been no "outward manifestation;" and *Theos*, the intelligent actor, is represented as existing in connection with "the out-

ward form," the *Logos*, and a basic underlying *substance*.

Under apostolic and lexical guidance, we are now entering the frontier regions of Substantialism.

We interview Moses on the subject of "the beginning," and he responds: "In the beginning God created the heaven and the earth. And the earth was without form and void; and darkness was upon the face of the deep; and the spirit of God moved upon the face of the waters. And God said let there be light, and there was light." Gen. i. 1-8.

Here Moses informs us that God, the original intelligent actor, "created the heaven and the earth." But he does not say that he made it "out of nothing." Neither is it a necessary inference that he was driven to that extremity, for John testifies, as we have already seen, that there was an abundance of *something* at hand, a *substantial* entity, and a much more available material than *nothing*, out of which to create the earth and atmosphere—the sea and the dry land.

In the last quotation it is said: "The Spirit of God moved upon the face of the waters." This introduces us to another entity called "the Spirit of God," the *Pneuma*, which seems to be not included in the things created, but co-existent with God, and co-operant with him in creation.

The same Greek Lexicon gives, among other definitions of *Pneuma*: "breath," "breath of life," "life," "soul or mind," "the Holy Spirit," "a spirit," "a spiritual being." So *Theos*, *Logos*, and *Pneuma*, with the underlying *substance*, were present at the beginning. And John testifies that "God is a spirit." Jno. iv. 24.

To avoid running into materialism, we must classify. Substance is primarily divisible into two grand divisions. 1. *Immaterial substances*. 2. *Material substances*.

I. *Immaterial Substances* will include three classes. a. *Intelligent entities*, or forces, as mind, spirit, etc. b. *Vital forces*, including both animal and vegetable life. c. *Physical forces* without mind or life, as gravity, magnetism, electricity, heat, light, sound, etc.

II. *Material Substances* will include those of which we may take cognizance by our physical senses, and by the appliances of philosophy and chemistry, and the other sciences, and will appear in the solid, liquid, fluid, semi-fluid, aeriform, gaseous, and other more or less attenuated forms.

The underlying substance, with the *Logos*, at the beginning, may be regarded as including the *immaterial substances* which are invisible separately, and with which *Theos* clothed himself in "outward manifestation," without the charge of materialism.

Then if by combination, analysis, condensation, rarefaction, or attenuation, he clothes himself with garments of visible "outward manifestations," it surely can detract nothing from His "eternal power and Godhead."

Here Substantialism drives down its initial stake, and takes its bearings, admitting, as per necessity from the foregoing definitions and revelations, the existence of immaterial substance in the active co-operants in creation, the *Theos*, the *Logos* and the *Pneuma*, with the essential underlying *substance*, which may include all the immaterial substances above named.

Substantialism sees *Theos*, the intelligent actor,

in the vast laboratory, the machine-shop of creation, prescribing the compounding of invisible elements of immaterial substance out of which to form *matter*, or material substance, and of which he made the heaven and the earth. In this way Substantialism can admit that God created the *matter* out of which he made the heaven and the earth, but that he created it out of the pre-existing immaterial substance "underlying all matter or outward manifestations," and which "was in the beginning with God."

Thus the thinking mind is not required to stultify itself by attempting to swallow the human dogma, nowhere affirmed in the Scriptures, that God created matter out of nothing, the logical scientific axiom, *ex nihilo nihil fit*, to the contrary notwithstanding.

Under the supervision of this intelligent force, and the obedient action of the unintelligent physical and vital forces, material substance is seen merging into visibility and tangibility. Even some of the material elements are still invisible, as, hydrogen, oxygen, nitrogen, and carbonic acid gas; but when, by the prescription of the great chemist, they are compounded, they assume the form of visible and tangible material entities.

At the command of God, we see the elements in motion. Invisible carbon and oxygen pair off in chemical affinity, and rocks in huge proportions stand before us.

Oxygen and hydrogen, silently and unseen, approach the hymeneal altar and, by the divine ceremony prescribed in electric affinity, in definite proportions, are made one, and the name assumed in the now visible marriage relation is *water*, which God spreads as a garment over the underlying rocks.

Then, obedient to the divine behest, oxygen and nitrogen, in definite proportions, form a mechanical copartnership, to perform service in atmospheric meteorology, and the aerial ocean encircles the earth in its loving embrace, and fans it with its zephyrs.

Another edict goes forth, and vegetable vital forces draw elements from the mineral kingdom, and arrange them in thousands of organic forms, and the multifarious phenomena of vegetable life announce the birth of the vegetable kingdom.

He issues from headquarters another mandate, and vital forces of animal life draw material from the vegetable kingdom, arranging them in myriads of organic forms, heralding the birth of animated nature.

One step nearer divinity calls forth the grand edict that combines the immaterial with the material and connects divinity with humanity. Spirit, or breath of life from the divine reservoir of spiritual existence, is placed in the human form divine, from material substance made, and man becomes a living soul; and the era of human intellectual existences is inaugurated, and to man is given the dominion over the works of creation inferior to himself, and the enthronement of mind is affirmed.

Intelligence, dwelling in and looking out upon and controlling the material world, must needs have some media through which spirit can cognize material as well as immaterial substances, to which end the Great Designer furnishes him an outfit in what are known as "the five senses," enabling him to feel, taste, smell, hear, and see external objects; all which senses or media, are by Substantialism, re-

garded as real substances, or substantial entities.

1. In the sense of touch, or feeling, we are individually cognizant of the fact that material substance comes in actual contact with our tactile nerves.

2. In taste we are also conscious of actual contact of material substance, in more or less diluted form, with our gustatory nerves.

3. In smell, philosophy admits that the sensation produced upon the olfactory nerves is communicated by the direct contact of infinitesimal particles of highly attenuated material substance with the nasal organs.

4. The sense of hearing, or sound, is by the popular philosophy regarded as produced by the contact of vibrations of air with the tympanum or ear-drum. But the Substantial Philosophy recognizes sound as a real immaterial substance, or substantial entity, emanating from the sonorous body, conducted by the atmosphere or any other conductor, and coming in contact with the auditory nerve.

5. Sight is also regarded as the result of the actual contact of an immaterial substance, light, with the visual organs and optic nerve, entering the eye at various angles from external objects of visual recognition. Thus invisible objects, by change of consistency, or by combination, may become visible.

The department of sound is the field where the main battle of Substantialism has been fought and the wave-theory of sound been demoralized.

The popular theory as taught in the school-books presents us with waves of air, a material substance, in alternate condensation and rarefaction, carved by and driven from vibrating strings or other resonant instruments and hurled against the ear-drum, causing it to move physically in and out in vibrations synchronizing with those of the sounding instrument.

The slowest vibrations producing an audible sound, I believe, is sixteen per second, and producing the lowest sensible pitch of sound. Then higher pitches of sound require more rapid vibrations, until they run up into the hundreds and even thousands of vibrations in a second.

A full seven-octave piano has strings of more than eighty different rates of vibration, producing more than eighty different pitches of sound, each of which to be audible must pelt and beat the ear-drum into tremulous agitation of more than four score different rates of pulsations, simultaneously, or in instantaneous succession of changing rates.

Then a full orchestra will present several hundred different rates of tympanic vibration, and we begin to feel a rising sympathy for our polite little servant, the ear-drum, acting as doorkeeper to our auditorium, and compelled to make a different style of bow to every pitch of sound that demands admittance! That is putting on style, and changing the style with wonderful alacrity.

A grave deputation from the lowest bass demand an entrance, and Mr. Ear-drum bows sixteen times per second to admit them to the audience-chamber. But here comes an airy deputation from the "upper class" of notes, arrayed in twinkling robes, demanding an entrance, and our little friend dons an extra air of super-subservient agility and nimbleness, and makes about half a thousand polite bows every second of time while admitting them. But here come representatives of a hundred

different pitches of tones and semi-tones in a single crowd, demanding simultaneous admittance; and the politeness of our delicate servant, the ear-membrane, must surely be taxed to an almost eruptive tension when called upon to perform the impossible physical feat of bowing sixteen times per second, five hundred times per second, and five thousand times per second, and at all the intermediate rates between these, and at almost as many different distances, and all at the same time!

The wonder is that the ear-drums of ourselves and progenitors have stood the wear and tear of such impossible performances, for so many centuries, without going to pieces and becoming entirely aborted. They should have raised a rebellion long ago. The skill of equestrianism would be severely taxed to so train a horse that he could trot, and pace, and canter, and gallop, and lope, and amble, and run and walk, all at the same time, and pass round the training ring, in all these gaits at once, and at all the different rates of speed and heights of jump known to the turf. And yet the execution of such an unreasonable demand would fall vastly short of the task imposed upon this little membrane by the wave-theory of sound.

SYCAMORE, Cal.

(CONCLUDED NEXT NUMBER.)

INERTIA AS RELATED TO GRAVITY.

BY REUBEN HAWKINS, ESQ.

It seems to me that the question of *inertia* could stand a little more light than has been thrown upon it in the various articles which have appeared in *THE MICROCOSM*.

What is *inertia*? Materialistic philosophers believe (or profess to believe) that all matter is normally in motion—that *force* has no existence except as the phenomenon or effect of motion in matter; and that matter possesses the inherent potency to produce all the phenomena of nature. Yet they admit that matter has no inherent potency to produce or arrest motion of mass in its own body, and this *impotency* is the *inertia* of matter as I understand it. How far this admission of materialists may be consistent with their fundamental theory of the all-potency of matter, I shall not discuss in this paper.

Now if it be true that matter cannot cause (nor arrest) motion of its own mass, it follows, that to put a mass of matter in motion external force is necessary; and the mathematical proportions and ratios between force, mass, velocity, and momentum, follow by a course of mathematical reasoning which is absolutely unavoidable.

Why then is it necessary to seek for any active cause for inertia? Is not the impotency of matter a sufficient cause? According to this view inertia cannot be considered a *property* of matter except in a negative sense.

True, it implies capacity to receive and transmit force by means of motion, but why is any active force (such as gravity) necessary to give it this capacity?

Is not matter simply the passive medium through which force manifests itself to our comprehension? And is not this impotency of matter coupled (as it must be where force is applied) with mathematical requirement sufficient to explain all the phenomena of motion,

velocity, momentum, etc., as the necessary effect of force acting on passive matter?

It seems to me that the apparent parallelism of proportion between inertia and gravity (or weight) at the earth's surface is sufficiently accounted for on the hypothesis that both inertia and gravity (weight) are in simple proportion to mass, or practically so at any given altitude.

The truth or falsity of this view of inertia might, I think, be practically proved by experimenting with the pendulum or some other device, at different altitudes.

Cannot your able scientific contributor, Captain Carter, solve this problem by practical experiment?

If my view of inertia be correct, the supposed parallelism of proportion between inertia and weight would be destroyed in any given mass by change of altitude—inertia remaining constant, while weight should vary with variation in altitude.

It is true (I believe) that the forces of nature are necessary to give to matter those abstract properties on which our comprehension of its existence depends—such as dimension, hardness, visibility, tangibility, weight, etc., etc.—but does it necessarily follow that *matter* would cease to exist without these forces? I think not.

Can it lose this abstract negative property of inertia (or impotency) without ceasing to exist? I think not. I am unable to see why inertia should be thought to depend on gravity or any other force. In the absence of all force, matter might and probably would assume so rare a form that its inertia could not be made practically manifest to our senses (supposing that we could exist physically organized under such conditions), yet it does not follow that under these conditions it would be deprived of its inertia.

But I may be wrong. I only make these suggestions to call out the result of such investigation as will throw more light on the subject.

Respectfully submitted.

CHILLICOTHE, Mo.

A SPECIMEN LETTER.

MORRISTOWN, Tenn., Jan. 6.

A. WILFORD HALL, PH. D.—Some time ago your "Problem of Human Life" came into my possession, by the hand of a friend, which I have been *studying* ever since. I was so much pleased with it that I resolved to be a reader and *student* of *THE MICROCOSM* as long as God may spare your life to fill its pages with such masterly defenses of *true Science* and *true Religion*. You are correct in your fundamental postulate of the Substantial Philosophy as the only possible explanation of the phenomena of the natural forces both in Physical and Metaphysical Science; while at the same time it will, as I think, beautifully account for and explain all of the phenomena of nature in God's great universe. For the first time in my life I had my eyes opened to see a *substantial invisible universe* underlying and pervading the gross, tangible and visible universe, and embraced in this is *Life, Spirit, God*. This is just what true biblical philosophy teaches, but I needed the transparent light of the "Problem of Human Life Here and Hereafter," to help me to understand its great lessons. By your masterly reasoning these profound questions have been

brought so clearly to view, that nature all around us is made to pour whole floods of light upon the religious teachings of the Bible, and becomes a grand prophecy of a *real substantial world* beyond this short, gross, material existence. I said I had been *studying* the "Problem of Human Life." Indeed, if a man is averse to studying he had just as well never touch it, for it cannot be understood by any man unless he study it. It is the grandest intellectual production of this or any other age of the world. The *wave-theory of sound* is literally taken up by the roots and cast out to dry beneath the scorching sun of the substantial theory therein so lucidly presented. I am writing to thank you from my heart for furnishing me with this deadly weapon by which I may, from the pulpit, as a Christian minister, batter down the ramparts of modern infidelity, and by which Christian people may become more firmly settled in the faith of a substantial future existence. May God bless you in this greatest of human works, and keep your intellectual powers clear for still more glorious achievements, by which the world will become convinced of the truth, and the church confirmed in its hope of a substantial hereafter.

Affectionately, C. T. CARROLL,

P. E., M. E. Church, South, Holston Conference.

MICROCOSMIC DEBRIS.

The British Government spends about \$5,000 a year in the photography of criminals.

In Mexico the school children who have done best are allowed to smoke cigars while pursuing their lessons.

Benedict Arnold's descendants are now among the most highly esteemed residents of Leeds and Grenville, Canada.

The dwellings and farms of widows, minors, and spinsters are exempted from taxation in several states of the Mexican Republic.

Berlin oculists report that the iron dust floating from elevated railroads in streets has added 5 per cent. to the profits of the profession.

Rare and lovely orchids are the flowers of the moment in London. Everybody who is anybody wears them in shoulder-knot or button-hole.

Oriental bronzes are now imitated in this country with remarkable fidelity. The majority are made of spelter, within a thin shell of bronze.

While boring an artesian well on the Rosecrans tract, near Los Angeles, the workmen discovered a deposit of conch shells at a depth of one hundred and sixty feet.

In the eighteenth century the growth of population in Denmark was so small as to be scarcely noticeable. During the present century the population has increased from one million to nearly two.

An enormous ranch in Mexico has just been purchased for £200,000 by a syndicate of English and Scotch speculators, of whom Lord Tweedmouth is one. It extends over sixteen hundred square miles.

The revision of the Old Testament does not include the Apocrypha. But it is not improbable that some members of the committee will continue to meet and undertake a revision of the Apocrypha on the same principles.

Dr. James Collis Browne, the inventor of chlorodyne, died in England on August 30, 1884. He was in about his sixty-sixth year, and was known in the yachting world for his experiments in the construction of yachts on the principle of the Kala fish.

The last report on Kew Gardens, near London, contains an account of the cow tree of Venezuela. From the trunk, when cut, exudes a somewhat glutinous liquid, whose flavor is of cream with a slightly balsamic taste. Seeds planted in India are thriving.

Blasting paper is a recent Austrian invention. It is described as being unsized or ordinary blotting paper, coated with a mixture of prussiate of potash, of charcoal, saltpeter, potassium chlorate, and wheat starch. On its being dried it is cut into strips, which are rolled into cartridges.

A monument of Carrara marble, costing only \$3,000, is to be erected to Garibaldi in Padua. Italy is the land both of cheap monuments and cheap marble; the busts of 100 philosophers, poets, orators, and scientists adorn the Pincian Hill at Rome, and the whole lot cost only \$10,000.

The Roumanian papers announce the death at Calatz of a member of the Roumanian clergy, Preda by name, who is said to have attained the age of one hundred and twenty years, having been ordained one hundred and one years ago. For the last fifty years of his life he never tasted flesh meat.

The Presbyterian Dr. Cuyler accords to the Baptists "the book which, next to God's own book, has had more readers than any in the English tongue," meaning Bunyan's "Pilgrim's Progress," and the preacher who has reached more hearers than any man since the apostles, in the person of Spurgeon.

There is but one place in the United States where gun-cotton is made. Until six months ago the navy was obliged to depend upon England for all the gun-cotton used, but a manufactory has been erected at the torpedo station, Newport, and now produces all that is required for sea-going men-of-war and torpedoes.

Bar Harbor, Mount Desert, is not obliged to have a stand pipe for the distribution of its water supply, as the source is Eagle Lake, which is embosomed among the mountains far above the village. A new reservoir has just been constructed at an altitude nearly two thousand feet above the level of the sea.

Monsieur Paul Bert is striving to secure for women doctors the privilege of walking the hospitals of Paris. He is warmly opposed by some of the most eminent physicians—men who believe that women doctors may become of great benefit to the world, but not as the responsible heads of hospitals for both sexes.

Public opinion is rapidly coming round in support of cremation, says the *British Medical Journal*, and broad, religious sentiment is pronouncing in its favor. Among its supporters may be counted the Earl of Shaftesbury and more than one of the bishops. The London Sewer Commissioners advocate the practice.

The seacoast of California has been visited this season by several varieties of birds which have never before been known to leave the mountains. This has generally been supposed to indicate a severe winter, but, according to science, the migration is more probably due to

the prevailing scarcity of all kinds of seeds in the mountains this season.

Professor Austin states that many clay and iron sewer pipes and house leaders are pervious to sewer gases. In one instance in Jersey City the leader was so porous that the parlor was rendered almost uninhabitable. He recommends that all sewer pipes be thoroughly varnished with shellac or soluble glass, or else painted with heavy paint.

The poisonous properties of stockings dyed with the brilliant aniline dyes are rendered harmless by dipping the articles in a bath of rubber dissolved in naphtha, or some other reagent. Subsequent evaporation covers each fibre with a thin film of rubber, and so prevents the transfer of the coloring material from the goods to the skin.

Mr. Yano, director of the Japanese *Hotchish-imboun*, has been visiting Paris' leading editors. He says that since 1875 the number of newspapers and periodical publications of all sorts in Japan have increased from 106 to 2,000! There are five important journals; but Dr. Yano's is the only one which contains literary articles. Its issue is about 20,000.

Joaquin Miller writes that he has found in New Orleans the noblest woman he ever saw, and he professes to have "seen the world well." She was born to wealth, received a careful education, traveled extensively in Europe, and at length became poor. She now keeps a little shoe store and works with her father and sister at making the stock.

Robert Browning is being painted by his son in all the glory of his scarlet Oxford doctoral gown for Balliol College, of which he is an honorary fellow. He sits in an old carved Italian chair, and on the wall is represented a piece of tapestry bearing the arms of the Medici, which now hangs in the poet's drawing-room. The picture is half length, of life size.

A Texas paper remarks: "The names of Jesus and Christ sound very sacred to English-speaking people, but among the Spanish both are very common names—given and surnames. At Laredo the other day Jesus H. Christ was registered at one of the hotels. We remember noting a few years ago that a Mexican named Jesus Christ had been hanged for horse stealing."

Thackeray's grandfather was grandson of Dr. Thomas Thackeray, Master of Harrow, who had nineteen children. The size of the family probably prevented its members, as years passed on, from keeping the run of their relatives, and the novelist was amazed and discomfited to discover that, in ridiculing the Public Orator of Cambridge University, he had been abusing his own near kinsman.

Parties who have returned to the Pacific coast from a tour through the Superstition Mountains, in Arizona Territory, report the discovery of extensive stone ruins, some of them in almost inaccessible places. The walls look as if they had been battling with the elements for centuries. The prehistoric people of whose existence they are the only remaining evidence must have been numerous.

The camphor laurel, a native of China, and the tree from which most of the camphor of commerce is obtained, seems to have been introduced successfully into California, one tree in Sacramento having attained a height of

thirty feet. The wood, every part of which smells strongly of camphor, is light and durable, not liable to injury from insects, and much favored by cabinetmakers.

Professor Fischer, of Munich, is said to have obtained from distilled coal a white crystalline powder which, in its action on the system, cannot be distinguished from quinine. Its efficacy in reducing fever heat is thought to be remarkable, though one of our wholesale druggists says that the amount of the drug required to produce this effect is so large as to preclude any rivalry between it and genuine quinine.

The adornment of Paris has recently been increased by two noble groups in bronze in the gardens of the Tuilleries. These were already well known in the plaster models to visitors of previous *Salons*; the one a lion and lioness quarreling over the body of a boar, the other a rhinoceros attacked by tigers. They were modeled by the eminent animal sculptor, Auguste Cain, the pupil of Rude, many of whose works already form the ornament of Paris.

The Empress Eugenie is now busy on the book she has had in mind, if only rarely in hand, since the death of the Prince Imperial, and arrangements are already being made for the publication of her "Memoirs," which will be produced simultaneously in England and France. The book is being "done" into English under the supervision of a lady of the highest rank, to whom the Empress is much attached.

At a London dinner party the following was handed to the master of the house: "A selection of pianoforte solos, songs, and vocal duets will be performed this or first fine evening under your window by two gentlemen in painfully reduced circumstances, who earnestly solicit your practical sympathy, which, if any, please kindly send out to us." In the street below was a piano on a cart, accompanied by two men, who proceeded to give an agreeable performance.

Dr. Klaczko of Vienna suggests a powerful preventive of cholera in petroleum or paraffine. In Galicia, says he, there are many petroleum wells, and here it has been observed that the workpeople have always enjoyed perfect immunity from cholera, even when it has broken out with great virulence in the district around them. This fact the peasants themselves attribute to the emanations from the petroleum-laden soil, which, they say, kill the pestilential germ and all kinds of insects.

Dr. Gamgee of Birmingham, England, has been interesting the Paris surgeons with his artificial sponge. It is made of cotton, rendered absorbent and treated with antiseptics. One of them of the size of a walnut will absorb water until it reaches the dimensions of a cricket ball. One of its most important advantages is cheapness; this quality makes it unnecessary to use it more than once, so that "sponge infection" becomes an easily obviated evil.

An arrangement for the protection of private property in literary, musical, and artistic works has been made between France and Sweden. By virtue of this convention, authors, artists, publishers and others will be enabled to take legal action for infringement of copyright in either of these countries by the production of a certificate, signed by duly appointed authorities in the other, to the effect that the work in question is entitled to legal protection there.

Some of the researches lately made by English explorers in regard to deep-sea beds have led to the belief that there are no rough ridges, abrupt chasms, nor bare rock, and that the sea bottom at great depths is not affected by currents or streams—even by those of the magnitude of the Gulf Stream—its general appearance rather resembling that of the American prairies, and it is everywhere covered by a kind of mud.

The accepted memorial to Gambetta is the joint work of the Sculptor Aube and the Architect Boileau. It consists of an imposing obelisk springing from a massive pedestal, on two sides of which are allegorical figures representing Strength and Truth. On the pedestal, in front, Gambetta is the central figure of a very striking group, while behind rises the inspiring genius of war waving with unfaltering hand the flag whose honor Gambetta strove to save.

Only women will be employed by the clerk of the Georgia Legislature to perform clerical work hereafter, a resolution to that effect having been adopted by an "overwhelming vote." The *Montgomery Advertiser* says: "In the debate on the resolution it was contended that all avenues of employment should be open to women, who had no voice in the government, yet obeyed its laws and paid its taxes. The vote was overwhelming. Maybe the Alabama Legislature will progress up to this point in the sweet time to come."

If a contrivance, a design of which has been submitted to the Australian Minister for Water Supply, be successful, one of the greatest enemies of the farmer, drought, will to some extent be avoided. It is a machine for bringing down rain, and is in the form of a balloon, with a charge of dynamite underneath it. The balloon is to be sent into the clouds, and the dynamite is to be fired by a wire connecting it with the earth. It is the intention of the inventor to make a trial of the apparatus on the dry districts of New South Wales.

Monsieur Vulpian, the Paris doctor, had a patient some time ago who was afflicted with that form of aphasia in which speaking is impossible, though the individual is able to sing without difficulty. The doctor utilized the stinging power by teaching this patient and those who followed him to sing whatever they wished to say, without confining themselves to the words of the air. As a consequence the hospital has become musical with the notes of opera bouffe and the Marseillaise, in which the patients ask for everything they desire.

A diver engaged in diving operations off the coast opposite Gibraltar, under Apes Hill, with the object of ascertaining the whereabouts of a recent wreck, has discovered at the bottom from eighty to one hundred large guns, mostly 24 and 32 pounders, and also two large anchors. They are supposed to have belonged to some large line-of-battle ship which sank in the old war, possibly after the battle of Trafalgar. As there was no apparatus for the purpose none of the guns were brought up, so that it has not been possible to ascertain their nationality.

The following statistics about the ascents of Mont Blanc were recently published in Norway: The first was in August, 1786, by two Frenchmen. During ninety years no less than 535 expeditions consisting of 661 persons, reached the highest point, known as the Monarch. Of un-

successful attempts, 176 were made from 1786 to 1861, while in the following fifteen 420 such are recorded, a fact which shows how much mountain climbing is developing in our days. The number of victims claimed by Mont Blanc during the last century amounts to about thirty.

In a voyage from Rio Janeiro to Bordeaux two French savants carefully investigated the quality of sea air. They found in all instances that over the open sea, at a distance from the vessel, the air was singularly free from the multitude of organisms which are found in land breezes. It is now believed by these and other investigators that none of the germs of an epidemic can cross an ocean with the wind, but that all low forms of life contained in it must soon reach the water and die. Sea voyages are now sometimes recommended on this special ground.

Some of the favorite dishes in Elizabeth's time were curious enough. Seagulls were eaten. There were pickled goose with cloves and ginger, soured turkey boiled in white wine and vinegar and soaked for a month, and pear puddings, containing no pears, but made of cold fowl or turkey chopped up, with flour, currants, and eggs, and then fashioned into the form of pears and baked! The stalks of tulips cooked like peas, omelets of mallow stalks, hartshorn jelly, pippins preserved in jelly, apple syrup, and quince cheese were also among the delicacies of the age.

The various shipbuilding firms on the Clyde launched last year three hundred and nineteen vessels of an aggregate tonnage of two hundred and ninety-six thousand eight hundred and fifty-four tons, being a falling off in tonnage of one hundred and twenty-two thousand eight hundred and ten as against 1883, of ninety-five thousand and eighty tons as compared with 1882, and of forty-four thousand one hundred and sixty-eight tons as compared with 1881. This result was only to be anticipated from the complete collapse in shipbuilding which set in toward the close of the year.

When Professor Nordenskiöld was in Japan after he had made the northeast passage, his attention was drawn to the very rich literature of that country prior to European influence. He decided to collect and take home a Japanese library. He bought between four and five thousand volumes, which are now in the Royal Library at Stockholm. Monsieur Leon de Roëny, professor at the School of Oriental Languages in Paris, has just catalogued the Nordenskiöld collection, which he says contains nearly all the works of any prominence, and furnishes complete materials for the study of Japanese literature and culture.

A will case involving a law question of some magnitude has recently arisen in a town near Augusta, Maine. A person worth a property of some \$10,000 died, and in his will he bequeathed the entire amount to the town. Three citizens of the town were witnesses to the testament. The will was admitted to probate about a year ago. Now the law says that beneficiaries of a will shall not be witnesses of such document. It is held that the witnesses of the above-mentioned will, being inhabitants of the town which receives the benefit, are such beneficiaries, and on this ground the direct heir of the testator will bring an action to break the will.

WILFORD'S MICROCOSM.

23 Park Row, New York, February, 1885.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent. EDITOR.

PERILS OF OCEAN NAVIGATION.

The old suggestion of "casting oil upon the troubled waters" to allay their destructive effects on vessels afloat in a storm, is now being revived in all seriousness even by officers of the naval and merchant marine in this and other countries. Sea-captains and other reputable seamen are actually adding their testimony to what few scientific men can but regard as a superstition of past ages, occasionally revived by the over-imaginative dwellers upon the great deep. So earnest have become the believers in this mystical, if not mythical, process for protecting ships from the effects of storms and boisterous waves on the open sea, that they have petitioned the different governments, not only to aid the carrying of oil and suitable apparatus for discharging it upon the surrounding waters when the ship is in danger, but to enforce it by legislation upon all ship-owners, especially those engaged in passenger traffic. We were surprised to see this subject treated in a most serious manner in a lengthy editorial in a recent issue of the *New York Sun*, a paper that scouts humbuggery, and would laugh the most honest and intelligent worshiper of Neptune in the face should he dare to intimate the possible existence of the fabled mermaid, or even of the renowned sea-serpent, so many times testified to under oath by reputable sea-captains and their entire crews. Here is an extract from the editorial referred to as a specimen of modern superstition, and which speaks so favorably of the puerile process of wasting oil upon uncontrollable waves, that we tried at first to think the editor jesting:

"The Hydrographic Office has lately begun the collection of facts designed to throw light on the extent to which oil is efficacious in smoothing rough seas during storms and gales, and also on the best methods of applying this lubricant, as shown by actual experience. The instances already gathered by it indicate that when this use of oil becomes more general and more methodical it may play an important part among the safeguards of navigation.

"One of last year's cases was that of the steamer *Thomas Melville*, which, after leaving Baltimore, found herself running before a gale from the westward that caused her to be constantly boarded by heavy seas. A couple of canvas bags were hastily made, punctured here and there with a sail-needle, then filled with oil, hung over the bows, and allowed to drag in the water. The seas quickly ceased to come on board; and as the holes were small, a gallon of oil used in this way lasted about an hour. The steamship *Moidart*, at anchor off Madeira, not long before had a like experience, riding out a heavy gale with very high seas, by the use of oil, and taking no water aboard.

"Last month the steamer *Thingvalla* encountered a severe hurricane, during which a life-boat was smashed and the third officer and three men injured. Then the marine drag was let go and oil bags were put over the side; and

for nineteen hours she lay in that way without shipping any water. Not less convincing was the experience of the British brig *M. Taylor*, caught in a severe hurricane in the North Atlantic, while the barometer fell below 28. When Capt. Ludlow put her before the wind, there was great danger of her being swamped. Two bags full of oakum and oil were then hung over the quarters. The effect was remarkable, the seas ceasing to break aboard the vessel, but changing to a heavy ground swell, in which the brig ran on safely for ten hours, when the fierce gale moderated.

"Instances could be gathered from private reports to augment this list of recent perils averted by the use of oil; but the foregoing are official from the latest memoranda of the Hydrographic Office. The British have been prosecuting much longer their researches into this subject, and not only government but private enterprise has been enlisted in its investigation. One or two Scotch gentlemen have been conspicuously liberal in their outlays of money as well as of labor for the purpose of determining by what contrivances harbors can be made safer under the emollient influence of oil. They have even constructed appliances, designed to be permanent, for the purpose of sprinkling oil at mouths of ports," etc., etc.

It is absolutely surprising that intelligent men will allow themselves to be duped by their own superstitious imaginings, for want of a little cool and clear observation of facts, taking into account at the same time the obvious impossibility of certain trivial processes producing mechanical results out of all proportion to the means employed to effect them.

It reminds one forcibly of the astounding assumption of physicists that a trifling insect, according to the present theory of acoustics, is capable of compressing four cubic miles of air into condensations by the minute movements of its stridulating apparatus, thereby generating heat sufficient to increase the elasticity of this entire mass of ponderable matter, and add *one sixth* to the velocity of its sound, shaking this mass to and fro with power enough to bend 2,000,000,000 tons of tympanic membranes, etc. Why should not an unscientific sea-captain, from imperfect observation, and under great mental excitement from surrounding danger, be justified in concluding that a few drops of oil had saved his ship from the disastrous force of a boisterous ocean, which happened to quiet down just as the "canvas bag" was lowered into the water, when the greatest scientific intellects in the world can believe and teach from similar superstitious notions and similar imperfect observations. That it is the "noise" of an exploding magazine which breaks in windows and destroys buildings, instead of the tremendous gas wave generated and sent off? Why may not believers in this canvas bag and oil nonsense look upon it as a scientific remedy for quelling a boisterous ocean, and making its waves neutralize each other, when the greatest living scientist

will tell us that two of the loudest sounds ever made will neutralize each other, and produce absolute silence, if their imaginary waves happen to follow each other at a certain distance apart, and that, too, without even the use of oil for lubricating them? Is any superstition too irrational and absurd to be accepted as scientific truth when such monstrosities as here pointed out are gravely taught in our colleges and universities? Why should not the government compel sea-going vessels to carry oil and canvas bags for distribution upon an otherwise unmanageable sea, when the managements of our State universities compel their professors to teach young men, as laid down in Tyndall's text-book, that it is the "*sound*, and not a *puff of air*," that goes through the long tin tube to "*blow out a candle*?"

The time is coming when all thinking scientific men will look for adequate causes for any physical or mechanical results they may imagine to have occurred, or that they may desire to accomplish. These causes may not come from the visible, material agencies that surround us, but from the invisible, immaterial, and substantial forces which experience assures us do exist in the realm of nature and which we know do accomplish well-known physical phenomena which would be totally inexplicable but for such immaterial, substantial agencies.

Singular as the coincidence may appear, the same copy of the *Sun* (Jan. 11, 1885), which indorses this superstition of anointing the ocean with a little oil to cause its subsidence, goes into another long article ridiculing a practical mechanical invention which we had the honor of suggesting as printed in the *Scientific American* with an engraving thirty years ago—namely, a system of mid-ocean life-saving and telegraph stations to float securely anchored, say, fifty or a hundred miles apart on the principal line of ocean travel, thus to be easily accessible to the shipping of the world in case of distress, and by this means to cause vessels to seek such a highway of nations between here and Liverpool. The *Sun* editor sneers at this idea of securing such stations, suitably constructed, in mid-ocean on account of the enormous weight and strength of the anchoring cables that would be required to resist or counteract the tremendous force of the ocean-waves. He forgot that the people on these stations would only need to have a few "oil-cans" and "canvas bags," as he had suggested on the opposite page, to mollify the mighty deep in case of a storm, and soothe its troubled breakers! And to make the ridicule stick, as he thought, the editor magnified the surface of such floating stations to just ten times the size that would be needed for all the practical purposes of such a great

convenience and improvement—a scheme, by the way, perfectly feasible and vastly more easily constructed than was the Brooklyn Bridge, or than were many other modern engineering works which have at first been sneered at by men of just such limited ideas as is the writer of the *Sun* article in question.

About fifteen years ago, by request of the editor of the *American Artisan*, we reproduced our plan in his columns with slight modifications, and should our readers so desire, we will print it in some future issue of this magazine, that the invention may speak for itself. We believe as firmly as we believe in any great engineering event of the future which depends upon man's all-conquering energy and perseverance, that many of our readers will live to see a line of floating stations across the Atlantic Ocean connected by telegraph cables from here to Europe, which will practically keep the passengers of our steamships in calling distance of land and home every few hours of their voyages, possessing as they will the facilities for receiving and sending messages every fifty or hundred miles of their journey, if need be. Such a line of life-saving stations would be very nearly in sight of each other and in sight of every vessel plying between here and the Old World, as sea-captains would all soon learn to keep near such a line and thus be in immediate hailing distance of help should any accident befall them.

As for the practical safety of the stations themselves, or their ability to ride out the worst storms of the Atlantic, a man must have a very limited conception of the possibilities of mechanics, ship-building, and scientific engineering who cannot see the feasibility of securing such vessels, specially constructed for the purpose alone of such moorage, when a frail dory, only large enough for a couple of persons and built for rapid sailing, has weathered the storms of a successful ocean voyage. To see any practical difficulty in properly anchoring such stations to the bottom of the ocean, when vessels are already supplied with grappling apparatus that will find and fish up a broken or disabled telegraph-cable from three or four miles of ocean depth, bespeaks a mind incompetent to discuss any great projected engineering work.

The supposition that the anchoring-cables of these stations would have to be of steel wire "two inches in diameter," this alone, almost if not quite, enough to pull the station to the bottom, shows the *Sun* writer to have paid little attention to our plan, or else that he possesses a very defective memory, for we distinctly suggested that the anchoring cables should be constructed of material, such as prepared manilla, that would not weigh, however

large, but little more than sea-water, thus allowing of many times more strength than would ever be required.

The editor's suggestion that an iceberg might come in contact with a station and destroy it, is a bare possibility, as any ship is liable to encounter, but which could be partially provided against by having no stations across the longitude most frequented by these straggling visitants. In case, however, of the approach of an iceberg, our original plan provided that the cables should be so connected with the stations as to be easily and instantly slipped. The craft itself, so strongly built as to stand the contact if struck, could then slip around it or float with it till picked up by passing vessels and returned to its mooring; the slipped cables in the meantime remaining in easy reach supported and designated by suitable buoys. We are glad to say that our whole system of constructing such an ocean highway of nations was so completely worked out thirty years ago that with all objections that have since been raised we see no serious obstacle in the way of its final and successful accomplishment.

PROF. REPERT VERSUS CAPT. CARTER.

REPLY BY THE EDITOR.

The *Christian Standard*, of Cincinnati, O., for Nov. 1, contains an article from the pen of Prof. Reppert (which we print elsewhere and which we beg every reader to examine attentively before going further with this answer,) criticising the views of Capt. Carter on sound as printed from time to time in *THE MICROCOSM*. The views thus criticised are also our own. It occurred to us on seeing this article to send it to Capt. Carter for his reply. But then we remembered that Prof. Reppert was an old opponent of ours, to whose strictures upon the *Problem of Human Life* we had occasion to reply in a series of papers in the *Apostolic Times of Lexington, Ky.*, before *THE MICROCOSM* had been started, and it seemed to us that the professor was properly "our meat," so to speak, particularly as a large portion of his present paper is but a relish of his former criticisms. Another reason why we did not submit his paper to the Captain's animadversions was that we really have a kindly sympathy, if not liking, for the redoubtable Kentucky professor, and do not want to see him pass through the vigorous disciplinary chastisement of the Pa. Military College, and be made mince-meat of. Without, therefore, wasting further words in prefatory remarks, let us come directly to his criticisms and try to answer them in such manner that even Prof. Reppert will be able to detect their fallacy.

First of all we must commend his bravery, not to say hardihood, in venturing to attack a position against the current theory of sound which is no more vulnerable to his assault than would be the strongest section of the Chinese Wall to the pith pellets of a popgun. The position referred to is that contained in our original demonstration, as printed in the October MICROCOSM, Vol. 3, namely, that the tuning-fork sounds audibly while its prongs are not moving at an absolutely measured velocity of more than an inch in *three hours* at the swiftest part of their travel, and which Capt. Carter, by means of his superior apparatus, carried to not more than *one inch in two years*, as printed in December following.

As will be seen, Prof. Reppert tries to make the task as easy as possible for himself by ignoring the "two years" of Capt. Carter's experiment, and frittering them down to "one inch in an hour." Either velocity, however, is almost inconceivably too tame to be swift enough to compress the mobile air and drive it off into "condensations and rarefactions," as the wave-theory necessarily teaches.

Now let it be observed that Prof. Reppert has yielded the entire argument by innocently admitting the essential facts of Capt. Carter's experiment, as the reader will see by carefully noting his article. He did this under the delusion that he was able to explain them away in such manner as to show that nearly the entire time of the "two years" in which it would take the prong to travel "one inch," is consumed in the "stops and starts" of the prong, or the periods of rest at the ends of swings, and that the actual travel must be at a high velocity—yes, "lightning speed," or swift enough to carve the air, as Tyndall expresses it, into condensations and rarefactions. We regret for the professor's sake that we will be obliged to demolish this little explanation, while leaving his unfortunate admission of the correctness of Capt. Carter's experiment in its full force against the current theory of sound as a matter of permanent record.

He claims, for example, that the "stops and starts" is a fixed quantity," and consequently, that they take up the same time precisely to each little swing, when the prong is traveling only one 64,000,000,000th of an inch at a vibration, as the captain's experiment shows, as if the prongs were traveling at their greatest amplitude: and therefore, that the prongs while moving in these minute swings, as he expresses it, "may be moving with lightning rapidity," or "lightning speed." He illustrates this erroneous view by the simile of a man running a mile straight ahead in five minutes, whereas if he had to run a mile by going forward and back a distance of twenty steps it

would take him four times as long, owing to so many "stops and starts," which being a "fixed quantity" in point of time, adds three-fourths to the time of running the mile, while the actual speed of the running motion continues the same. Now this is all true enough, so far as the man's running the mile is concerned. His *turns* at the end of each twenty steps are necessarily a "fixed quantity," and therefore the more turns in the mile the more loss of time. But fortunately for the cause of true science this is a perniciously false and misleading illustration, having not a vestige of truth in it, as we will now show.

First let us say in plain words that this whole matter of so-called "stops and starts," or more correctly, changes in direction of the prongs' travel, has been clearly and elaborately settled in our favor and against Prof. Reppert by the high authority of Profs. Helmholtz and Mayer. They both distinctly teach, in the first place, that the motion of the prong of a tuning-fork when sounding is of the same nature as that of a common reciprocating pendulum, namely, slow at the start, swiftest at the center of swing, then again, slower toward the finish, then repeating the same proportions of velocity at each subsequent swing, however small, till the prong comes to rest (see *Sensations of Tone*, page 28); and that the prong's motion, like that of the pendulum, is *isochronous*, that is, *slower in velocity* just in proportion as the swings get shorter in distance traveled, thus requiring the same time to swing the millionth or the million-millionth as the eighth of an inch. Whereas the man in Prof. Reppert's simile is supposed after each turn, to run through his twenty-foot swing with the same velocity exactly as through his mile swing! Here, then, is the first part of the ridiculous failure of this abortive illustration.

Then comes Prof. Mayer in his recent work on *Sound* and clinches the fatal nail in the coffin of the wave-theory by an unmistakable illustration of the pendulum's true proportionate rate of velocity at the swiftest as well as slowest part of its swing. He does this by his illustration of the *circular or conical pendulum*, which is so crushing to the wave-theory and its advocates, though he was not aware of it, that we take the liberty of copying the explanation entire, as follows:

EXPLANATION OF PENDULOUS MOTION.

"An ordinary pendulum changes its speed during its swings right and left *exactly as a ball appears to change its speed* when this ball revolves with a *uniform speed in a circle* and we look at it along a line of sight which is in the plane of the circle.

"Let one take the ball and wire to the further

end of the room and by a slight circular motion of the end of the wire cause the ball to revolve in a circle. Soon the ball acquires a uniform speed around the circle, and then it forms what is called a *conical pendulum*; a kind of pendulum sometimes used in clocks. Now stoop down till your eye is on a level with the ball. This you will know by the ball appearing to move from side to side in a straight line. Study this motion carefully. *It reproduces exactly the motion of an ordinary pendulum of the same length as that of the conical pendulum.** From this it follows that the greatest speed reached during the swing of an ordinary pendulum just equals the uniform speed of the conical pendulum." (Mayer on Sound, page 82.)

To complete this shattering evidence, a little further on, when experimenting with vibrating rods to show that musical instruments have the same character of motion as that of the pendulum, Prof. Mayer says:

"A vibrating rod swings to and fro with the same kind of motion as has a swinging pendulum." "But our experiments have taught us that a vibrating rod moves to and fro with the same kind of motion as a swinging pendulum," etc., etc. (pp. 43. 52).

Here, then, the highest authority on sound in America has shown that the swiftest travel of a pendulum or prong in any given swing, let that swing be of much or little amplitude, can only be at a velocity of about 1 1-2 times the space of such swing in the same period of time. That is to say, the conical pendulum passes half way around a given circle with uniform speed while the reciprocating pendulum swings once across it or about two thirds as far; and then it returns to the place of starting while the reciprocating pendulum recrosses the circle. Thus, as the circle is about three times its diameter, the law, as laid down by Prof. Mayer, turns out to be substantially correct, as we have verified by careful experiment with a conical and a reciprocating pendulum operating side by side. Lest the reader may not catch the full force of Prof. Mayer's simple illustration let us elaborate it a little in detail, to assist the average reader:

If the common pendulum is of a length to swing through a foot in a second, its swiftest velocity (at the center of its swing, of course) can be only at the rate of about 1 1-2 feet in a second, since manifestly a conical pendulum

of the same length passing around a foot circle would make one half of it, or about 1 1-2 feet, at uniform speed in the same second, or while the common pendulum was completing this one swing of a single foot. There can be no possible dispute about the substantial accuracy of this estimate of the swiftest velocity of a reciprocating prong or pendulum. It being so, then for all swings of pendulums, however reduced in distance, instead of their stops and starts being a "fixed quantity," as Prof. Reppert blunderingly asserts, amount to a deduction of only about one third, as shown, from the average velocity. That is to say, if the pendulum's motion is an inch in a second at a swing instead of a foot, its swiftest velocity at the center will only be at the rate of 1 1-2 inches in a second. If it travels but a sixteenth of an inch at a swing in a second (as it will, according to the law of *isochronous* motion, as it slows down toward a state of rest), its swiftest velocity, instead of being "lightning speed" (!) will be at the rate of $\frac{1}{32}$ of an inch in a second, and so on. Then changing the pendulum for the prong of a tuning-fork, which is governed by the same law of *isochronous* motion and proportionate velocities, as Prof. Mayer correctly teaches, and we have the same proportion to be added for its swiftest velocity in any given swing, precisely as in the case of the pendulum. For example, suppose the swing of a prong at the start, as in Capt. Carter's experiment, to be the $\frac{1}{16}$ of an inch during the $\frac{1}{512}$ of a second, as he used a fork of 256 double vibrations. It is clear that its swiftest velocity must be at the rate of only $\frac{3}{32}$ of an inch in the same $\frac{1}{512}$ of a second, and when the prong's swing is reduced in amplitude one half, or to $\frac{1}{32}$ of an inch (keeping up the same 512 swings in a second, as in the case of the *isochronous* pendulum), it is perfectly plain that its swiftest travel, in the center of its swing, can be only at the velocity of $\frac{3}{64}$ of an inch in the same $\frac{1}{512}$ of a second, or at the entire rate of 25 inches in a second. Then wait till the amplitude of this prong has again reduced, even to the 1,000,000th of an inch at a swing, as shown by the new method of measurement, and we need scarcely inform the intelligent student of arithmetic that the swiftest travel of such prong can only be at the rate of 1 1-2 millionths of an inch in $\frac{1}{512}$ of a second, or at the entire rate of an inch in 48 minutes. Thus, instead of the stops and starts being a "fixed quantity" for each distance a prong may travel, whether long or short, it is demonstrated by Prof. Mayer's law to be thus: Add one half to the space of any given swing in a given time, and the swiftest rate of travel at the center of such swing will be at the rate of

* Of course Prof. Mayer means to teach that the two pendulums in swinging should reach such an angle from the hitch-point of the wires, as to make their travel proportionate to a circle and twice its diameter, but he neglects to say so. Even then there might be a fine mathematical discrepancy in results, as Capt. Carter will show next month, though by his exact formula of motions Prof. Mayer's conclusion is shown to be substantially correct.

this aggregate distance in the time of one such complete oscillation. Thus a prong, while still sounding, and traveling at the average velocity of only one inch in four years, as Capt. Carter's experiment shows, must travel at the center of its swings only at the velocity of 1 1-2 inches in four years! What, then, becomes of Prof. Reppert's "fixed quantity"? Positively, an investigator of natural philosophy incapable of making this transition from a pendulum's *isochronous* swing through a foot, an inch, or a thousandth of an inch in a second, to a prong's similar swing through a millionth or 64,000,000,000th of an inch in the $\frac{1}{512}$ of a second, and carrying along with him the same laws of motion and proportions of velocity as shown in Capt. Carter's experiment, is unfit to dabble with physics, and should never take the sacred name of science upon his uncultured lips. Yet Prof. Reppert proves himself to be wholly unaware of these simple laws and proportions of motion in the oscillations of prongs, strings, and pendulums, by pretentiously putting forth the monstrous fallacy in the *Christian Standard* that the stops and starts "are a fixed quantity," thereby allowing the prong to increase in velocity of travel as it reduces its amplitude of swing till it actually reaches "lightning speed!" Was ever scientific darkness more intensified in the human brain?

We have, then, only to follow Capt. Carter to the end of the four minutes, when his prong had nearly ceased sounding, and when its travel had become reduced to the 64,000,000,000th of an inch, or an aggregate velocity at the rate of one inch in four years, and we have, by the same simple arithmetic process, as just shown, demonstrated its swiftest velocity to be at the rate of only 1 1-2 inches in four years, or actually more than 25,000 times slower than the hour-hand of a common clock. Can such almost infinitely slow travel as this "carve the air into condensations and rarefactions," when the travel of a clock pendulum will do nothing of the kind, as both Tyndall and Helmholtz frankly admit. (See *Lectures on Sound*, page 49; and *Sensations of Tone*, page 28.) Yet it is a positive fact that a common regulator pendulum moves more than 1,000,000,000 times swifter, as shown by Capt. Carter, than the prong of a fork, while still sounding audibly! Remember now, and never forget it, that both Prof. Tyndall and Prof. Helmholtz, the highest authorities on sound living, declare that the pendulum, which moves 1,000,000,000 times faster than a prong while still sounding, *cannot condense the air, or drive off sound-waves because it does not move fast enough!* Let young students of science everywhere familiarize themselves with this single overwhelming argument against the wave-theory and fearlessly present it to their

teachers who expound to them the theory, and they will be forced to confess themselves unable to reply.

But while thus digressed for a moment from Prof. Reppert's difficulties, let us finish the wave-theory by another turn of the crank of our patent crushing machine. According to the same scientific works which teach the wave-theory of sound, we are taught that a molecule of air is about the one 5,000,000,000th of an inch in diameter, or in other words, its diameter is more than twelve times greater than the distance traveled in one swing of the prong of a fork, while still sounding audibly. Then, these same scientific works tell us that the air-molecules are 200 times their own diameter apart. Now it is perfectly plain if the molecules of air refuse to abide in actual contact, but remain 200 times their diameter from each other, though in sympathy, that they will not consent to come any nearer than this, if as near, to a foreign substance not in sympathy, such as a steel prong, for example. Hence, as the prong moves but the 12th of a molecule's diameter, and has to move over a space equal to 200 of these diameters before reaching a molecule, it is demonstrably clear, according to modern science, that a prong might vibrate all day and produce audible sound all the time without touching a molecule of air! It might, in fact, make 2,400 such movements, as demonstrated by Capt. Carter, all in one continuous direction, before reaching a molecule of air, and when it did reach it the entire blow (?) would only be equal to one 12th the diameter of the molecule hit, and at a measured velocity of 1 1-2 inches in four years. Great science! What a condensation and churning of the air such "blows" would produce! Have physicists no shame, after reading these logical consequences of their theory, to continue teaching philosophical formulas involving such monstrous absurdities as here pointed out?

In view of such motion of the sounding prong as here shown,—a motion so minute as to stand 2,400 chances against one of not hitting a molecule of air at all,—can the wave-theory be the true solution of sound phenomena, or must sonorous problems be explained some other way?

To return to Prof. Mayer's law of the conical pendulum and its complete confirmation of our original discovery that the prong of a fork sounds audibly while moving vastly slower than any object ever before measured in physics, we have only to ask,—dare Prof. Reppert or any other scientist try conclusions with the Hoboken physicist by attacking his illustration of the conical pendulum? We will see. It is a part of the business of this Maga-

zine to get wave-theorists by the ears and help them by so doing to annihilate each other's objections, and thus hasten the scientific year of jubilee when they shall all see eye to eye upon the subject.

The truth is, Prof. Reppert's whole trouble consists in his erroneously estimated value of the so-called stops and starts of the prong as a supposed "fixed quantity," amounting to millions of times more in duration than the actual time employed in travel, thus, as he asserts, giving "lightning speed" to the prong while moving in order that it might thus condense the air and send off waves as the theory requires and as he thus virtually concedes necessary. That is, he thinks (as he formerly put it in the *Apostolic Times*) that because it takes a horse, when plowing out corn, just 10 seconds to turn at the end of each row, whether that row be long or short, a pendulum or prong must act in the same way! Had he chanced, however, to see Prof. Mayer's book, and what is better, had he understood it, he would never have placed himself on record in such an unscientific plight as he has done, which by the way is but a specimen of the philosophical blunders into which physicists constantly are precipitating themselves in their efforts to escape the force of the Substantial Philosophy, which has classified all the natural forces, including sound, light, heat, electricity, magnetism, gravity, etc., as real substantial emanations, and not as the mere motions of the material substances which happen to conduct them.

Prof. Reppert is manifestly too shrewd a critic not to know that a prong moving at the rate of an inch in a second, or even ten, twenty, or thirty inches in a second, could not possibly condense the air or send off pulses as the present theory teaches. How natural, then, in following the lead of Tyndall, that he should unwittingly admit the necessity of "swiftly advancing"—yes, "lightning speed" to accomplish such result, thus giving away the entire sound theory under his totally mistaken supposition that the stops and starts were an enormous "fixed quantity" millions of times greater in duration than the time of travel? And what was more fatal to the professor's ill-timed and ill-conceived article, this same misconception led him to admit the correctness of Capt. Carter's figures, with all the terrible consequences to the theory which they imply. The disaster which has thus naturally followed the professor's blunder, in supposing the prong's purely *isochronous* motions to be exactly the same as "those of a horse plowing out corn" or those of a man running a footrace with stops and turns at every twenty steps, which of course constitute a "fixed quantity,"

should lead him and every young student of physics to reflect seriously, before venturing the hazard of rejecting the Substantial Philosophy. Clearly, the fact of Prof. Reppert's urging the possibility of "lightning speed" is proof positive that in his estimation it needs something moving very swiftly, or "swiftly advancing," as Tyndall says, to condense the air. So sure, however, was he of his ability to deduce "lightning speed" from Capt. Carter's figures by the transparent blunder of an assumed "fixed quantity" for stoppage, that he proceeded to admit enough to break down a thousand such theories as the one he was trying to defend. Now, as the figures of Capt. Carter are admitted to be correct, and as Prof. Reppert dare not deny Prof. Mayer's facts of pendulum or string motion, hence, the wave-theory breaks down between them as the only alternative. In plain logic, by putting these facts, figures and admissions together, they constitute a mass of evidence against the truth of the theory that is simply overwhelming. Let us look at it as a syllogism of admissions:

1. Prof. Reppert admits the correctness of Capt. Carter's experiment, making the entire distance of the prong's travel but at the rate of one inch in four years.

2. Prof. Mayer admits that only one-third of this time must be deducted to constitute the remainder the swiftest velocity of the prong's travel, that is, *at the rate of an inch in two years and eight months.*

3. Prof. Reppert claims that the periods of rest are such an important "fixed quantity" as to give the prong "lightning speed" while traveling, thus admitting an enormous velocity of the prong as absolutely necessary to drive off air-waves.

4. Therefore, by the figures of Capt. Carter, the scientific facts of Prof. Mayer, and the admissions of Prof. Reppert, the wave-theory must fall to the ground, since he admits that sound must be something else than air-waves, *as they can only be produced by a body moving at "lightning speed!"* What need we of further witness?

But he wants to know how Capt. Carter can account for sound on the *Substantial Theory* with such almost inconceivably slow travel of the prong? The Captain does not need to account for it at all, in order to accept it as a fact. He simply has to demonstrate as he does, that such slow motion cannot mechanically compress the material, ponderable and mobile air, and drive off waves or condensations as the current theory of sound requires. After this is done, he has only to accept the fact that in some unknown way the numerous reversals of motion in the prongs generate this sonorous form of force out of

the general force-element which exists everywhere present in Nature, just as substantial heat is generated by the inscrutable motion which occurs in combustion; just as substantial electricity is generated out of the same force-element by the chemical motion which takes place in the battery; just as substantial light-rays are generated by the inconceivably minute motion of the material particles of the fire-fly; or just as the substantial rays of magnetism are generated and radiated out of that same universal force-element without any known motion at all in the molecules of the steel magnet.

When we speak of anything being done by *motion*, let it be remembered that we do not mean motion *per se*, but motion as the actual contact of the substances, material or immaterial, which move, since motion of itself is nothing entitative, and without substantial contact can produce no effect in nature or mechanics. Hence, sound must be generated in some unknown manner by molecular contact in the movement of the sounding instrument, or of the substantial forces resident therein. Whenever Prof. Reppert will explain how substantial light, heat, magnetism, gravity, electricity, etc., are generated out of the one universal force-element of Nature, as different forms or manifestations of force, and how they are enabled to radiate each by its own peculiar law, as given to it by the First Cause of all things, so as to impress our senses or produce certain physical results, then it will be time enough for him to ask Capt. Carter to explain how substantial sound-pulses can be generated and radiated to our sensations by the infinitesimal movements of a tuning-fork's prongs traveling at the rate of but one inch in four years.

But these are not the whole of the apparent difficulties presented in Prof. Reppert's singularly weak paper. As it is *THE MICROCOSM*'s usual habit of not leaving its critics an inch of ground to stand on, we suppose Prof. Reppert would feel slighted should he be able to collect together enough of his criticisms to be visible under a microscope. Hence we proceed to answer the minutest of his difficulties, writing as we are doing, not so much for present effect as for the use of others who may be called upon to take our place in defense of the Substantial Philosophy after present prejudice shall have given way to the dispassionate judgment of a new generation of scientific investigators. For we expect little encouragement from the present generation of physicists except in a few rare instances.

Prof. Reppert refers to the fact, well known and often observed, that a string vibrating at full amplitude can be seen well defined at the

two extremes of its swings, while it is not seen in the center, except, as every one knows, as a hazy or indistinct object. But he does not attempt to give an explanation of this fact except by the now exploded assumption that in the center the string "moves at *lightning speed*" while resting at the two extremes enormously longer than the time of motion. But these effects on our vision, as can be clearly shown, result from the fact of the short space (only about the sixteenth of an inch) passed over by the string before it stops, and then returns over the same space, whereas if it moved steadily forward at its greatest amplitude and velocity during a whole second, its outline would be easily observed and followed, since its swiftest motion at such amplitude, as just shown, would not be more than about two or three feet in a second. At each end of these minute swings, however, the string at these parts of its travel presents, in addition to its slowest motion, two diameter-views before leaving its place, instead of one only, as in the center of its swing. This fact of slowest motion and double-time view of diameter of string in one place while stopping and starting explains all the difference of hazy appearance in the center and defined outline at the ends of swing which seem to bear so weightily on our professor's mind. If he will try the following experiment, he will convince himself that we are right. Take a wooden frame, say, of four strips of lath tacked together, and string it like a zithern with threads one sixteenth of an inch apart stretched taut, and then pass the frame close behind a card while you try to look at the strings and define their outline through a slit in the card only a sixteenth of an inch wide, and running longitudinally with the strings. This brief view of each string, as it passes the slit, corresponds with the brief view of a single string while moving through an equal space, and the same when it returns. The result is that the same hazy appearance or want of definition presents itself through this slit in the card as is observed in looking at a vibrating cord, *and that, too, when the frame of strings is moving at a velocity of less than one inch in a second.* Had Prof. Reppert the inventive genius to think up some such simple device as this to aid him in his little difficulties he would 'never have written his paper, and might, in the course of time, come to be something of a physical investigator, especially should he become an earnest and honest reader of *THE MICROCOSM*.

Another of his difficulties is founded upon the Captain's demonstration as presented in the first and second volumes of *THE MICROCOSM*, that the intensity of sound does not, by actual experiment, decrease as the square of the dis-

tance from the sounding instrument. The professor is evidently all at sea upon this part of the Captain's teaching. In fact, he knows nothing about what he is criticising, in any correct sense of the subject. He refers to *light* and *heat* as radiating from a center on the law of the sphere, and that they must of necessity decrease as the square of the distance, as shown by the shadow of a book, etc. Now, all this is true of light and heat, and it is equally true of *sound*, since all are alike substantial, and all alike must radiate from a center of active force. But this is not the question in controversy at all. It is simply this: does the *intensity* of sound decrease as the square of the distance as Tyndall and all authorities tell us? *Intensity* depends entirely on the sense of hearing, as it simply means the degree of *loudness* experienced in our sensations. With a nearly deaf person there would be no *intensity* at all a few feet from a steam whistle, while the sound itself might be in full proportion. Hence the *intensity* in that case would decrease almost infinitely more than the law of the sphere teaches or than the sound itself diminishes. Now while the sonorous substance itself, according to the Substantial Theory, decreases in quantity, as the square of the distance, the same as light itself, or heat itself, or as the atmosphere itself increases, the intensity or loudness of sound does not follow any such law, as Capt. Carter has abundantly shown in his elaborate experiments as printed in this magazine. If sound consisted of the *motions* of the tympanic membrane, as caused by corresponding *motions* of the air, and if *intensity* was only the width of swing of the air-particles and of the ear-membrane as Tyndall distinctly urges, then of course the decrease of loudness would correspond exactly with the decrease of sound, as the *sound*, being only motion, would also be *intensity*. But sound being the radiation of immaterial substance, the same as light and heat, it may be easily supposed that the ear might be filled with a thousand times more sonorous substance, when near to the sounding body, than can take effect upon the auditory nerve, and thus be converted into loudness. Hence the *intensity* of the sound, close to an instrument, such as a whistle, bears no comparison to what it should be according to the law of the sphere as shown by being measured at different distances away. This very fact of an immense difference or discrepancy between *intensity* as actually observed, and the law of the sphere, is conclusive proof that sound is not mere motion, but like light and heat is the radiation of an immaterial, substantial force. This fact ought to answer Prof. Reppert's query as to what this experiment of Capt. Carter's on the intensity of

sound "has to do with the Substantial Theory of Wilford Hall."

The explanation here given is not new to the readers of THE MICROCOSM, as the following extract from vol. 1, page 195, shows:

"Near to a very loud instrument only a certain quantity of the substantial corpuscles of sound which enter the ear can take effect upon the tympanic membrane to produce the sensation of tone, since no motion is thereby communicated to the membrane, and that a number of corpuscles so great may readily enter the ear when near to the instrument that a large portion of them may prove to be surplusage, and in this way may cause the sound to be only about as loud to our sensations as when we are much further away from the instrument, and consequently when the ear receives but a small fraction of that number of corpuscles. A small pinch of sugar, for example, scattered over the tongue and gustatory membrane, will taste just about as sweet as would a whole mouthful of sugar, thus proving that the intensity of this sensation bears no fixed relation to the number of saccharine corpuscles that may be taken into the mouth. Is not this plain? Then why should it be different with the sensation of tone? Assuming sound to be substance, we can easily suppose its corpuscles to affect the auditory sensation in an analogous manner. At a foot from a common pitchpipe we are certain that the tone sounds only about twice as loud as at a distance of twenty feet, though *four hundred times* as many of the original sound-corpuscles, according to our hypothesis, enter the ear at one foot from the instrument as at twenty feet."

At this point it is our duty to refer to a statement of the professor's at the beginning of his third paragraph, which he must have known when he made it *was not true*. We are sorry to make this charge, but the facts will be seen to justify it. He distinctly says that "*no living scientist has ever doubted*" but "that the aggregate space passed over by the vibrating prong of a tuning-fork in a given time is *very little, even so little as one inch in an hour!*" What confidence, we ask, is to be placed in a writer who can deliberately record such a statement as this? Now, Tyndall and Helmholtz are both "living scientists," at the same time they are the highest authorities who have ever written on the subject of acoustics. Yet Tyndall speaks of the prong as "*swiftly* advancing," "*carving the air into condensations and rarefactions*" (*Sound*, page 62); by which he meant, according to Reppert, an aggregate motion of "*even so little as one inch in an hour!*" Then Helmholtz as distinctly tells us (*Sensations of Tone*, page 28), that the prong of a tuning-fork makes the same kind of motion as that of a clock pendulum (namely, "*fast*" at the centre and "*slower*" toward the ends). "*only very much faster.*" Who ever heard of a common clock-pendulum moving "*very much*" slower than an "*inch in an hour?*" O recklessness! thy name is Reppert. "*An inch in an hour!*"

Yet this same professor knew when he penned that statement, that Capt. Carter's experiment, which he had conceded to be correct, had demonstrated the fork's "aggregate" travel while still sounding to be at the rate only of an inch in four years, instead of "an hour," or 1,000,000,000 times slower than the pendulum Helmholtz referred to. Still he says, "no living scientist" ever doubted what Capt. Carter's experiment demonstrated!

One other point only remains to be disposed of and Prof. Reppert may be laid quietly to rest. We quote his own words so as to do him strict justice:

"Now grant that a musical chord passes over one inch of aggregate space in a second or an hour, yet it has to stop and start in this period four hundred times and deliver four hundred strokes (?). *Can this be slow motion?* Verily the man that can believe such stuff can——!"

To meet this allegation and silence the allegator we will look at his own illustration of a man running a mile in five minutes. In this space he makes 750 steps or swings of his legs of about 7 feet each. This may be called *swift motion*, not by virtue of the number of steps taken, but alone by virtue of the velocity of each step and the aggregate velocity of the runner thereby caused. To prove this self-evident truth let the runner try it again, and like the ordinary *isochronous* pendulum or prong, let him make the same number of steps, but only of 8 1-2 feet each, during the same time: does a professor of physics need to be told that the man's motion is slower than before? Clearly it is only half as fast as before, though made up of the same number of steps or swings. Then let him try it again, keeping up the same 750 steps, but slowed down to one inch at each swing, and his whole distance traveled will be but about 68 feet in five minutes instead of a mile, as at first. This would be "slow motion," and we pity the professor of science who would call it "swiftly advancing" because of the 750 inch steps which it took to constitute such motion! Finally, let the man's feet be so bound together that he can make but the 100th of an inch at a step, keeping up the same *isochronous* 750 steps during the time, thus making an aggregate distance of only 7 1-2 inches in the five minutes. Yet, be it known to the scientific world that Prof. J. S. Reppert, A. M., a teacher of physics in a prominent Kentucky college, ostentatiously asks:—Can this 7 1-2 inches in 5 minutes, which took so many steps to make the distance, "*be slow motion?*"

Enough up to this point. Let it be remembered that *the swiftness or slowness of motion* has nothing whatever to do with the number of steps, starts, or separate movements made by an advancing body, but, as before stated,

that it depends entirely upon the velocity of each separate motion made and the resultant aggregate velocity thereby given to the moving body. Stops and starts certainly have nothing to do with condensing the air or sending off pulses; neither has the distance moved or the number of motions in a second, but *velocity of motion* is the sole factor involved in this condensing process. A body might stop all day, but such state of rest would not send off a pulse. If one stop would not produce a condensation, why should a million stops? Nor would a million starts come any nearer producing condensation, unless they involved great velocity of motion. As the prong still sounds audibly as has been demonstrated, while moving at the rate of only 1 1-2 inches in four years, as Prof. Reppert concedes, and since he insists upon "lightning speed," or at least a high velocity in order to condense the open air and send off a pulse, we may safely pronounce the wave-theory demolished at the hands of one of its most enthusiastic friends.

A NEW IMPETUS TO THE NEW PHILOSOPHY.

A DISTINGUISHED SCIENTIST ABANDONS THE WAVE-THEORY OF SOUND.

We have at last the pleasure of announcing the turning-point in our long struggle for the recognition of Substantialism; especially are we glad to state that this recognition comes in such an unquestionable shape as to command the respect of the learned world. It has been the sneering boast of many professors of physics, and of a number of the leading religious newspapers of the country, such as the *Christian Advocate*, the *Independent*, and the *Baptist Examiner* of this city, that "none of the respectable colleges" and that no "men of recognized standard as men of science" had renounced the wave-theory of sound or accepted the Substantial Philosophy as the more probable solution of the mysteries of physical science. It has been also a common remark with such professors and editors, that the advocates and expounders of the new departure in science are "an association of cranks" who are riding a hobby and who are unworthy of notice by such distinguished and clear-headed investigators as Tyndall, Mayer, Helmholtz, Sir William Thomson, Lord Rayleigh and their coadjutors. This, however, has not been the universal sentiment of thinking men who have taken the trouble to look into the claims of the Substantial Philosophy. Hundreds of professors of the various colleges are even at this moment almost persuaded to be substantialists, and have been for years convinced that the current theory of sound is a

practical fallacy of science, but whose fears of encountering ridicule from their fellow professors have deterred them from boldly taking sides with *THE MICROCOSM*, till such time as some prominent scientist should lead the way and publicly declare for the new departure. Especially have the professors referred to adopted this timid and time-serving course in view of the persistent refusal of Tyndall and Mayer to say one word on the subject pro or con, though urged for years to speak, both by the friends and opposers of the New Philosophy. Notwithstanding this refusal to speak, yet for more than five years we have been writing in the firmest confidence that it was but a question of time when some leader in science would come to the front and prove himself neither afraid nor ashamed to champion the struggling cause of Substantialism, and when the proper time had arrived, throw down the gauntlet to the great advocates of the wave-theory, backed by such influence, learning and respectability, as to force the attention of the colleges and thus inaugurate a genuine scientific sensation.

It is true that during these years of anxious struggling and waiting we have had much encouragement by many able and noble accessions to the new and unpopular movement in physical science, of whom we shall always be proud,—men of careful habits of investigation and of invincible courage, and who were not disposed before espousing a cause to place its popularity or unpopularity in the balance of their decision;—yet they have lacked that prominence in the scientific world which was imperatively needed to stop the mouths of gainsayers and assure the over-cautious physicists that there was actually something in the Substantial Philosophy worth considering. Glad, however, are we to announce that such a man has made his appearance in the nick of time in no less distinguished an author and investigator than Dr. Henry A. Mott, Ph. D., E. M., F. C. S.; Member of the American Association for the Advancement of Science; Fellow of the Chemical Society of London; Professor of Chemistry in the New York Medical College; Member of the American, Berlin and Paris Chemical Society; Member of the Society of Public Analysts of London; Member of the New York Academy of Sciences; Member of the Medico-Legal Society; Fellow of the Geographical Society; Member of the American Pharmaceutical Society; Professor of Physical Science in Columbia College, etc., etc.: having become famous as a chemical analyst and expert in many government cases which have placed him at the very head of his profession. He is the grandson of the late Dr. Valentine Mott, the renowned surgeon of this city, Paris and London, and aside from the

name of his family he has by his own individual achievements, as an author of several books, given himself a world-wide fame as an independent investigator. Such a man, it is safe to say, would not be apt to act precipitately in so radical and important a matter as a complete abandonment of a universally accepted theory of science, or without the most mature and deliberate consideration of all the consequences that might attach to his course, particularly knowing as he does that the wave-theory of sound is now taught as unquestionable science in every college and university in the world, with the exception of a few recent changes in consequence of the spread of the Substantial Philosophy.

This sudden carrying of the scientific contest into the very camp of the giants of Physical Philosophy the Doctor also well knows must subject his course to the severest criticism at home and abroad, and very soon must inaugurate a war of extermination either of himself as a reliable investigator, or of a total collapse and break-down of the theory of acoustics as held by all scientists up to the first appearance of the *Problem of Human Life*, about seven years ago.

He assures us that he has counted the cost, and as evidence that he has not underestimated the force or prowess of the opposing army, or overestimated the invincible character of his own resources and strategic positions in the coming conflict, we take great pleasure in referring to his opening charge upon the enemy's lines in his introductory lecture before the Academy of Sciences at the Hall of Columbia College, in this city, on the evening of Dec. 8, 1884, in the presence of the chief scientific magnates of the various associations of which he is a fellow.

As his lecture (a considerable portion of which had to be omitted on account of its length) has just been issued from the press of Wiley & Sons, of this city, in a neat, cloth-bound book, we shall not here attempt to give a synopsis of its arguments, presuming that our readers will no doubt wish to read the entire work of 100 pages, which we will send by mail, at the publisher's price—50 cents.

We take pleasure also in announcing that Dr. Mott has cheerfully consented to join with the editor in getting up the long-promised textbook on *Sound*, in accordance with the new departure, and which will now be hurried out with all possible dispatch, due notice of which will be given in *THE MICROCOSM*.

The following are the concluding sentences of Dr. Mott's highly sensational paper:

"In concluding this lecture, I would state that numerous other arguments could be added to show conclusively the fallacy of the wave-

theory of sound, but time will not permit, and I question whether any more arguments can be necessary; for Prof. Huxley* has said that every hypothesis is bound to explain, or at any rate not to be inconsistent with, the whole of the facts it professes to account for; and if there is a single one of these facts which can be shown to be inconsistent with (I do not merely mean inexplicable by, but contrary to) the hypothesis, such hypothesis falls to the ground—it is worth nothing. One fact with which it is positively inconsistent, is worth as much, and is as powerful in negating the hypothesis, as five hundred.

"My object this evening, as I have stated before, has been to show the fallacy of the wave-theory of sound as was first demonstrated by Dr. A. Wilford Hall, and to point out just such facts as Huxley speaks of, and to show that it is a fallacy of science handed down from age to age like the Ptolemaic system of astronomy until a Copernicus should arise, and his *aide-de-camp* Galileo, to show the world a more excellent system.

"Now, gentlemen, while I submit the arguments and facts presented in this paper to your careful consideration, with the hope that you will weigh the facts and mathematical deductions with the greatest of care and with the one view before you of searching for truth and accepting the same when found, I am willing to risk the fallacy of the wave-theory upon the correctness of one single demonstrated objection, namely, the *slow* instead of '*swift*' movement of the tuning-fork when sounding audibly, and its consequent inability to produce atmospheric sound-waves as required by the current theory of acoustics.

"If any scientist can fairly and logically meet and answer that one argument, I will gracefully acquiesce. Otherwise the wave-theory should be abandoned at once as a mistake, for one single fact which is positively opposed to a hypothesis, remember, according to Huxley, overturns that hypothesis as completely as would five hundred such opposing facts."

CALLING NAMES.

It is becoming quite common for professors of physics to call any man a "crank" who may claim to have discovered something new in science, particularly if such alleged discovery should happen to conflict with some accepted theory as laid down in the books. These liberal dealers in epithets forget that both Copernicus and Galileo were called "cranks," or the equivalent of that term in Italian, by the prejudiced adherents of the Ptolemaic theory of astronomy, even for a century after the Copernican system had been demonstrated to their utter confusion. Like the present advocates of the wave-theory of sound, they found it easier to sneer and call names than to defend their own contradictory system which the new discoveries in science had overturned. It would be well also for such bigoted revilers of everything new in

philosophy, to remember the contumely heaped upon the heads of William Harvey and Edward Jenner, by the learned medical professors of their time, for having claimed the discovery of the two important physiological principles now accepted universally as true science, and thus think of the radical revolutions time has effected. As a specimen of these more recent imitators of the self-inflated sciolists who opposed the discoveries just referred to, and who now flippantly denounce "Wilford Hall" and those who agree with him on the sound question as a "coterie of cranks," we refer to Prof. Stevens, of the Packer Collegiate Institute, of Brooklyn, N. Y. We do not personally object to that professor applying his favorite epithet to us, if it tends to allay his chagrin and mortification at finding himself wholly unable to reply to our objections published against his favorite theory; but the public decidedly objects to this substitution of ill-tempered slang for argument. We would rather a hundred-fold be called a philosophical "crank" than proved a scientific coward. Of all the despicable men of any learned profession we think least of those who will persist in teaching a theory as true science because it is popular, after they have become convinced that it is no longer tenable. This remark applies to Prof. Stevens in all its force, for we have reason to know that he is too bright and intelligent in scientific matters not to see that the wave-theory of sound, as taught by the highest authorities, present and past, has been hopelessly crushed by the arguments printed in this magazine. If he will carefully read the single reply to Prof. Reppert, as printed in this number, he will feel a tingling sensation around the appendages of his scientific conscience that will forcibly remind him of his duty to his classes of young students, unless the said conscience has become seared as with a hot iron. We sincerely trust that he will soon be old enough to see that his assumed attitude of contempt for positions and arguments which he well knows defy criticism, can only excite a feeling of pity in the minds of all independent investigators of physical philosophy. Vastly more to his credit than calling names would it be could he muster the courage to meet Dr. Mott openly, in a written discussion of the entire merits of the wave-theory as taught in our schools and expounded in our standard text-books. Such a presentation of facts and arguments, pro and con, would be interesting reading matter; besides, it would have a wide circulation in these pages as well as in other journals. Dare Prof. Stevens act upon this suggestion and thus enter the controversial arena with a man worthy of his scientific steel? Such a friendly and dispassionate set-to would

* Origin of Species, p. 140.

be much more noble and high-toned than calling names. The invitation stands open both from Dr. Mott and from THE MICROCOSM.

OUR VACATION.

Thanks to the liberality of our subscribers for indulging us in a brief release from editorial toil. We needed a change more than we needed absolute rest, and to tell the exact truth, the latter we have had very little of during the two months of vacation which have now ended. While "resting," as we have termed it by courtesy, we have worked incessantly in developing an invention for scientifically overcoming all friction in revolving machinery, such as journal-bearings, axles of cars, wagons, shafting, pulleys, etc., for which we have received a United States patent. The primary object of this work was to secure means by which we could extend the usefulness of our other scientific labors as presented in this magazine, which we have so much at heart that we are willing to sacrifice anything we have for its prosperity. We anticipate from the important invention referred to, means sufficient to make us easy and our work prosperous, and should our expectations be anywhere nearly realized, this magazine will receive the full benefits of the same.

THE HARD TIMES.

We have nearly 1000 post-offices where we had small lists of subscribers for the third volume of THE MICROCOSM, where but one person at each office has since renewed for volume four. The meaning of this was a puzzle to our intensely mathematical and philosophical book-keeper. At last, by keeping a close watch on correspondents from various points of the compass, he claims to have completely solved the problem, by the adroit fact that a list of subscribers at a given office "chip together," as he puts it, contributing ten, twenty, or twenty-five cents each, and thus send in one subscription, so that all by turns can enjoy the benefits of the magazine at a very small cost. We do not by any means complain of this, though it manages to keep back not less than five thousand names that would otherwise, no doubt, have gladly renewed if they could have afforded to do so. This state of facts, as corroborated in many of our exchanges, indicates very hard times for money all over the country. We can only ask of our readers and the friends of Substantialism to do the best they can and we will try to do the same.

SPECIMENS OF PRESS-NOTICES.

(From the *Holton (Kan.) Signal*.)

WILFORD'S MICROCOSM, "the Organ of the Substantial Philosophy," is on our table, and a better religio-scientific magazine it has never been our lot to read. It is devoted to science and its bearing upon religion. When we tell our readers that it is edited by A. Wilford Hall, one of the most forcible, caustic writers in the country, they will at once make up their minds that nothing too good can be said for it. Send for a copy to Hall & Co., Publishers, 23 Park Row, New York. Only \$1 a year. Single copies 10 cents.

LETTER FROM PROF. SCHELL.

No. 52 Broadway, New York, Jan. 23, 1885.

MESSERS. HALL & CO.

GENTLEMEN,—I wish I could make the scientific world understand the real value of THE MICROCOSM. I have been a studious reader of the most important publications in our great libraries for many years, and I know of no work of the same size which will at all compare in vital information for the masses of mankind with your modest monthly. I have, during the past three months, carefully re-read the entire first three volumes and the numbers of vol. 4 as far as published, and I have no hesitation in recommending them to all thinking persons as an indispensable contribution to the scientific and philosophical literature of this progressive age.

Very respectfully yours, etc.,

H. S. SCHELL.

A STRAW FROM "OLD PATH GUIDE."

"We have examined the controversy on the subject of Sound, and we say that some of Hall's positions are irrefutable. No one of those who impugned Hall's positions has successfully done so."—*Courier-Journal, Louisville, Ky.*

It is strange that the most able advocates of the Wave-Theory of Sound do not try to refute Dr. Hall's positions. If they can, they owe it as a duty to Science to do so; if they cannot, then honesty would require them to acknowledge the force of his arguments. A true philosophy requires us to labor for even the salvation of one person from error. Dr. Hall is influencing as many young men as any other philosopher in America. Let the highest scientific culture speak out—*Old Path Guide, Ibid.*

THE LATEST AND BEST OFFERS.

For one subscription (old or new subscriber), with \$1, for present volume of THE MICROCOSM, we will send, post paid, Dr. Mott's new book on *Sound*, referred to elsewhere; or we will send our new condensed Webster-Dictionary (384 pages), as may be preferred. For two subscriptions as above (\$2), we will send either "Universalism Against Itself," "Walks and Words of Jesus," or the present vol. free. For three subscriptions as above (\$3), we will send the "Problem of Human Life," either volume of THE MICROCOSM, bound, "Death of Death," or "Through the Prison to the Throne." Our encyclopedia offer still stands good, as seen elsewhere. We have disposed of many sets, in all cases to entire satisfaction. See last page of November number.

SPECIAL NOTICE.

Should any friend, not a subscriber, chance to see this number of THE MICROCOSM, please show it to those who might be interested in its contents, and greatly oblige the editor. Our special offers cannot fail to interest those who think on scientific and philosophical questions.

THE FINAL OFFER.

Any person desiring to own the first three volumes of THE MICROCOSM, bound in cloth, the present volume in numbers, and the "Problem of Human Life," cloth, can send us a club of ten names for present volume, with the money, \$10, and the books named will be sent by express prepaid.

WILFORD'S MICROCOSM.

Vol. IV.—No. 6.

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{ One Dollar a Year.
{ Single Copy 10 Cts.

IS MAN'S MORAL NATURE AN EVOLUTION FROM THE SOCIAL INSTINCTS OF ANIMALS?

BY REV. JOSEPH S. VAN DYKE, A. M.

Wide as is the divergence in intellectual faculties between man and the lower animals, in moral nature the chasm is still broader, is in fact practically infinite. Quite manifestly it is not merely a difference in degree, but in kind, animals being entirely destitute of moral qualities properly so called. True, they possess social instincts, and in the exercise of these occasionally manifest, in slight degree, qualities resembling those which in the human family are denominated ethical. The horse, which apparently carries forward a process closely akin to reasoning, and evidently remembers places which it has frequently visited, seems also to have a certain measure of affection for its companion, and even for its owner. The elephant, which may be teased into a frenzy of rage, is also capable of appreciating kind treatment, and possibly feels an impulse slightly akin to gratitude. The lioness, fierce as her nature is, has a measure of affection for her whelps. A monkey has been known to come to the rescue of its keeper when he was attacked by an enraged baboon, thereby seeming to manifest a disposition to requite remembered kindnesses. Cattle, though sometimes far from manifesting sympathy with each others' sufferings—as when the wounded are driven from the herd—have nevertheless been seen to stand intently gazing on a dying or dead companion. The queen-bee, though she kills her fertile daughters, quite evidently has a measure of sympathy with all the members of her well-regulated household. It is no unusual thing to see birds expressing, seemingly, extravagant joy over the nest which contains their happy young; some even build houses which are expressly designed and exclusively used for social pleasures. Insects, as well as puppies and lambs, sport and wrestle and enter with zest into amusements, sympathizing with the joys of others. Crows have been known to feed a blind companion, thereby giving evidence of possessing the rudiments of what man regards as the highest virtue, unselfish care for the aged and the helpless. The baboons of Abyssinia, before setting out to plunder a garden, choose a leader and enjoin strict obedience to orders on all the members of the company; if any one on the journey makes a noise, so endangering success, his nearest companions give him a slap to remind him of the impropriety of disobeying orders.

Not only do animals appear to possess, though in but slight measure, love, gratitude, sympathy, obedience—qualities usually considered as possessing moral bearings,—but also manifest courage, and in some circumstances the spirit of self-sacrifice. The bear, with intelligence adequate to the procurement of food for her cubs, will also rush between them and danger. When a troop of monkeys is attacked by dogs, the males will hasten to the front, showing valor and a readiness to sacrifice themselves

for the good of the company; so successfully can they cover the retreat that even the youngest and the feeblest commonly reach the mountains in safety; there they receive the praise which gratitude prompts the rescued to bestow.

Perhaps the nearest approach made by the inferior animals to what we denominate conscience is the apparent sense of shame, bordering on remorse, which the whipped cur seems to experience as he cringingly supplicates a return of his master's favor. Professor Agassiz thinks that dogs possess a faculty closely akin to conscience.

Without questioning the truth of these and numberless similar facts, we do not hesitate to affirm that there is in the lower animals no quality and no combination of qualities from which the sense of right and wrong, as it exists among men, could have been evolved. In this affirmation we are unquestionably sustained by the facts of the case, and also by the testimony of naturalists well qualified to express an opinion. Mr. George Mivart, though an ardent advocate of progressive development (not, however, of natural selection, nor of the derivation of man's mental and moral faculties from the lower animals), boldly asserts: "There is no trace in brutes of an action simulating morality which is not explicable by fear of punishment, by the hope of pleasure, or by personal affection."

Those evolutionists who pursue their theory to the extent of developing man's higher faculties from the *Simiade* hold, that though the moral sense constitutes by far the most important difference between man and the lower animals, still, even here, the difference is one of degree and not of kind; that, though there is a wide divergence between the two conceptions, "the expedient" and "the morally obligatory," they are nevertheless the same in origin; that those apes which possessed an instinctive liking for practices useful to the community, have, through natural selection, perpetuated a more numerous offspring than those possessing tendencies in an opposite direction; that the liking ultimately became "innate," and in man has gone on improving, though moral sense is feeble in savages, till it has culminated in the dictum, *Fiat justitia, ruat cælum*.

The advocates of this theory have different methods of designating the bond that unites moral sense, as existent in man, with the germs thereof as they exist in inferior animals. Some maintain that it has had its origin in the principle of selfishness. This Darwin pronounces absurd,* and affirms that "The moral sense is fundamentally identical with the social instincts," which "have certainly been developed for the general good of the community." "Thus any animal whatever endowed with well-marked social instincts, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well developed, or nearly as well developed, as in man."† Again: "The first foundation or ori-

* Descent of Man, Vol. 1, p. 94.

† Ibid., p. 68.

gin of moral sense lies in the social instincts, including sympathy. . . . The social instincts would give the impulse to act for the good of the community." Mr. Herbert Spencer evolves conscience from the principle of utility, as existing in inferior animals. He declares, "There have been, and still are, developing in the race certain fundamental intuitions; and, though these moral intuitions are the result of accumulated experiences of utility gradually organized and inherited, they have come to be quite independent of conscious experience." Others evolve it from the regard, manifested by animals, to the highest happiness of the largest number. In the opinion of Sir John Lubbock, the author of *Pre-historic Times*, the moral sense has its origin in "deference to authority." This, on examination, turns out to be simple utilitarianism; since, unless there is such a thing as absolute morality (which he denies), obedience must be produced either by the hope of reward, or the fear of punishment, or the mere pleasure arising from obeying—the motive must be utility.

It thus becomes evident that to develop conscience from the social instincts of inferior animals it must be regarded as having its genesis in selfishness, in the desire to secure the greatest good to the community, or in a regard to the highest happiness of the largest number, no other sources of moral principle existing in animals—if, indeed, these exist and are possible sources of moral fruition.

As already intimated, the advocates of this theory admit that it is extremely difficult to account for the moral element in man, that this, which Darwin designates "the most noble of all the attributes of man," causes him to differ most profoundly from the simial family. "A moral being," says Darwin, "is one who is capable of comparing his past and future actions or motives, and of approving or disapproving of them. We have no reason to suppose that any of the lower animals have this capacity. . . . In the case of man, who alone can with certainty be ranked as a moral being, actions of a certain class are called 'moral,' whether performed deliberately after a struggle with opposing motives, or from the effects of slowly gained habit, or impulsively through instinct." Surely, then, we are justified in affirming that it will require a large induction of facts, larger than has yet been made, to establish the proposition that animals possessing social instincts inevitably acquire a moral sense, when there is a corresponding development of the reasoning faculties.

We are ready to concede that there may be adduced from the animal kingdom examples in abundance of acts simulating morality, as the care taken of the young, the feeling of love between members of the same fraternity, the posting of sentinels to guard against the approach of danger, hunting in company, obedience to the commands of leaders, etc. But acts which are merely conducive to the good of the community are not necessarily moral; indeed, they may be positively immoral, and instead of tending to quicken the sense of right and wrong, may tend to blunt it. By a community of thieves, who secure their booty not infrequently through murder, indifference to the sufferings of the helpless may come to be considered as eminently beneficial. If, as we are told, cruelty is characteristic of savages, who are declared to be an intermediate link between the ape family and the human, how are

we to account for man's intense sympathy with suffering? How explain his care of the weak, the mentally imbecile, the aged and the worse than useless? Certainly it is not beneficial to society, and never has been, that the feeblest members should impose burdens upon the strong, and even leave enfeebled children as a legacy of woe to posterity. What, then, could have been the origin of man's noblest charities? How does it happen that his tenderest emotions prompt to self-sacrifice in the erection of Hospitals, and Insane Asylums, and Inebriate Homes, and Magdalen Retreats, etc.? How has humanity toward animals, even toward those which are useless to man, ever come to be regarded as a virtue? It is conceded by Mr. Darwin that a high standard of morality gives no advantage to individuals;* and when, as in these cases, it is clearly detrimental to the welfare of society, how could it have become established?

Is the difference one of degree and not of kind? We are conducted through a lengthy and labored argument, the design of which is to prove that the more enduring instincts conquer the less permanent. Birds, yielding to the more powerful impulse, migrate when the season arrives, leaving their helpless young in the nest. Who can say that the joys of their new home in the sunny south are not clouded, in measure at least, by the remembrance of their deserted young in the chilly north? They may suffer from remorse, deeply regretting their weakness in yielding to what for the time was a more potent desire. To civilized men "duty" is, indeed, the most powerful word in the language; but why may we not say that the hound "ought" to hunt without any regard whatever to present or prospective advantages?

We are thus given to understand that conscience, in its highest functions, when it acts regardless of self-interest, is to be regarded as merely the exercise of an inherited habit. The retriever "ought" to bring his game and lay it at his master's feet, because he "ought" to obey an impulse transmitted from his ancestors. Man ought to do right, even though it may not conduce to personal advantage, for he has inherited a habit which was laboriously evolved from the social instincts of the lower animals.

In answer to this specious theory we may very properly ask: Are the acts to which conscience prompts always instinctive? Has the moral sense no more enduring foundation than an inherited habit? Does it testify to the existence of an eternal law of right and wrong? Do not its mandates come to us bearing the seal of a just God? Is remorse nothing more than the transient pain which results from disregarding the promptings of inherited habit? This anguish, which poets have depicted in such vivid colors, and from which the guilty vainly seek to escape, is it nothing more than an unpleasant sensation arising from the perception that one instinctive impulse has been yielded to rather than another? Before these and similar questions can be answered in such a way as to cast discredit upon conscience as an independent and Heaven-delegated power, there must evidently be a more extended array of arguments, and these more potent than any yet adduced. Logic has an arduous task to perform before a majority of the human family

* *Descent of Man*, Vol. I, p. 150.

will believe that the moral sense of man and the social instincts of inferior animals are essentially one, differing in degree but not in kind. Though, from the argument as presented, we are expected to infer that man may feel remorse such as conscience is fitted to produce, simply because he has yielded to a stronger instinctive desire, thereby doing what calm judgment pronounces detrimental to the good of the community, we resolutely refuse to gratify the cherished expectation.

Most persons believe in "absolute morality," maintaining that notion of conscience which makes it to differ from even the noblest of mere animal instincts. It is viewed as erecting its own standard of right, and compelling one, as past conduct is reviewed, to approve or condemn. For a course of conduct which an awakened moral sense strongly disapproves, no matter how powerful were the temptations, the transgressor is forced to feel regret, sometimes keen and long-continued remorse. In this respect man differs from the animal creation almost as widely as it is possible to conceive.

As already intimated, the acceptance of the proposed theory carries with it the belief that "the right" and "the useful," two entirely distinct ideas, are essentially identical and have a common origin. Even on this hypothesis, the task of proving that the moral sense of man was developed from the social instincts of apes would be an arduous one; for to speak of social instincts having their origin in selfishness and ripening into self-denial appears absurd; nor is there less absurdity, seemingly, in assuming that a regard to the highest happiness of the largest number could have evolved a conscience sufficiently sensitive to condemn practices which an overwhelming majority of every community must have considered conducive to the well-being of nearly or quite all; and the absurdity, though perhaps less easily comprehended, is but little diminished, indeed in the minds of some is augmented, by supposing that the social instincts of brutes gradually developed a moral sense capable of enacting and enforcing laws which no amount of intelligence, without the assistance of lessons from experience, could pronounce well adapted to promote the good of society, being destructive, apparently, to the prospective as well as to the present interests of a very large majority. How, for example, could man, according to this theory, have acquired his ideas in reference to honesty. "Honesty," as Mr. Hutton says, "must have been associated by our ancestors with many unhappy as well as many happy consequences, and we know that in ancient Greece dishonesty was openly and actually associated with happy consequences." How came our ancestors, in the days of "miserable savagery" or in their previous ape-condition, to look upon marriage within certain degrees of consanguinity as improper? "Savages," says Mr. Wallace, "choose their wives for rude health and physical beauty." It is highly improbable, even if they were able to perceive resultant evils, that they could be induced to condemn incestuous intercourse, much less to discontinue it. And yet, among many savages, so great is the repugnance to such unions that they are rigorously forbidden, though the will of the husband alone determines the duration of the marriage contract, the wishes of women being in no way consulted. Among the Fiji-Islanders, brothers and sisters, mothers and sons-in-law, fathers and daughters-in-law,

brothers-in-law and sisters-in-law are forbidden to speak to each other or to eat from the same dish. In Australia, a man, if he has the courage, may steal another man's wife, but he may not have a woman of the same name as his own, lest possibly she may be a remote relative. The Esquimaux frequently exchange wives as an act of friendship, but care is taken to prevent the union of blood-relatives. This abhorrence of intercourse within prohibited degrees could hardly have originated among the savages; and to conjecture that it may have arisen in the Simial family is to ignore the fact that monkeys of every class are in a pre-eminent degree exempt from sensitiveness upon such subjects.

Nor is it less difficult to perceive how "the advantageous" could have been transmuted into self-sacrifice; into temperance, chastity, truthfulness, gratitude, etc. Regard to the well-being of society is not the only, nor indeed the main, element in these and kindred virtues. They evidently include devotion to God. It is perhaps possible to conceive that slight feelings of approbation or of disapprobation, sufficiently powerful to prove advantageous to a limited community and sufficiently universal to influence large numbers, may have been transmitted through natural selection. But as the stream cannot rise higher than the fountain, it is impossible to conclude that these feeble emotions could have developed the ennobling conception of duty. The distinction between "the advantageous" and the "obligatory" is so fundamental that the idea of benefit does not enter into the idea of right; indeed, the disadvantageous could more readily evolve the conception. "The advantageous" and "the pleasurable" are not contained in the idea of "duty," not even in germ-form. This is conceded by Mr. Herbert Spencer, the philosophical exponent of evolution, though he nevertheless maintains that "the experiences of utility, organized and consolidated through all past generations of the human race, have been producing corresponding nervous modifications, . . . which have no apparent basis in the individual experiences of utility."

It is, moreover, worthy of note that the theory in question proceeds upon the assumption that apes, and even inferior animals, possess what man has not attained to, namely, an unerring instinct telling what is for the good of the largest number; nay, more, it assumes that they are capable of ignoring the lessons of experience and even convincing their companions that more conscientious courses would result in greater good, not, indeed, to the individual, possibly not even to the existing generation, but to the race in the lapse of centuries.

To believe that the social instincts were the germinating principle of man's entire moral nature, and that, by the aid of the intellect and though the force of unconquerable habit, they ultimately issued into the golden rule, requires a degree of credulity which few can hope to reach; and to conceive, as this theory does, that devotion to God and self-sacrifice, and even gratitude, have been developed from the unselfishness necessary to the better preservation of brute communities is, in the opinion of most persons, a simple impossibility.

The point of the foregoing process of reasoning is not blunted by saying, The result merely ensues from the survival of the fittest; for how, we may ask, could any considerable number within the limits of the same tribe be-

come possessed of the moral qualities? Evidently they could not; and the remainder of the tribe being incapable of appreciating this high moral tone manifestly could not transmit it; nor could the few, since the powerful influence of the many would inevitably destroy the slight advances made by a very small minority. The variations of individuals become eliminated by the mere force of numbers. Thus the lives of the more moral (rendered more moral to benefit community) would be a self-sacrifice without the faintest hope of benefiting succeeding generations—a martyrdom such as man has never been called upon to undergo.

Darwin, perceiving the cogency of this line of reasoning, assigns two agencies through the operation of which he thinks a large number of the members of any tribe might have become possessed of these social and moral qualities; namely, the perception that assistance is the loan for assistance, and the potent effect of praise and blame. These, however, must necessarily be powerless just where potency is needed.

If we were to admit that certain well-defined moral qualities, having their foundation in utility, may possibly have been acquired by a few members or by a majority of some tribe, could it be shown that these qualities would probably be transmitted from generation to generation? Could it be proved that they actually were transmitted? Neither, as we think. It is difficult to discover any ground for the belief that even a large majority of any monkey-tribe could transmit moral qualities which have an origin no nobler and a character no more enduring than that imparted to them by the survival of individuals having infinitesimal measures of increased regard to the good of the community. Moral qualities, such as connect themselves with a law inwoven with human nature, are, indeed, transmissible. It is undeniable, however, that senseless customs, superstitious practices, and meaningless moral distinctions, though widely prevalent and powerful for centuries, cannot be transmitted from parents to children. The Hindoo father does not transmit his intense horror of unclean food, though he may transmit his detestation of falsehood. The Mohammedan mother has been known to transmit her inclination to theft—as have also wealthy parents in civilized society, as is testified to by kleptomania—but she has not been known to transmit, except by instruction, her shame of appearing in public with unveiled face. The children of the Hottentot may, indeed, inherit his veneration of some higher power, but not his superstitious reverence for meaningless religious customs. Facts such as these, and they are numerous, would certainly seem to indicate that moral laws are an essential and not an accidental part of human nature: that they are an indestructible portion of man's constitution and not something ingrafted thereon.

That the moral sense possesses an authority, such as is not possible to inherited tendencies, even should they become a powerful bias regularly transmitted, is the nearly unanimous conviction of the human family. The approval of right and the approbation of wrong are accompanied with a deep-seated persuasion of supernatural authority. Truth, honesty, the spirit of self-sacrifice,—all the virtues,—are considered praiseworthy and obligatory not merely, nor mainly, because the noblest of the human family have commended them, but

in a pre-eminent degree because they are believed to have the sanction of a Supreme Being, by whom the love of them was inwoven, as is believed, with man's better nature. In like manner, falsehood, envy, selfishness, rascality,—all the vices,—are deemed despicable, not simply because moralists have dared to condemn them, nor because of a wide-spread conviction that they are poorly adapted to secure either present or future advantages, but because most persons are forced to conclude that man's nobler nature, as it came from the hand of its Creator, involuntarily condemns them. It would be difficult to assign any other satisfactory reason. Certainly, the most brilliant success has sometimes accompanied craft, dissimulation, knavery, and selfishness.

Again: If the social instincts are the basis of conscience, all persons or nearly all, as it would seem, ought to approve what society recognizes as right. Such, however, is not the case. Every person, besides being capable of forming estimates respecting his own acts, also forms judgments in reference to the conduct of others, thoroughly persuaded that right is right and wrong is wrong independent of men's beliefs and practices. His judgment is independent. He believes himself accountable to God alone. As a right delegated from heaven he exercises the privilege of holding others to a superhuman standard of rectitude, though he admits that man's conceptions of duty vary, owing to prejudice and ignorance. Whilst deeming it folly to condemn the conduct of brutes, because they possess no moral sense, he is impelled by an inward necessity to entertain an opinion respecting the moral acts of every sane person. Convinced that all possess conscience, which, though often resembling a palace in ruins, yet speaks of a more glorious past and invites to a nobler future, he considers no argument necessary to prove that it is an original element in human nature. The denial of this, on the part of an occasional reasoner, has little or no effect in destroying his faith in the validity of the argument. Atheists exist. They have advanced labored arguments to substantiate their position. This has not induced theologians to concede that there is no argument in the nearly universal testimony of the human family to the existence of a Supreme Being.

Will any one pretend to affirm that this "social-instinct" theory satisfactorily accounts for the fact that an act is deemed praiseworthy in exact proportion to the unselfishness that characterizes it? The existence of unselfish qualities in our ape-like progenitors would have impeded the improvement of the species. The development of useful qualities is perhaps conceivable, but the development of qualities detrimental and tending to deterioration is irreconcilable with the theory. We may safely challenge the evolutionist to furnish a single instance in which "the disadvantageous" has been transmuted into conscience. His chances for success are slight indeed.

So cogent is the argument which we have attempted to outline that most persons, even those who deny a supernatural Revelation, are ready to admit that the clearest evidences of man's having been created in God's image are found in his moral nature. To see beauty in goodness, and charity, and forgiveness, and love; to admire them even when they are not permitted to mould the life; to condemn wrongdoing, and instinctively loathe it, even when

practicing it—these surely are strong proofs that conscience is an essential and indestructible element of human nature, the direct workmanship of “a Hand Divine.”

CRANBURY, N. J.

THE POSSIBILITY OF SIN A NECESSITY OF MORAL BEING.

BY REV. T. NIELD.

GOD CANNOT SIN. Sin is transgression of law. Law is the expression of will to which allegiance is due. Since God is eternal, self-existent, infinite, there is no higher will; He can owe no allegiance; be amenable to no law. Hence why He cannot sin.

GOD IS NOT A MORAL BEING. A moral being is a creature of conditions; is amenable to moral law. Since God is above law, He has no moral qualities; for moral qualities imply a sphere of law toward which these qualities assume an attitude as positive or negative. The character of God has but one quality, viz.: infinite perfection—beyond law, beyond analysis. The attributes ascribed to Him are but the aspects in which we contemplate His infinite perfection. And yet, it is convenient, even necessary, to think of God as having attributes, that we may have a means by which our minds may look on human and imperfect actions in the light of infinite perfection, and test their harmony, or otherwise, with that perfection.

MAN IS A MORAL BEING. As such he is amenable to moral law, which defines the rightness or the wrongness of the acts of moral beings. A moral being has capacity to see the fact that acts have qualities of rightness or of wrongness, or, in other words, that they harmonize or are discordant with the infinite perfection of the *One Great Lawgiver*. And he has the power of moral acts. That which makes him a moral being in performing those acts, and, at the same time, gives the acts their moral quality is:

1. They are positively his own acts.
2. They are his because he chooses them while having power of contrary choice, and he chooses them to the rejection of their opposites.
3. He chooses them with a knowledge of their quality.
4. He chooses them *because* of their quality.

Here is the basis of accountability to moral law. If he breaks the law he defies the law, preferring to be out of harmony with infinite perfection. He is what he is, because that is what he chooses to be. Hence, it is a solecism, or tautological, to speak of a free moral agent. Were man not free he would not be a moral agent.

Sin must be possible to a moral being. As we have stated, sin is the transgression of law. Had man no power to transgress, he would have no power of choice, and hence no power to choose the right; and hence his acts would have no moral quality. With power to choose the right, and so obey the law, is power to choose the wrong, and so to disobey, which is to sin.

Conclusion. In making man a moral being God was under the necessity of making sin a possibility. To have made man incapable of sin, he must have been created outside the sphere of moral law—either above it or below it, either God or brute. Since God could not make us gods—a race eternal, self-existent, infinite—His equals—He had to make us capable

of sin, or make us brutes. Hence, he who criticises God for making man a creature capable of sin must be dissatisfied to find himself above the brute.

What we have said of man applies to every order of intelligence above the brute. The angels are within the sphere of law. All, of necessity, have been in a probationary state—have had a choosing and a destinating time. Those in heaven worship God, and so they are in harmony with law and infinite perfection. Certain of them “kept not their own principality.” They chose to antagonize the law, and received the penalty.

GREENSBURG, Ky.

FOREKNOWLEDGE VERSUS PREDESTINATION.

BY REV. G. H. M'KNIGHT, D. D.

EDITOR OF MICROCOSM.—As this old question has been revived of late in your columns, and several of your contributors have “reasoned high of fate, foreknowledge, and free-will,” will you give a little more space to the same subject to a former contributor to *THE MICROCOSM*?

Now, I suppose that all will concede in the first place that the old Calvinistic theory or doctrine, otherwise called the Superlapsarian, has gone by the board. I very much question whether any one at the present time would have the hardihood to stand up and in bold terms declare that God from all eternity had predestinated some of His creatures to eternal torment, or that in His eternal decrees of life and death some infants were doomed to the latter, inasmuch as they were not among the elect; and yet this is the doctrine of the Presbyterian Book of Faith. See page 28, where it thus reads—“By the decree of God, for the manifestation of His glory, some men and angels are predestinated unto everlasting life, and others foreordained to everlasting death. These angels and men, thus predestinated and foreordained, are particularly and unchangeably designed; and their number is so certain and definite that it cannot be either increased or diminished.” Again, on page 64, it reads: “Elect infants, dying in infancy, are regenerated and saved by Christ through the Spirit.” The only inference here, of course, is that non-elect infants are left to perish. Mr. Froude, the historian, has said that “Religion is of God, but theology of the devil.” This is a strong way of putting it, yet if any theory could drive man to infidelity and thence to the devil, this certainly would. To say that God brings multitudes of human beings into the world to damn them to eternal torment, or that He would suffer them to be born, when preordained to endless suffering, is a doctrine so monstrous that it fills us with astonishment that it was ever taught. But if any one supposes that this is a theological man of straw that I have set up simply to knock down, let him turn to one of Jonathan Edwards' sermons on the punishment of the wicked. Here he will see how God delights in the torments of the lost and how extremes meet, how an ultra Protestant can so read the Gospel and so misunderstand the character of a God of infinite justice and mercy, as to manifest the spirit of a first-class minister of the Inquisition—the spirit of a Torquemada, or Philip II. of Spain.

But now in regard to this whole question, while we admit that God's character and rule involve mysteries which the finite mind cannot fully understand, yet some things are too plain to be mistaken—and

I. What God preordains, or what He wills or decrees, He is the author of.

II. If He preordains or predestinates a certain number to destruction or death, then the number so ordained have no free-will; and hence no responsibility or accountability; for the freedom to choose between good and evil, life and death, is inseparable from responsibility.

III. If those so ordained cannot choose, and hence are impelled to sin, then God is the author of sin.

I am well aware that there is nothing new or original in this way of putting it, but as we are on an old subject we might as well look at it in its old deformity and repulsiveness. But now when the predestinarian is pushed to the wall by this aspect of the case, he immediately confounds predestination and foreknowledge. Does not, he asks in all innocence, God know whatsoever shall come to pass, and if He knows it, is it not equivalent to His decreeing it or preordaining it? I answer, no!—a thousand times, no! God's foreknowledge is simply His omniscience; God's predestination is an act of His will; and this makes the two things as widely apart as the poles. God's knowledge of an event or fact no more makes him the author of it than our knowledge of an event or fact makes us the author of it. I know a man to be a thief; that when he has the opportunity he will steal, every time. God knows men are wicked; that they will do wickedly when they have the power; but He in no wise ordains them to wicked acts; and while He knows that they will commit them, yet at the same time He knows that they can refrain from committing them; that they are under no fate, no necessity, no predestination, which compels them to a single act of evil. The fact that His knowledge is certain in no wise changes the fact of their free agency. As an able writer observes. "Things come to pass not because they are foreknown, but they are foreknown because they will come to pass."

Why will they come to pass? Because wicked men voluntarily resist God's will, and in spite of all of His warnings, admonitions and entreaties; ay! in spite of the tremendous sacrifice of Christ to redeem them and reform them, will choose the ways of sin and death. Why God permitted evil at all; why He created man knowing he would fall and the consequent misery, is a mystery beyond the finite mind to solve. We may believe, however, that in permitting it, He saw that in the end, more good would result to the race and the universe, than not to create man at all, or so to create him that he would have no power of choice, hence no responsibility, hence no character, either virtuous or vicious—or in other words, in such a case he would be a mere automaton or puppet in his hands, without will or virtue or responsibility. Now while this view of the case does not, as I admit, solve the problem of evil, or clear up every difficulty in regard to the government of the Supreme Being, yet it certainly presents a view of God's love and justice entirely in harmony with Scriptural teaching, and relieves us from the shocking features and the absolute contradictions of the predestinarian system of theology sum-

med up by Lorenzo Dow in those oft-repeated words:

"You will and you won't,
You can and you can't,
You'll be damned if you do,
And you'll be damned if you don't."

And this reminds me of a conversation I once heard on the cars, when traveling from Michigan City to Indianapolis. A Methodist and Spiritualist had been for some time in controversy, when a large, jolly-looking individual came forward from the rear end of the car and said: "What is all this argument about? I am an old-school Presbyterian, and go clear back to the primer, and can settle this question in a few moments. Now, whatsoever is to be will be, whether it comes to pass or not. Whoever is born to be saved can't be lost, even though he is damned." This, of course, pleased the Methodist brother hugely, and I submit whether it is not about as lucid and satisfactory an explanation of the predestinarian theory as you can get.

ELMIRA, N. Y.

MISTAKES OF "TRAINED EXPERIMENTERS."

BY CAPT. R. KELSO CARTER.

"The best of men are liable to mistakes," is a well-known adage, but if we were to credit the utterances of some modern scientists the conclusion would be irresistible that the leading lights of science, in this day of grace and knowledge, make no mistakes at all. Certain is it that when any one rises, ever so respectfully, and ventures to question an experiment or conclusion in any leading work upon science, he is contemptuously told that it is not to be supposed that such absurdities have been neglected by the "trained experimenters" who have devoted years to the investigation of the subject, and that his objections are therefore entirely inconsequential. It seems strange that such should be the conduct of scientific men, who have only to look back a short lifetime to see Morse struggling with the prejudices of the world, or a mere trifle of a dozen years to find Edison dubbed a lunatic and an impostor because he dared to suggest the duplex telegraph. A few weeks ago, in the halls of a prominent college, was presented the spectacle of a distinguished member of a leading scientific association presenting an able paper on certain mistaken ideas in the popular theory of acoustics, only to be coolly and contemptuously informed by a fellow member that no matter what arguments he might produce, nobody in that association would condescend to meet them, and no matter what questions he might propound, no member would even vouchsafe a candid reply. And this within a few miles of the famous laboratory at Menlo Park. We do not think that such bigoted intolerance and such gross discourtesy can be taken as a fair sample of the real knowledge, education, refinement, and desire for truth in the average college professor in the United States.

Now what constitutes a "trained experimenter?" Very evidently, popular writing and lecturing are sufficient, if not absolutely requisite, to such title. We maintain that the man who has thoroughly performed any experiment, within his means and powers, *from an adverse standpoint*, is a thousand times more competent to testify of its merits than any one

who has performed it with no thought of questioning its accuracy. The man with the ax to grind never thinks of calculating the amount of power expended upon the crank. And he who cannot receive a plain and logical proof that he has made a mistake, is of all men the most undeserving of leadership. Of such a man and his followers it can be truly said, blind leaders of the blind, both will fall into the ditch.

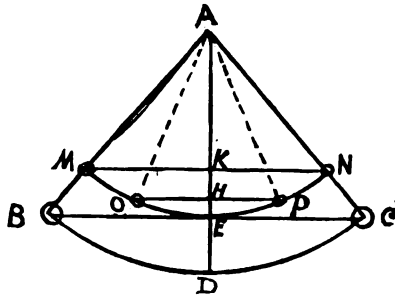
I have one object in writing this article. I hope to clearly set forth the fact that the acknowledged leaders of the science of acoustics have made grievous mistakes in their statements, experiments, and illustrations, and that therefore there is every reason for a candid and honest mind to give a fair and impartial hearing to those who claim to have made new and iconoclastic discoveries in that science. For myself I simply declare that no personal motive whatever influences me in this matter. Prof. Mayer and his models, Tyndall and Helmholtz, are to me of no more personal account than the dwellers in the heart of Africa. The college to which I belong has no possible thought of rivalry in any conceivable way with the noble institution at Hoboken. I am grateful to those gentlemen for the simple and instructive books which they have written upon this subject, at least so far as I find them to contain the truth; but when I find error I am not only compelled to reject it myself, but to do all I can to call attention to that error, and secure its rectification. It is therefore in a spirit entirely impersonal that I earnestly beg the attention of the scientific world to some serious and fundamental mistakes in the theory of acoustics. A constant use of the various instruments of the philosophical laboratory for eight or ten years, and a special devotion of a portion of my time for four more years to the trying of crucial experiments, connected with the wave-theory of sound, may not constitute me a "trained experimenter" in the eyes of my fellow professors of science, but it certainly will make me a competent witness in the jury box of every candid mind.

1. The first mistake to which I call attention is a fundamental one. Anything whatever which spreads in all directions from a center, in the form of shells or spheres, must necessarily decrease in intensity as the inverse square of the distance from that center. This is recognized and claimed by all wave-theorists. And in support of this an experiment is freely cited in the text-books: "Four bells at forty feet will exactly equal, in intensity of sound, one bell at twenty feet." There is not an acoustician on earth who ever publicly questioned that statement and experiment until the *Problem of Human Life* appeared. And here I make the sweeping statement that not one of the "trained experimenters" ever once tried to perform that experiment, but simply took it on theory alone. *This is a fatal mistake.* I myself first tried this experiment with a very complete apparatus, and was astounded to find that instead of four equaling one at double distance, four equalled one at *thirty times* the distance. The full details of this fundamental experiment have been standing on public record for three years, absolutely unchallenged. I simply say to the leaders of acoustical science: Gentlemen, you have never tried this experiment (for to suppose that you have would be to believe you absolutely dishonest); I have tried it, and call

your attention to the result. Will you try it, and give the result to the thinking world?

2. Prof. Tyndall's ludicrous mistake with the big tin tube, when he clapped the books at one end and extinguished a candle at the other, has been so thoroughly exposed by Dr. Hall, that I merely allude to it here. As a matter of personal testimony, in the line of actual experimentation, I may recall the fact that I publicly tried this before a scientific association, using a short tube and an immense gong bell. Tyndall's books puffed out a candle through a tube fifteen feet long. My big gong failed to cause a flicker when the tube had a length of only four feet. Yet Tyndall especially declared that it was the sound and not the puff of air that extinguished the flame.

3. Profs. Helmholtz, Tyndall, Mayer, and all other writers on sound, have united in supposing that a tuning fork, or other vibrating body, moves with great rapidity, and thus succeeds in condensing or driving the air before it. Dr. Hall fully exposed this fallacy, by a little simple arithmetic, years ago; and I was enabled, by a careful yet exceedingly simple experiment with a large tuning-fork, to carry the calculation for its actual velocity down to one inch in four years, while still audibly sounding. This mistake of the wave-theorists has been felt to be fatal, and several attempts have been made to explain away the difficulty. These attempts will be noticed in due time, but now let us consider a mistake in illustration and in reasoning, made by Prof. Mayer, of Hoboken, in his little book on Sound. A simple diagram will be necessary for a complete understanding of the subject.



4. On page 82 of his little work, Prof. Mayer says, of the conical pendulum. "It reproduces exactly the motion of an ordinary pendulum of the same length [italics all mine] as that of the conical pendulum." There is no mistaking this language. But Prof. Peck says in his *Mechanics*, under the conical pendulum: "The time of revolution of a conical pendulum is equal to a double vibration of a simple pendulum whose length is A E," and not A B as stated by Mayer. In this diagram imagine a conical pendulum A B or A C swinging around in a horizontal circle, whose diameter is B C, and then regard A B and A M as ordinary pendulums, vibrating back and forth over the arcs B D C and M E N. Now Prof. Mayer's words clearly indicate that an ordinary pendulum, of a length A B, will exactly reproduce the motions of a conical pendulum A B, when viewed as he directs. I have not space enough to quote largely from his book, but refer the reader to it, in order to see that I do not misrepresent him. But to make assurance doubly sure he immediately adds the following extraordinary conclusion, the like of which it will be

hard to find: "From this it follows that the greatest speed reached during the swing of an ordinary pendulum just equals the uniform speed of the conical pendulum."

I seriously beg every reader of this article to deliberately consider this statement. I beg Prof. Mayer, for the sake of his own reputation, to carefully eliminate it from future editions of his book. I would like to have him undertake to answer the questions: From what does it appear? What ordinary pendulum does he mean? What speed of the pendulum? and what conical pendulum? Does he mean the ordinary pendulum A B? If so, the conical pendulum completes its circle much quicker than it can vibrate back and forth, and hence there is no comparison whatever between them. Does he mean the ordinary pendulum A M? This is the one which occupies the same time with the conical A B. But what speed does he mean? He says "the greatest speed." Is he absolutely ignorant of the fact that this depends almost entirely upon the amplitude or width of the pendulum's swing? Does he not know perfectly well that if the pendulum A M swings from M to N in one second, it will also occupy the very same time in swinging from O to P? Has he never heard that the same pendulum occupies the same time, no matter how much the amplitude varies? (There is an exceedingly slight difference when the arc exceeds 5 degrees). And can he not therefore see plainly, that if the distance from O to P is just one half the distance from M to N, the "greatest velocity" in O P will be just one half the greatest velocity in M N? And if this distance be reduced to one tenth or one hundredth, the same reduction in velocity will follow. But all the while the conical pendulum A B completes the very same circle, in the very same time, with the very same velocity.

Prof. Mayer evidently refers to the ordinary pendulum A B, as compared with the conical A B, and means to say that the greatest velocity, reached at the point D, is just equal to the constant velocity of the conical pendulum. I am compelled to say that it is to be hoped he does not teach Mechanics as well as Acoustics. As shown from Peck, these particular pendulums do not compare at all, and if they did the velocity question would, as before, depend upon the amplitude of the ordinary pendulum's swing. As another example of that strange series of *miraculous accidents* which led Tyndall to clap his books toward the open mouth of the tube, and led him to measure a resonant glass jar with a *flaring mouth*, thereby securing his desired 18 inches, I here call attention to the fact that accident has again miraculously assisted the wave-theory. It just happens to be true that, if the pendulum A M be swung over the full arc M E N, its "greatest velocity" at the point E will just about equal the regular velocity of the conical pendulum A B. I cannot forbear asking Prof. Mayer if he ever really made the strict trigonometrical calculation that proves this fact. How did it *happen* that he instinctively selected an arbitrary amplitude for his ordinary pendulum? And how did it happen that, out of an infinite number of angles, he hit upon the one single angle which make his words *approach* the truth? I say "approach," because his words, "of the same length," point to the ordinary pendulum of a length A B, which has no comparison at all to the conical pendulum A B, and yet the difference would not be *very* great.

Prof. Mayer says: "From this it follows that the greatest speed reached during the swing of an ordinary pendulum just equals the uniform speed of the conical pendulum." I repeat the words "from this." From what? He says, from the alleged fact that the conical pendulum "reproduces exactly the motion of an ordinary pendulum of the same length." Now in plain English no such thing follows from any such premises. When an ordinary pendulum, not of "the same length" A B, but of a length A E, is swung over exactly the same angle as that covered by the conical pendulum A B, his conclusion is correct; but it follows not from any "reproducing exactly," etc., but from certain exact mathematical properties in the triangles. And if the ordinary pendulum be swung over an arc in the least degree less or more than M E N, away goes every vestige of his conclusion. Let the swing of this pendulum be reduced until the arc traversed only equals the one thousandth part of M E N. Still it will take just two seconds to complete a double vibration, and therefore its greatest and average velocities will only approximate the thousandth part of the former values, while the velocity of the conical A B will be precisely the same.

But what has all this to do with sound? And suppose it is all true, is it of sufficient consequence to make so much to do over the mistake? To answer these questions will require another article. I propose to show that the mistake is of great importance; being one of the many which, if discovered by the wave-theorists and reflected upon, would have certainly led to their rejection of their theory itself. And I propose to show the very close connection between this pendulum illustration and the laws of acoustics in the wave theory, as also in their application under Substantialism.

PA. MIL. ACAD., Jan. 1885.

SOCIETY.

BY REV. D. OGLESBY.

There is no question of greater importance to mankind, of an earthly character, than the social problem. Society is in a constant state of fermentation all over our world. Like a boiling caldron, or the tempest tossed ocean, whose mad waves dash incessantly against each other, so society is cut up into factions that wrangle and rage in an unending struggle.

Is there no better state awaiting our race? No sunny day, no quiet sea, no harbor of shelter, where the tired, restless ship of humanity can cast anchor and enjoy a season of repose? Can it be that the GREAT FATHER intended his children should thus spend their stay on earth? Certainly not! The very thought savors of profanity. Then what is the never-ceasing cause? There must be a disturbing element somewhere; otherwise this social tempest, this political cyclone would have passed away. But it does not. It has been raging for thousands of years, and in some respects with unabating fury.

Take for instance, the problem of capital vs. labor, or of the rich and poor. Is this question that is vexing every nation on earth any nearer a *correct* solution, than it was ages past? The condition of the poor in our country, we grant, is very much better than it is in some

heathen lands, and better than it was ages ago in most countries. But why should society divide into antagonizing factions, for money, for wealth, for bread, for existence? Why should this gulf between Dives and Lazarus be so long, so wide and so deep? The GREAT CREATOR causes the Earth always, every year, to produce enough for all living things, both man and beast. Then why should any suffer by hunger, or shiver with cold? None should, except the idle. But above all, why should any, a few, accumulate enough for thousands, while thousands struggle for a bare existence? If labor creates all wealth—and it does; and if the laborer who creates wealth, owns it—and he most assuredly does; then why, on what *just* grounds can one accumulate a great fortune who puts forth no more labor, not even as much as others who receive for their toil scarcely enough to exist on? A correct solution of this question, if put into practice, would be above all things the greatest blessing to our world. The disturbing element which causes the great inequality among men must be removed, otherwise the great gulf must remain. It is the aim of the writer in this article, and others to follow, to point out the cause of the great inequality that exists in our world everywhere between the rich and poor. It is not assumed that there should be perfect equality. Justice and equity do not demand this, but it is assumed that the difference in the condition of men is too great; that all over the world a very small minority possess great wealth—while the great majority struggle in slavery for bread. This condition cannot be accounted for on the side of the rich, but very *partially*, on the grounds of superior wisdom, industry, economy, or virtue: nor on the side of the poor, but very *partially*, on the grounds of ignorance, idleness, wastefulness or vice. Hence, it must inhere in the system of business as carried on in the world. Labor creates all wealth, labor is the first price paid for any kind of wealth. Hence it is self-evident that the laborers own at first all the wealth created, having paid for it by labor. Now it follows, equally self-evident, that if each laborer received an equivalent for his labor, and no one received more, there could be no very great difference in the condition of men in society financially. But if one receives more than he earns by labor, he is taking what some one else has earned and in justice owns, and his gains are unjust, and they are robbed.

Justice is an exchange of equivalents. We are in justice bound to recognize a difference to a limited extent in the creation of wealth, on the grounds of superior physical or mental strength. But the great central pillar that upholds the whole fabric is labor—we must stand by this. And any accumulation on any other grounds is unjust. An equivalent in labor, or *its equivalent*, must be given. This is too self-evident to need proof. This leads us to the main point to be considered, viz., the business systems of the world. There are two false and pernicious principles incorporated into the web and woof of business, that necessarily produce the GREAT inequality in society. These are the disturbing elements. These are, first, the admitted principle that money can produce other money—*interest*—independent of labor. The second is, that property can produce other property—*rents*—independent of labor. These two things, which are in fact but one, viz., *usury*, are the cause, and the *only* cause, which

produces in society the GREAT inequality, which is tormenting, and troubling, and vexing, every government, every state, every large city, in every land under the sun. The proof of this will be given.

RICHVIEW, Ill., Jan. 12th, 1885.

VARIATION OF SOUND-INTENSITY.

BY REV. WM. ALLEN.

A. WILFORD, PH.D.,

DEAR SIR.—If I remember correctly, since the establishment of your MICROCOSM there has been, from time to time, some discussion on sound pertaining to irregularities in intensity according to distance rates. For example, the running of a railway train was represented as heard more distinctly at places further away than at others nearer by. This is undoubtedly true, and many persons have made such observations. You remember what was said of this matter at the time it was discussed and the positions assumed.

This brings me to consider observations I have made in my own vicinity. Out here in the open prairie country, tending very much to evenness of surface we have very favorable opportunities for making observations. In this country we generally have winds or brisk breezes, yet we have a sufficient number of calm days for all practical purposes, and less intervening obstructions than belong to most places. Within view and hearing of my residence sometimes more than half a dozen reapers and mowers are in operation and the sounds they make distinctly heard. I have on a calm day been struck with the varying volume of sound made by the same machine. Sometimes very indistinct, or not heard at all; then again very distinctly—all these alternations being made sometimes within the compass of a moment. I have made similar observations on threshing machines—therefore it makes no difference whether the machine is moving or stationary so far as relates to the facts in the case.

Now the question arises, what causes this difference of intensity? Is it from increased or decreased air density? I think not. Is it from increased or decreased power—faster walking of the team or higher steam? My observations are to the contrary. Is it attributable to electrical changes? I think not. What then? I am of opinion that it is attributable altogether to the changes in the vibratory motions of the machinery, and for the following reasons.

When the machine is running and yet neither sickle nor cylinder fed there is much uniformity in the volume of sound. No more decrease or increase of intensity than might be reasonably attributed to change in vibratory motion produced by unevenness of surface or slight increase or decrease of power. But when the sickle is let to the grain or when the feeder begins to give the sheaves to the cylinder, there begins a marked irregularity, subject, however, to modifications. If the grain is evenly thick and no alternating changes in the friction of the machinery, there is much uniformity in the sound produced. But if there exist alternating friction, there will follow changes in the vibratory action of the machinery and consequently changes in the sound produced.

On one occasion I was so much impressed

with the varying sound a mower of mine made that I was attracted to the field with no other purpose than to discover the cause of the variety, thinking that there was danger of damaging the machinery. The grass that was being cut was very green. My first observation showed me that the draft was harder at intervals than in other places. After a few stops and further observation, I discovered that the grass was caught and clogged under the heel of the sickle. Just in proportion to the quantity of grass caught, in the same proportion did the team labor through the increased friction. The sound made was heavy, low and dull—could not be heard very far. It was like laying the hand on a sounding board. But just as soon as the plug of grass would fly out, which it did every now and then, it was like lifting the hand from the sounding board. Immediately the sound lost its dull heaviness and increased. I have made similar observations on threshing machines. The varying intensity of sound in these machines is, as I think, almost altogether attributable to improper gearing, irregular feeding, or clogging of the machinery.

The irregularity of sound produced by railway trains is, in my opinion, attributable to varying vibratory motions. But these vibratory motions are by no means limited to the train itself. The earth acts as an important factor in getting up these modifications. When I say the earth—of course I do not mean the whole of it. I remember when I was a boy it was remarked by the whole family that between the old homestead and the church, along a little valley, the walking of our horses made a much louder sound than at other places on the road. The sound made was as though the earth was hollow beneath. A railway train passing over such ground would give a sound unusually distinct. Many persons have observed that the human foot-fall is much modified in places along the same path, where there is no perceptible difference in the firmness of the surface. We have said enough, perhaps, to illustrate the modifications of sound produced by railway trains. At any rate out of respect to THE MICROCOSM we must here stop.

ROCK HILL, TEXAS.

GOD'S PERSON LITERALLY—A BIBLE DOCTRINE.

BY DANIEL VANIMAN.

Moses said, "The Lord delivered unto me two tables of stone written with the *Finger* of God." DEUT., xix. 10.

"David said, "When I consider the heavens the work of thy *Fingers*." PS., viii. 3.

Job said, "The *Hand* of the Lord hath wrought this." JOB., xii. 9.

"His *hands* were made strong by the mighty *Hands* of the God of Jacob." GEN., xlix. 24.

Isaiah says, "The Lord has made bare his holy *Arm*." ISAIAH., lii. 10.

"Underneath are the everlasting *Arms*." DEUT., xxxiii. 27.

"The *eyes* of the Lord are upon the righteous, and His *ears* are open to their cry. The *face* of the Lord is against them that do evil." PS., xxxiv. 15-16.

In addition to this Paul says Christ is the Glory of the Father, and the express *image* of His person. HEB., i. 3.

Now what have we in the above toward proving person for Jehovah?

1. A finger, then fingers. 2. A hand, then hands. 3. An arm, then arms. 4. *Eyes*, ears, and a face. 5. Christ the Glory of the Father, and the express image of His person. Surely this is enough for one who believes the Bible.

It is also said, "known unto God are all His works, from the beginning of the world." ACTS., xv. 18.

"The eyes of the Lord are in every place." PROV., xv. 8.

Man can, through the medium of the senses, obtain knowledge ranging from touch and taste to the distant fields of sight embraced in the bounds of the telescope's range. It needs, therefore, no great reach of the imagination to view God in the form of a man seated upon His throne in heaven, possessed of powers so infinitely greater than ours that He can, from His favorable position, see everything in the universe, and hear every sound in it, and comprehend even every thought of the human heart.

VIRDEN, ILL.

THE GREAT MYSTERY.

BY REV. A. PLUMLEY.

MR. EDITOR,—In the number for March, 1884, of THE MICROCOSM, there are two articles, one on "Foreknowledge and Foreordination," and one on "The Origin of Sin," and both very ably treated. Upon both of these topics I have thought much and written some. Perhaps the following paper may serve to throw an additional ray of light and, to some small extent, tend to harmonize the "Divine Sovereignty" with "human volition."

Peter, speaking of the salvation of human souls, says, "Of which salvation the prophets have inquired and searched diligently, who prophesied of the grace that should come unto you: searching what, or what manner of time the spirit of Christ which was in them did signify, when it testified beforehand the sufferings of Christ, and the glory that should follow." "Which things the angels desire to look into." The suffering of Christ was a well-attested historical fact, and universally admitted. The fact, then, was not the object of their solicitude; but the wonder of the angels was, *why* he suffered *at all*! What caused his bloody sweat in the olive shadows of Gethsemane's midnight solitude? What broke his guileless heart when he uttered these ever-memorable words: "My soul is exceeding sorrowful, even unto death"? What evil omen shut him out from his Father's face when he cried, "My God! my God! why hast thou forsaken me"? Why must he tread the winepress alone, and complain, "I sought for comforters and found none"? *Why* must the Immaculate suffer and die alone, without man, angel, or God to comfort him? The sequel will show.

But, for the present, let us, with the angels, further inquire. What fundamental principle in the administration of the Divine Fatherhood of humanity had suffered such indignity that only such suffering from an innocent being could repair the wrong, and fully meet the demands of justice?

The Book tells us that "God is love," and that, in infinite wisdom his love had its first application in the creation of the world and all

things therein. But, in return for this wisdom and love, God, as was his just due, demanded the supreme and constant affection of every human heart, and the unqualified and perfect obedience of every human will. But, in the absence of authority to command, and power to enforce such command, the command, in the presence of solicitation to evil, would be disregarded, the commander despised, and, the administration would become an utter failure. Now, if human genesis be the offspring of Divine love, then Infinite justice demands the existence of a law fully adequate to the protection of such offspring.

Hence, man was created under law, and that law is co-equal, and co-eternal with the Divine law of love which brought man into conscious existence: and its nature must ever be what inspiration declares it to be,—“*Holy, just, and good.*” We have here, then, two attributes of the Divine nature,—his benevolence and his justice, and each co-ordinate, co-equal, and co-eternal, the one with the other, and immutable as the throne of God itself: and both equally and eternally pledged to man's protection and perpetuity.

Here then, we have Divine security against any possible human loss or injustice. But what indemnity has God against human infraction of Divine law? Now, here are two parties,—the human and the Divine; the one bound by the most solemn sanctions of Divine love and justice, to protect and to perpetuate human happiness. And, shall man be lawless? Shall the Divine be bound, and the human go free? But is there moral wealth enough in the treasury of human endowment to indemnify the Divine claim against all possible moral lapse? Was primeval man, in the perfection of his physical and moral constitution, *only* able to meet the claims of God's just and holy command, which declares to him, “Thou shalt love the Lord thy God with all thine heart, and with all thy soul, and with all thy might?” But God's perfect law requires perfect obedience from a perfect moral creature and in perpetuity. But man's amenability to moral law presupposes him to be a moral agent, and, if a moral agent, then his act must be volitive: and, if his act is volitive, then he may obey, or he may disobey. But perfect obedience requires all of his heart's affection, and all of his soul's powers, and all of his physical might. He can, then, with all his original powers unimpaired, do *only* what the law demands. That is, he can do no more than the law requires—he *cannot* perform a work of supererogation. If he lose an hour's time, it is lost forever; for, he has no reserve force by which he may do *over* work, and thereby redeem the wasted moments. If he infract the law, and incur guilt, the law is forever dishonored; for, he has no superabounding holiness with which to make an atonement for his sin, and the compact is *forever* broken,—the law becomes a nullity, the foundation of the Divine administration forever fails, and God Himself is defrauded of His glory in creation. Then, I ask again, what indemnity has God against such a catastrophe as this?

The difficulty can be met in only one of two ways. *viz.*: God's beautiful world must have been left a moral blank, without spirit or intelligence, and composed only of gross matter, capable of neither knowing nor loving its author, and of acting only as it should be acted upon. Or, in the creation of human volitive intelligence, God must have indemnified

His administration against any possible contingency of volitive moral lapse, by the anticipation of a vicarious sacrifice adequate to satisfy the just demands of His dishonored law. This, then, was the *special* thing into which the angels so much desired to look.

Now, *did* God anticipate such a contingency? and did He *provide* for it? Before we proceed to answer this question, we must first understand that past and future time are terms used with reference to finite understanding; but touching the *Infinite* intelligence, there is no past, and there *can* be no future. His ubiquity is just the measure of His omniscience, and *vice versa*. But He is not only everywhere, and always present at the same time, but He knows everything and always. Man's existence is finite, having a beginning, and an end, and his present is ever changing from the beginning and progressing to the speedy and certain end. Eternity past, and eternity future, are, with the Infinite, eternity present and unchanging. Whatever is progressive and contingent in the human, is stationary in the Divine, and, eternally sure. The creation, the temptation, the fall, the “Promised Seed,” the “sufferings of Christ and the glory that should follow,” were all part and parcel of the Divine *plan* in the constitution and destiny of a moral agent. Perhaps we are now prepared to answer the question—did God indemnify Himself and His administration against all possible moral loss? It is admitted then, that the fall of man, and his redemption, though a profound mystery to angel ken, was, nevertheless, from the very *first*, an inception of the Divine mind, *who* should champion the lost cause, and meet the penal claims of the broken law, and let out the guilty party. Now, touching the Divine knowledge and energy, we have already seen that time is not relative, having no past and no anticipation, but is ever present. Hence, “One day is with the Lord as a thousand years, and a thousand years as one day.” But human intelligence requires the use of relative terms, both past and future. So we may say, from the “Beginning” (it might have been for untold myriads of ages), when God created the substance of the material universe, down to the Adamic period, or, the creation of man, uncounseling and uncounseled, He wrought out according to the solitary purpose of His own will, and laid in order the foundation stones of the physical and moral universe. Thus far the Trinity has wrought in Divine unity; but, henceforth, Divine unity must work in Divine Trinity. In the pre-Adamic age, the one Godhead was essentially three persons; but, in the work of creation and redemption as recorded by Moses, the one Godhead assumes three distinct persons, but still of one substance and eternity. God, in the first person, and also incorporating the second and third persons, all of one substance and nature, spake matter into being. But, when darkness was yet “upon the face of the deep,” “the *Spirit* of God moved upon the face of the waters.” “And God said: Let there be light: and there was light.” And still, the spirit of God is the great moral light of the world. But *plurality* of the Divine unity, is first mentioned in connection with the genesis of humanity. “And God said. Let *us* make man in *our* image, after *our* likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth.” But,

says the eternal Logos, or, the *Word* of God, if we make man in our image,—capable of willing and choosing for himself, he will be disobedient, and array himself against Divine authority, and introduce sin and death into the moral universe, and confuse the Divine administration and bring the curse of God on the whole race. True, replies God the Everlasting Father; but the creation of man minus volition, or, incapable of choice, would leave him powerless to perform the functions of his office, for he is to be ruler and judge in the earth, and to have dominion over the whole order of the lower creation. And, moreover, to bar him from the choice of evil would also destroy his choice of good, and leave him not a man, but a thing, incapable of either virtue or of vice.

Now, matter, and vegetable, and animal life are created and exist in nature's richest perfection; but between animal instinct and Divine beneficence and wisdom, there is no intelligent earth governor to reflect the Divine wisdom and love. That darkness may be less gloomy, shall there be no sweet contrast of beautiful sunlight? That human suffering may cease, shall humanity be destroyed? That sin shall not be, shall virtue never exist? That there may be no future hell for impenitent and wicked men, shall there be no heaven of eternal, rapturous joy for believing and obedient saints? Because men will be lawless shall there be no law to protect the innocent?

Yes, "let us make man in our image, after our likeness," and let him be monarch over this new creation, having dominion, and power to rule in air, and land, and sea. And I will indemnify the honor, majesty and eternity of my pure and holy law by a sacrifice most costly and precious, which only infinite wisdom and love can supply—a sacrifice fully adequate to meet the penal claims and satisfy the great dignity of my immutable law. But this sacrificial indemnity against all possible Divine loss, must be of human mold.

Man, in satanic collusion, has broken the law; and man, in Divine unity, must honor the law by suffering its just penalty. True, the humility, the mental agony, and the physical sufferings of the victim will be, "*Ne plus ultra*,"—the extreme limit of immaculate human endurance; but it will be only for a moment, and the excess of glory which shall follow, will be a thousand fold, and it shall be *eternal*. Let the day of man's calamity mark the issue of the Divine proclamation, that the woman's all-conquering seed, whose heel, through Abel's line, shall be bruised for four thousand years, when, in the fullness of time, the heel of the woman's victorious seed shall effectually bruise the wily serpent's head. The word God shall be the "*Lamb* slain from the foundation of the world."

Abel's bleeding lamb and all the blood that shall ever stain patriarchal or Jewish altars, shall be typical blood, and symbolic of the bloody-sweat in the garden, and of Calvary's bloody cross.

Four thousand years shall suffice in which to demonstrate my authority over the succeeding generations of fallen humanity, and to rule all the nations of earth with a rod of iron, (the ceremonial law,) until the "Scepter shall have departed from Judah, and a lawgiver from between his feet; and, until I shall bring in everlasting righteousness, and seal up the vision and prophecy, and anoint the most Holy."

Despairing of deliverance from satanic thrall-

dom by any other power, the last and only hope of human redemption will center in the woman's promised seed—the all-conquering Lion of the tribe of Judah. In the overshadowing of immaculate human mold by the Holy Ghost, I will incarnate the *Eternal Word*, "and that holy thing which shall be born of thee, shall be called the *Son of God*." And, as Isaac, who was a lively type of the Lamb of God, was submissive in the hands of his father, Abraham, when he was about to offer him up in sacrifice on Mount Moriah, so the Submissive *Word* would say, "*Even so, Father, for so it seemeth good in Thy sight*." In all this work of human redemption, then, we see: first, God, the Infinite Father, "laying help upon one," and the only One that could help, and "that was mighty to save;" and, in the second place, we hear the Son of God saying, "Lo, I come: in the volume of the book it is written of me, I delight to do Thy will, O my God: yea, Thy law is within my heart."

Here then, we have, in creation a Trinity in unity: but in the work of redemption a unity in Trinity. Like the compassionate king whose erring son had broken the royal law, thereby forfeiting both his eyes, he caused one of his own eyes to be plucked out that he might spare one of his son's eyes. So God gave his Word,—His only begotten Son, for the ransom of His rebellious children of earth. In this plan, then, as conceived and consummated by the Triune God, the Eternal Father finds in his Son ample indemnity for any violation of his holy law, and salvation for lost humanity, and the final glorification of the Son of God, "with all the glory that he had with the Father before the world was," increased and augmented by the infinite glory or the cross of Jesus Christ. Here, then, in the immaculate purity of the Divine law, and in its exact demand upon the helpless sinner, we have just the measure of the *suffering* of Christ. But, with what power shall we equipoise the infinite and "eternal weight of *glory*" that shall follow?

WEST WEBSTER, N. Y.

DOES MAN POSSESS A MIND?—No. 2.

BY HON. B. J. PENGRA.

We must again call attention to the fact, that thought is not mind, but the product of mind. By the movements of the watch, we have the measure of time, but the watch is not time. How can we have an action in thought, without that which produces the act?

The inherent impulse of the attributes generates the force of action, expressed in action, of mind and body. The brain is the principal nerve center of the whole body. In it the mind is enthroned, not that the brain is the mind, but that the mind uses this nerve organization from its principal center, as a mass of telegraph wires.

It produces action through this media in certain parts of the physical frame, to manifest its will in meeting the wants of life and its defense of every order.

In holding the physical citadel under the control of its will it sometimes meets with powerful resistance from the lower order of consciousness, and the negation of its own forces.

There can be no doubt but that the cognition of objects by the five senses of instinctive being, is invariably telegraphed from the nerve

centers, as they exist in the senses, to the mind in the brain, where the further cognition of that which is seen or heard, etc., is instantly had in conception. And, though there may be pointed out many anomalies which at first sight appear inconsistent with the order and operation as we define it, yet a closer study of them shows that they are but subtler illustrations of it.

The law of phenomenal action manifested in specific or general action, is, in its essential relations in the act, so masked, that it requires persistent accumulation of observation and experience to impress upon consciousness the true connection of antecedents and consequents they involve. But notwithstanding the masked condition of action, the frequency and vividness in uniform relations of action repeated in consciousness, in multiplied cases of observation and experience, compel their recognition and determine the question of existence, origin and relation.

The data of consciousness which the attributes manifest within; the consciousness that they exist as force in the mind, that this residuary force cannot disappear from consciousness, but manifests its presence in every equivalent change, the consciousness that they are present to inspire action, and take cognition of the *right* and the *wrong*, the correct and incorrect, in every line of thought compels their recognition.

In speaking of the mind we speak of that which in man is limited; but at the same time of that which is *conditionally limited*. And here we call special attention to the term used in science, "conditioned."

Its proper meaning in connection with subjects of science, is *state of change*, as well as relationship. Philosophy is more than a science of the conditioned, and thought, in faith, in love, in hope, in charity and justice, transcends the measure of limited being.

The phenomenal action of the attributes in thought is frequent, direct, conspicuous, and impressive. Frequent in the sense that in all matters which come before the mind, one or more of them lead in the decision of the mind, either to repel or to determine the act. Conspicuous and impressive, for the reason that in all conflicts in the mind on the questions of right and wrong, they lead on the side of morality; and, though often overwhelmed and defeated in guidance to right action, they still remain an impressive form in the mind, pointing to the right, and persisting in action. This is man's life! were it not so, no good end could have been attained by his creation. The mind could not otherwise accept the offer of continued life. Nay, more; it could not have conceived of it.

It is the status of mind which enables it to "work with Him who hath made all things well," and "to endure the trials to which it is subjected, in order to its own final and eternal weight of glory, and the glory of Him who made him."

Spencer says (see page 463 of his "Philosophy"): "There is a progress toward equilibrium, between the relations of thought and the relations of things. This equilibrium can end only when each relation of things has generated in us a relation of thought, such that, on the occurrence of the conditions, the relations in thought arise as certainly as the relations in things, which

"relations can only be reached in *infinite time*."

A grander conception in thought, taken in all its bearings, never was "evolved" in the mind of man than that which is involved in this declaration.

The conception is, that the mind is so constituted as not only to render it possible, but certain, as a matter of "progress" (in evolution?), that the relations which constitute the power of thought, operating in the mind, will continue in the progress or genesis of thought (evolution?) until all outward relations of things are known, which is the establishment of "equilibrium" in an "*infinite period of time*;" when, in the perfection of knowledge, that which is manifested in outer relations and actions, will be perfectly known and understood by the culmination of power in the mind.

How Mr. Spencer came to make this concession so much at variance with his assumption as to the unknowable, will not now be discussed. The conception that the mind will continue its operation in "progression" of conception of relations to that "*infinite time*" when it grasps a knowledge of all outward relations, is a predicate of infinite existence. And if some friend could get him to reflect that in his cognition of the phenomenal "relations of mind to the relation of things" he has already passed to what he had assigned to the field of the unknowable with the power and means of taking cognition of what is, he may be able to take one step further—viz.: that as there is relationship between the status of intellect which may and will understand what exists in relations, and what may still come in the line of creation as infinite conception, which may yet operate to bring forth new relations; and for the further reason that he may still continue to generate thought in the effort to a more perfect conception of things, he, and our medical friend, in their wanderings in the immeasurable infinite, may pass so near the *source of the first cause*, as to take cognition as to *what it is*, and *that it is*. Spencer further says, "that an insight obtained into chemical combinations such as *heat*, electricity, etc., implies that a rationale of them when formed, will be an exposition of some higher general facts."

We are certainly not at the end, then, of the processes where the final mystery is solved. And science will go on explaining one class of facts by including them in larger classes, until the ultimate facts of conditioned being are reached. The successive deeper and deeper interpretations of nature, which constitute advancing knowledge, are merely successive inclusions of special truths of a more and more general nature. And this is but a plain statement of what is really true; otherwise the ultimate truth can never be reached, and special truths could never be clearly known.

It is, therefore, plainly evident that every more general explanation of facts, as they pass in review, or in first conception (*primary*) by the mind, must conform in their order to the facts of a less general order of facts, belonging to those of which the mind has already taken cognition, in order to be understood. It is upon this ground, and for these reasons, that we expect to be understood, and that we *hope* to make clear what we have undertaken.

We will, therefore, repeat the statement that the truths which follow in the argument are still, as a whole, more general truths to which

the existence and operation of the mind and its attributes belong; and if science has not yet been able to take cognition of all of them, we hope in some measure to enable her to take a wider and more perfect view.

But let us pause here and take a retrospective view of some of the operations in our history as rational beings. See, for instance, with what uniformity of action the attributes are manifested in the operation of mind. The theological or priestly profession and the medical were, in point of time, the first known in history, dating far back of all written history. The *hope* of the perpetuation of life, by the prevention of the causes operating to its overthrow, was, and is, that *hope* on which they have maintained existence in various modified forms down to the present. The ancient order of the Alchemists, and from whom the old orders of the Rosicrucians and the Rosy Cross derived their origin, unable to obtain cognition of what is now contained in the Christian Philosophy—viz., that mortal existence, in every form, is a thing of time only, and cannot exist beyond its allotted period—sought in the mineral kingdom and in the vegetal, by extracting the juices, the "Elixir of Life," or a means to the end *hoped* for.

The *love of life* comes from the mental organization of the mind, and death, being its opposite, a condition which was seen to pervade all their surroundings, what was more natural than a determination of the mind thus constituted to grapple with its foe? The mind organized for this purpose and to the end that its existence might be perpetuated, and not perceiving the ultimate cure, sought in living nature the means to the end. And now, if the mind were so constituted as to be destitute of *hope*, destitute of *love of existence*, destitute of *faith*, which operate as force in the conclusion, and together with justice and charity establish and determine the action, and direct the effort, then no such effort could be inaugurated, because of lack of capacity and impetus.

The medical profession having derived its existence from the early beginning of the Alchemist, though greatly modified as to the conception, still plies its nostrums in the *hope* of preserving life, and however erroneous and ill-directed the conception from its origin, it matters not. "man is imperfect" and it is sufficient that the emanation of his mind prove the proposition.

Again, the adaptation of the mind to the necessities of physical existence, as well as to the attainment by succession in inheritance from the finite to the infinite life, is the field in which the Priestly Orders and Theological Profession have, under great diversity of orders of *faith*, by pointing to the ultimate *hope* maintained their existence. Now look at the history as it manifests itself to-day. If the building of iron ships at the proximity of coal and iron mines gives to Philadelphia an advantage, the builder is drawn to that center by action of these qualities of mind, and especially so as food and clothing are cheap, and therefore add to the inducement in the *hope* of accumulating the means of life.

So the Stock Brokers cluster together where the men of commerce and business most assemble. *Love* and *hope* of success are the stimulating cause in the operation of mind which causes the clustering together of all these classes. For like reasons, the artisan seeks the best field; the farmer the best soil; the merchant the widest sales; the mariner the favor-

able port, and the scientist and the theologian the fields they *love*, and in which they *hope* for the highest success. Such has been the lead of the mind, and must ever continue to be. Thus we are able to perceive that the mind is so constituted as to furnish the right conception of the field at the right time in which it is called or elects to act. If it were otherwise there could be no action, and mind would be a failure.

Deeper than the conception of man, by use of these faculties, is the evidence of their possession by him. Deep as infinity! Deep as the unconditioned source of their origin is the reason of their existence.

Here, then, we arrive again, in the line of argument to a conception of the *abstract evidence* of the existence of these attributes as constituent parts of active intelligence, affirming by their *primary* action the existence of mind.

By a further inductive survey of the facts it is manifest that the various classes of relations are variously generalized in the order of their succession. This is because of the difference in their natures, and because of the subject, the incident or necessity which calls them into action, in respect to time, place, and our own constitutions, our perception thereby being influenced by these conditions in endless combinations according with the necessity, the relative frequency, intensity and continuation of action, and always depending again upon the amount and intensity of perception which they furnish, which, of course, will be limited by their inherent power or strength, as well as by outer conflicting causes, from all of which there results a highly complex process of mental action.

"Familiarity with special uniformities has generated the abstract conception of general uniformity. The idea of law and these conceptions has, through successive generations, been gaining fixity and clearness." Especially is this true of all men having extensive knowledge of natural phenomena—men of science. These men having made themselves acquainted with the vast accumulations of uniformities, shown by their predecessors and themselves in the continual adding of new ones and verifying the old, "thus acquiring a far stronger *faith* in law than is ordinarily possessed. With them this *faith*—action of mind—ceasing to be passive, has become active inquiry." When there are phenomena of which the dependence is not yet ascertained, these most cultivated intellects, impelled by the conviction that here, too, there is invariable connection, proceed to observe, compare, and experiment. And when they discover the law, as they eventually do, their general belief in the universality of law is further strengthened.

It is evident that these conclusions are correct, and that a higher and still more general train of evidences will by and by enforce these *primary ones*. The conclusion that such results must follow is irresistible, if we concede that law is universal; for we perceive that the progress which we make in the discovery of law *does itself conform to law*.

It is commonly the case that in contemplating an external object, man imagines that his consciousness is extending to the very place where the object lies. To him, the appearance and the reality are about one and the same thing, as much so as though the object contemplated was actually within. The metaphysician however knows that consciousness does

not embrace the reality in physical objects, and although in the subject of the attributes of mind, we are not dealing with physical forms, but with that which persists in the *mind* in the product of thought, these relations produce thought in relations, for this is truly the form of all thought. Now, relations are of two orders—relations of sequence and relations of coexistence; and in the operation of these attributes, the operation is that of coexistence and co-operation. In other words, "we think in relations," and the reason why we do so is because of the order of existence to which the mind belongs. It is because the mind is itself a part of the order, and a thing of parts.

It will be asked at this point of the argument by some, that if we take it as granted that those faculties named are really what we assume that they are, "attributes of mind," why do we not include *hate* as an attribute of mind? The answer is that it is the *negation*, the *antagonism* of mind. But the question which disturbs the philosophic mind is as to *why these antagonisms?* The language of Paul is that "we are subjected to these conditions for a purpose," and the purpose as expressed is that we, through faith, charity, love, justice, and hope, overcome the antagonisms, and *work out for ourselves a far greater and exceeding weight of glory*. And this glory is again pointed out as the glory of *perfected being*—in new existence from the mortal into immortality by the "new birth," and the continuation of entification by "change" in the time of "the twinkling of an eye." Here let us digress a little further in this declaration to say that it matters not as to the crude teachings and misconceptions of the theological or scientific lines of thought. It still remains an absolute truth that what is spoken of by Paul as that to which the mind is subjected, is a fact in the mind; and what is spoken of as the object and end aimed at so far as pertains to *results, if carried out*, will be in strict harmony with science, and with philosophy to its uttermost, and the most abstract of all its conceptions.

SPRINGFIELD, Oregon.

(Concluded next month.)

OLDER THAN THE MOUND-BUILDERS.

BY G. R. WATSON.

If in this day of careful research, when science has left no region unexplored, a statement should be made revealing to public attention a nation that were in their graves when the earliest known tribes trod over the ground unsuspecting, would the testimony be accepted? It could not be challenged by other than scientific modes, and must reveal that what is hidden to the eye of research is often made manifest to the chance ramblor. For "there is nothing covered that shall not be revealed."

What a comfort it would be to fix the date when the Mound-builders roamed the Continent. They came in mysterious bands, those old skillful workers in the mold and clay—shall we say in copper and wood? Their lives are veiled, that history might not read them, and they laid them down to sleep amid the traditions of their worship, they rest amid the monuments of their blind faith. And thus, from their silent graves, they hold up feeble hands pointing us to their habits and their

records. Dead though they be, and unchronicled their doings, they give us to guess the tragedy of their lives and speak of wanderings, of searchings, of the mind-queries and heart-trials of simple wondering life—unanswered questionings they must have been,

"For knowledge to their eyes her ample page,
Rich with the spoils of time, did ne'er unroll."

Yet as we wander through the Ohio and Mississippi valleys, their rude horse-shoe mounds lead us to think of restful, simple faith, of temples and cemeteries, long before shrines or vaults were known. But what if now, while our minds are battling with the mazes of this early time and striving to grasp the customs and antiquity of those primal men and women, what if, specter-like, there rises up before us the phantom of an earlier day, beckoning us still backward to the homes of an alleged older people? And what if, when we see their resting-place, the tongue of evidence be unloosed to tell us of their broader culture and higher faith? Let us not be blind or biased. What better can we do than, with the Tuscan of old, humbly exclaim "Mirabile dictu?"

Impelled toward their lives, through ages where the light breaks as the uncertain dawn before me, I pondered long and in silent awe upon the character and period of the ancient Mound-builders; when lo! traveling in the mountains of Southwest Virginia I found my sacrilegious feet among the resting-places of a people whose name I had never heard, whose lives, I take it, are to the world an unwritten scroll. But they press forward to be known.

We evidently must ask, "Who were these strangers in the land? When did they live?" This we must learn from their customs, and our imperfect knowledge of those customs. Imperfect we say—for we know them only in death, thanks to the fact that they did not cremate. Time has left but imperfect vestiges of their forms, none of their instruments and utensils. Accident, again, brought us upon a plantation in Montgomery County Va., where these sleeping forms were disturbed by *hundreds and by fifties*. This is *literally* true; and now we cite the two facts that are remarkable, and quickly distinguish them from others as yet written of or known.

First, they lie with hands folded over the breast. Second, they lie in rectangles whose sides bear the ratio 2:1. Two hundred of them lie buried in the line of east and west; and side by side are one hundred buried north and south, thus forming two sides of the quadrangle, and in these unvaried figures, in multitudes they lie over the areas of this plantation.

Are these facts not peculiar and distinctive? You behold no evidence on the surface to warn you that below are a whole nation of men who sleep undisturbed under the trampling of the furious warhorse or the roaming beasts. But downward we search and soon we find them, hands folded over the breast, the stalwart heroes of ages back in the dawning of time. Know you any nation *unchristian* who, thus enwrapped, lay down to the "sleep that knows no waking?" But more marvel, the graves are laid in system *Christian*—in long rectangles east and west. Hear you of any nation who so do? Are they not certainly imbued with the spirit of Christian tradition, burying to the east? Associate with this, the rising of the star in the east, the planting of our corner-stones to the east, the wise men of the East, and the general tendency of Christian burial.

But may they not be merely Indians? It is not shown in the skulls, though those people bury thus (*why*, we do not now ask). Or, were they not mere worshippers of the SUN, shown in this rite akin to the elevated tribes that once adorned Mexico?

Both of these conjectures, drawn from the position of their bodies, are made improbable by the simple position of the hands, folded upon the shrive from which the divinity has fled. For so they tell to us in unmistakable tokens, their last undying hope—their looking forward to the day when the divinity shall return, and this mortal put on immortality.

But whence came this hope? Certainly they are older than any race known. The most remote of prehistoric races are a mixture of rudeness and paganism compared with these. If descendants of these lately found friends, they (the Mound-builders, Mexicans, etc.) are so remote, the lapse of time so great, that the early purity and definite faith have been lowered and weakened, if not lost, in incongruous myths and superstitions. Besides, if they were contemporary with known races, where are the evidences of intercourse always found in early nomadic tribes. Could science have overlooked such if they existed?

These facts and reflections bring before us a people that must have lived prior to any prehistoric tribes yet heard of. They are imbued with the spirit of Christian belief, they evince customs at least coincident with Jewish rites and the enlightenment of revelation.

Who are these strangers? and whence learned they this wisdom? Can they be kin to the magnificent Solomon, and were their burying-grounds planned from the court of the great temple? What can we learn of them? How came they here? And can they at last establish it in our minds that the old world peopled the new, and that God hath made of *one* (blood) all nations of men?

If I do not weary you or your columns, I can name one statement that they make to us from their dreary homes. It was learned from them that after death the human frame remains a magnet. Not the slightest particle of their dust but is as truly and powerfully positive or negative as was the individual in life. This was one of the aids which led to the discovery of their abodes. And we cannot in these days of incredulity attach too much importance to this fact: *No other body of animate existence retains that quality in death.* What more deadly weapon against materialists who affirm all flesh is one and in no way differentiated? What more practical and convincing corroboration of Paul's pre-scientific wisdom—"There is one flesh of birds, another of beasts, *another of men*"?

And now we must leave them; but not to silence, we hope, though their annals be unwritten, their tombs unlettered. They could have had no written language, no documents, no history. Hence, were their customs, traditions, beliefs, perverted in the course of ages to the strange combination of Christian and pagan found in Atzec, Toltec and the rites and architecture of other and later tribes? They may have had a definite, assured account of the flood and Babel, become so incongruous by the time the Nahuas, Cliff-dwellers and tribes of Mexico and Peru received it. They certainly are strangers with a new story. Are they not worth our acquaintance? Can we not enter their stately chambers, "provoke the silent dust" to

tell us something of these honored fellow-mortals—their parentage and homes, their wanderings and trials, their battles (if any) or their temples? Can they not tell us when in their simple, vivid faith, marked by such unmistakable theism, they gave their souls to God, their bodies to the dust? *Requiescat.* They have passed "the inevitable hour, mortals that they were."

ROANOKE, Va.

CAMPING TOUR TO THE YOSEMITE VALLEY AND CALAVERAS BIG TREES.—NO. 4.

BY PROF. I. L. KEPHART, A. M., D. D.

Morning dawned bright and clear—the morning of the day on which we were to begin to feast our eyes on the grandest of mountain scenery. A good night's rest had thoroughly refreshed us, and prepared all hands to relish a good breakfast. The Professor and I having been fully satisfied with our experience at sleeping under the wagon on *wild oats* hay, we effected "a change of base," and made a bed of our sacks of crushed barley, in the front half of the wagon, where we slept as if in a palace. Breakfast over, dishes washed, and the wagon oiled, I busied myself packing and stowing away the provisions and camp accouterments while the women "made the beds" and the Professor "hitched up." This done we commenced the ascent of the tremendous hill from the Stanislaus River. The road is a well-graded one, but winding and steep. As we ascended we had a fine view of the high-towering palisades on the opposite side of the river, towering in serried columns several hundred feet, and presenting the appearance of a mighty, long-stretching line of most formidable fortifications.

Union Bridge is nine miles west of China's Camp, which was our next objective point. Our early start gave us the advantage of climbing the hill during the cool of the morning—an advantage of no little importance. The hill was covered with a growth of chapparal and manzanita, affording hiding places for quail and jack-rabbits. The Stanislaus River, which we have just crossed, is the boundary line between Calaveras and Tuolumne counties, and Union Bridge, or Knight's Ferry, as it was formerly called, is at the point where the two counties join the county of Stanislaus. From Milton to this point our route lay nearly all the way on the line that separates Calaveras and Stanislaus counties; but, having crossed the river, we are now in Tuolumne, a county which to the geologist affords a rare field for study. Here have been discovered many of the most interesting fossils. Pieces of silicified wood, resembling opal, and hence called wood-opal, are found here in the strata of detrital material that underlies the lava beds. Impressions of leaves on pipe-clay also are found, which are, by good authority, said to belong to quite a different flora from that of the present flora of this State. From a careful examination of these remains, Prof. Whitney has concluded that before the great lava flow desolated this vast area, it was inhabited by the rhinoceros, an animal related to the hippopotamus, an extinct species of horse, and a species allied to the camel. These were all destroyed by the great flow of lava, and after that a new fauna appeared in which were numbered the mastodon, the elephant, the tapir, the bison and two species of horses, one of them being the now somewhat famous mustang.

Remains of these have been found in the detritus of the gold regions, but not beneath the lavas. It is also claimed that the remains of human workmanship have been found among these animal remains, from which it is inferred that man existed in these parts at an age quite anterior to that indicated in the Bible as the period in which Adam was created: but this claim lacks confirmation.

Having ascended the immense hill from the river, and entered upon a somewhat level plateau leading out in the direction of *Chine's Camp*, a half-grown jack-rabbit made his appearance. It being "my turn to shoot," the report of the gun soon reverberated among the hills, and there was one less *live* jack-rabbit in the world, and a handsome addition made to our commissary stores. A short distance beyond this, a fine cock quail sat upon a fence near by, and the Professor, now having the gun in hand, added "quail" to our stock of provisions.

The day was warm, and consequently our progress was not very rapid, but about 10 A. M. we arrived at the once famous mining town known by the name of *Chine's Camp*. It is situated in a flat east of *Table Mountain*, at an elevation of 1300 feet above the level of the sea. Here placer mining once flourished in all its glory; but alas! that glory has departed, because the mines have been exhausted, and as a result the town is almost deserted. One hotel remains. It is a "stage station," for here the stage from the *Calaveras Big Trees*, via *Murphy's*, on its way to *Yosemite*, stops over night. From *Chine's Camp* we wind up a moderate hill and pass under one of the flumes in which water was formerly conveyed to the mining camps near by. We then wind down a big and tremendously steep hill, at the foot of which we ford *Wood's Creek* near where it empties into the roaring, plunging *Tuolumne River*, and soon we find ourselves in *Jacksonville*, a village of but three or four houses. At this point the *Tuolumne River* makes a sharp turn to the left and breaks through a mountain spur, forming a narrow canyon. Here we stopped for a short time, watered our horses, and conversed with the hotel-keeper, who gave us quite a graphic description of the great flood of 1862—pointing out to us a mark on a tree as a point to which the water had suddenly risen, it being thirty feet above ordinary high-water mark. This flood carried away a number of buildings—among them a church and a livery stable, and several miners' cabins.

From *Jacksonville* a well-graded road leads up the river. A mile beyond we came to *Peay's Garden*, where we saw some thrifty fruit-trees and grape-vines. A mile beyond this garden we came to *Stephen's Bar*, where, right on the banks of the sparkling, swift-flowing *Tuolumne* (the banks full), we halted for dinner beneath the spreading boughs and in the grateful shade of two beautiful maple-trees. Feeling somewhat weary and hungry, we took a good nooning, cooked a good square meal, fed our horses well, and thus prepared ourselves for one of the most laborious tasks of our journey, viz.: climbing *Rattlesnake Hill*.

MOSES ON THE ORIGIN OF SPECIES.

BY REV. J. MERRILL.

In the account given by Moses of the Creation, the fact is plainly revealed that all the

vegetable and animal species were an original creation. The innumerable forms of vegetable life were all distinct from each other. The fiat of the Almighty, that brought them into existence, is as follows—"And God said: Let the earth bring forth grass, the herb yielding seed after his kind, and the fruit-tree yielding fruit after his kind, whose seed is in itself on the earth; and it was so." "After his kind" was the original and universal law. Each species had in itself the power of reproduction. "Having its seed in itself," each seed being a prophecy for all coming time.

This account of Moses accords perfectly with all we know of the vegetable world. There are myriads of species, from the gray mosses and lichens on the rocks, to the oaks of *Bashan*, and the cedars of *Lebanon*; but each is after its kind, having a self-perpetuating power. We never find an intermingling or confounding of the species.

The same origin is ascribed to the animal as to the vegetable world, namely—the fiat of omnipotence. "And God said: Let the earth bring forth the living creature after his kind, cattle and creeping thing, and beast of the earth after his kind, and it was so." There is as great a diversity in the animal, as in the vegetable world; innumerable species all clearly defined, and distinct from each other. The fowls of the air, the fish of the sea, the beasts of the earth, the flocks and herds on ten thousand hills, the unnumbered millions of reptiles and insects that float in the air, or swim the floods, or creep upon the earth, are all in distinct orders and types of life. And each type reproduces itself through all ages. This is the evident meaning of Moses, and it accords with the universal observation of mankind. In these species there are many varieties of form, size, color, etc., but the types remain unchanged.

Now if the theory of the evolutionists were true, namely, that God created originally but very few types of vegetable and animal life, and that all the existing species have been developed from them, the most incredible thing we could imagine would be, that all these forms of life should appear in distinct species, each after its kind, and endowed with the power of reproduction: or indeed that there should be any such thing as species. It would seem inevitable, on the theory of evolution, that there would be a perfect chaos of forms and shapes all running together, and blending into each other—"confusion worse confounded." If there were, originally, but very few types, how can we account for it, that they should be multiplied by a thousand or a million, and yet each be distinct from all others?

It may be said that God could bring into existence the present order of things, by gradual development, just as well as by original creation. Very true—all things are possible with God. But where are the indications of this? Where, in the whole realm of organized matter, is there any evidence of the gradual development of the species? Evolution necessarily implies gradations. But where are the gradations—the successive steps in the process? They are not to be found. The doctrine of evolution is but a baseless theory—a castle in the air.

This appears more evident, if possible, when applied to the human race. The account of man's creation, as given by Moses, stands by

itself, as of an infinitely higher order of being than any that had preceded. There was first the vegetable creation, then the irrational animals, then the being who was to have dominion over all. Before his creation there seems to have been a consultation in the divine mind, the Deity consulting with himself, saying, "Let us make man in our image, after our likeness, and let him have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth on the earth. So God created man in his own image, in the image of God created he him, male and female created he them. And God blessed them and God said unto them, 'Be fruitful, and multiply and replenish the earth, and subdue it, and have dominion over the fowl of the air, and over the fish of the sea, and over every living thing that moveth on the earth.'"

Who, after reading these majestic words of Moses, can believe that man is only a well-developed ape or monkey? What is meant by the image and likeness of God, if not that man is God's child in a peculiar and exclusive sense? in a sense that cannot be predicated of any other terrestrial being. When did he become God's child? When was the divine image impressed upon him? In other words, when did the monkey become the man? At what point in the long cycles of evolution can we draw the line and say on that side is the brute and on this the human? Do not these inspired words of Moses denote that man is God's greatest work—his masterpiece, infinitely superior to all other creatures, and separated from them by an impassable gulf? God made man in his own image, that is, *like himself* in his intellectual and moral nature, having the same spiritual attributes. "He breathed into his nostrils the breath of life, and man became a living soul." that is, he became immortal like the infinite Father, whose image he bears. He is God's child, made "a little lower than the angels"—not a little higher than the monkey—and "crowned with glory and honor." He was made to have dominion over all the works of God. And as man was made in the image of God, so that image was transmitted to his posterity. The intellectual and moral faculties that distinguish man as *the child of God* have been perpetuated. They distinguish the race in all latitudes and longitudes. We are in no danger of mistaking the brute for the man, or *vice versa*.

There are varieties of color, of physiognomy, of size, and of intellectual and moral culture. But all have the same human characteristics. Wherever we find man we find traces of the divine image—a nature infinitely above that of the brute. "After his kind" is the immutable law of the species.

Now, to say that this account of Moses harmonizes with the theory of Evolution, is to say that his plain language is delusive and misleading. It is to do violence to the plainest rules of interpretation, and bring the word of God into contempt. If the doctrine of Evolution be true, then Moses has given us no revelation of the origin of the *human* species or any other. He is a deceiver. He has drawn purely on his own imagination, for all that he tells us about God's work of Creation. The result will be that Moses, or Evolution must go to the wall.

TROY, N. H.

THE SUBSTANTIAL PHILOSOPHY: AN ADDRESS.—No. 2.

BY PROF. G. R. HAND, A. M.

(Concluded from last month.)

Physical impossibilities, as well as possibilities, exist in the material world. It is sometimes said that nothing is impossible with God, and yet possibly it would not be a breach of reverential courtesy to say that there may be physical impossibilities even with Him. But whether the impossible feat of tympanic vibration imposed upon the ear-drum by the wave-theory of sound, is one of the divine impossibilities, I leave open for discussion.

But space in this address will not permit me to discuss this feature of our subject. I simply lead you to the battle-field, and ask you to survey the reeking remnants on the gory field, strewn with killed and wounded, dead and dying.

Dissolving views of captured prisoners and retreating combatants, occasionally turning back to fire a farewell shot, may give variety. Prominent in that conflict figured the shrill notes of the locust, as by its rapid stridulations it threw the surrounding atmosphere into multitudinous vibrations. Tremulous tones of tuning forks figured fantastically in the fray. Small arms rattle and cannon roar amid the blare of trumpet-notes, while, from the melancholy siren sounds of the distant fog-horn, a soothing influence steals over the conflicting belligerents.

Dense volumes of smoke from exploding powder magazines, impelled by the elastic force of liberated gas, roll in accumulating masses, borne onward and upward in steadily unfolding convolutions, and wreath a sulphurous canopy over the tragic scene.

Having commenced with "the beginning," in what I may be permitted to call Theistic Substantialism, I do not purpose extending its ramifications far beyond the limits of that field, and will therefore return from this excursion.

We read that "things which are seen were not made of things which do appear." Heb. xi. 8.

Here the visible things were made from the *invisible*, and not from *nothing*.

Paul says: "For the invisible things from the creation of the world are clearly seen, being understood by the things that are made." Rom. i. 20.

While we cannot see the invisible things, not even the immaterial substances, yet we can see invisibility merging into visibility, in "outward manifestation" of His "eternal power and Godhead," thus revealing the "invisible God," who "stretcheth out the heavens as a curtain and spreadeth them out as a tent to dwell in." Isa. xl. 22.

Here the prophet seems to lead us into the penetralia of Substantialism, where, in the presence chamber of the invisible God, we may gaze upon his environments.

From a photograph taken by the inspired poet laureate of Israel, some three hundred years before the pen of Isaiah drew the foregoing picture, we take the following view: "O Lord, my God, thou art great; and art clothed in majesty." Then peering through this majestic, though invisible clothing, into the dwelling-place of deity, and home of Substantialism, he proceeds: "Who coverest thyself with light as with a garment; who stretchest out the heavens like a curtain; who layeth the beams

of his chambers in the waters; who maketh the clouds his chariot; who walketh upon the wings of the wind . . . who laid the foundations of the earth . . . Thou coveredst it with the deep as with a garment." Ps. civ. 1-6.

This carries us back to the creation, where the infant earth lay wrapped in swaddling clothes of water, and "darkness was upon the face of the deep." Exterior to the clouds and mists of darkness, was God himself clothed in garments of light, beholding the darkness that enveloped the earth.

His voice is heard for the first time in the realms of space, and the sublime sentence that pioneered the pathway of thought, from the source of all intelligence in "outward form," to greet the new creation, called for LIGHT.

God said, let light be, and light was there, where the darkness was before, that is, on the face of the deep, and the smiling waters greet the light in sparkling recognition.

Another photograph bears this sublime view: "He bowed the heavens also, and came down; and darkness was under his feet. And he rode upon a cherub and did fly; yea, he did fly upon the wings of the wind. He made darkness his secret place, his pavilion; round about him were dark waters and thick clouds of the skies." Psalm xlviii., 9-11.

In all these sublime manifestations of the entities and activities of *Theos*, and *Logos*, and *Pneuma*, so beautifully portrayed by inspired prophets and apostles, can there be any valid objection to regarding all these actors as real substantial entities? And is it degrading to the character of God to accord to him the ability to utilize the immaterial substances that "underlie all outward manifestations," in framing and bringing forth all these grand outward manifestations in earth, and air, and sea?

Is it any stain upon his originality, that he, who is clothed with light, should have enjoyed companionship with light from "the beginning," beyond which "the memory of man runneth not to the contrary," and of which the ken of prophet taketh not cognizance?

We can regard gravity, magnetism, electricity, caloric, etc., as immaterial substances existing through all the realms where God existed, as his accompaniments, or clothing, or external nature, subject to his intelligent control, and ready at any time, at his bidding, to become the "outward form by which the inward thought" of deity would be expressed, and God be honored thereby.

Then if the great chemist of the universe should compound some of these immaterial substances and form material and visible substances, it would be but the visible made from the invisible, and becoming "manifest;" and we have seen by the definition, that substance "underlies all outward manifestations."

John, having informed us that the *logos* was in the beginning, says: "And the word was made [or became] flesh and dwelt among us." John i. 14.

Now the *logos* which was the "outward form," in creation, becomes the outward form—and that form is flesh—in which the invisible God is made "manifest" to men.

May not this throw some light on Rev. iii. 14, where the same writer calls Jesus Christ "the faithful and true witness, the beginning of the creation of God." Some have thought this passage makes Christ a created being. It need not so imply. Understand "creation" here to mean the *work*, or performance, and

not the *things created*; and *archee*, beginning, will refer to the beginning of the *work*. And *logos* is represented as being a co-operant with God in the beginning of creation.

The "manifestation" is expressed in another place thus: "That which was from the beginning, which we have heard, which we have seen with our eyes, which we have looked upon, and our hands have handled, of the word of life; for the life was manifested and we have seen it." 1 John i. 1.

Here an invisible substance, the life, the *logos*, was made "manifest" and visible.

Again he says: "And ye know that he was manifested to take away our sins . . . For this purpose the Son of God was manifested that he might destroy the works of the devil." 1 Jno. iii. 5.

In this manifestation, the *logos* has become the Son of God, a new relationship and different from that sustained "in the beginning."

Referring to this manifestation, Paul says: "God was manifested in the flesh." 1 Tim. iii. 16.

Thus we see Substantialism multiplying before us in the Scriptures, and invisible substances coming into new relationships and visible manifestations.

Spirit is immaterial substance, and spirits are substantial entities. After immaterial substance and invisibility had put on visible manifestations, in the physical universe, it pleased God to connect the visible and invisible, the material and immaterial, the physical and the spiritual, and give the unseen spirit a visible "manifestation" in man. So God made man of material substance, and breathed into him the immaterial, the "breath of life," spirit, the *pneuma*, and man became a living soul.

In the microcosm man, we have a combination of two worlds, the material and immaterial, the physical and spiritual.

The spirit of man, then, is an emanation from God, who is also spirit and the great fountain of spirit. Hence God is said to be the father, the maker, the giver, the owner, of our spirits. And we find such expressions as the following: "O God, the God of the spirits of all flesh." Nu. xvi. 22. "The God of the spirits of all flesh." Nu. xxvii. 16. "The Lord, who stretcheth forth the heavens, and layeth the foundation of the earth, and formeth the spirit of man within him." Zech. xii. 1. "Shall we not rather be in subjection to the Father of spirits and live?" Heb. xii. 9.

This substantial relationship of material and immaterial substance, spirit and body, must be separated in death, but a more substantial reunion is promised.

The apostle says: "Knowing in yourselves [or for yourselves] that ye have in Heaven a better and an enduring substance." Heb. x. 34.

The Psalmist says, in view of the silent and unseen coming together of material and immaterial substance in the embryo man: "Thine eyes did see my substance, yet being imperfect; and in thy book all my members were written, which in continuance were fashioned, when as yet there was none of them." Ps. cxxxix. 16.

With an eye to the dissolution of this corporeal frame, Solomon wrote: "Then shall the dust return to the earth as it was, and the spirit shall return to God who gave it." Eccl. xii. 7.

Peter, looking to the same dissolution, says: "Yea, I think it meet, as long as I am in this tabernacle, to stir you up by putting you in remembrance; knowing that shortly I must put

off this, my tabernacle, even as our Lord Jesus Christ hath showed me." 2 Pet. i. 13, 14.

Watching the same vanishing relation, Paul says: "But though our outward man perish, yet the inward man is renewed day by day. . . While we look not at the things which are seen, but at the things which are not seen; for the things which are seen are temporal; but the things which are not seen are eternal." 2 Cor. iv. 16, 18.

Here the substantial inner man is renewing strength daily, while the material outward man is wasting away; and the bodies, the *seen*, are declared to be mortal, temporal, and the spirit, the *unseen*, eternal.

But the *separation* is not eternal. The spirit leaves the mortal clay for a while.

"But if the spirit of him that raised up Jesus from the dead dwell in you, he that raised up Christ from the dead, shall also quicken your mortal bodies by his spirit that dwelleth in you." Rom. viii. 11.

The difference between the material and immaterial in man is aptly illustrated by the Saviour, when he suddenly appeared to his disciples after his resurrection.

"But they were terrified and affrighted, and supposed that they had seen a spirit. And he said to them: . . . Behold my hands and my feet, that it is I myself; handle me and see; for a spirit hath not flesh and bones as you see me have." Luke xxiv. 37, 39.

So a disembodied spirit, being immaterial, is according to the great teacher, an intangible entity, not having flesh and bones.

But Paul, speaking of the incarnation, says: "Who is the image of the invisible God, the first born of every creature." Col. i. 15, 18.

The image of the invisible required *substance* to make a visible "outward manifestation," as we have seen, and the *logos* was there in the beginning, who, with the underlying substance, became "the outward form by which the inward thought is expressed," and the "manifest" image of God. But he is "the first born of every creature," the first born from the dead, or as John says: "The first begotten of the dead." Revised version reads: "The first born of the dead." Rev. i. 5.

He has pioneered the pathway through the dark regions of the tomb, and conquered death in his own dominions, and bids us follow, trusting in him to lead us safely out into the bright realms of eternal day, beyond the dark confines of the charnel house of the mortal remains of Adam's race.

In full confidence of this glorious deliverance, let us, in conclusion, join with the apostle in the triumphant culmination of visions of the seen and unseen, the temporal and eternal, and "light afflictions" placed in antithetical counterpoise with "a far more exceeding and eternal weight of glory," as the announcement of the triumph of "glory" breaks forth in the sublime language (2 Cor. v. 1): "For we know that if our earthly house of the tabernacle were dissolved, we have a building of God, a house not made with hands, eternal in the heavens."

SYCAMORE, Cal.

CONSTITUTION OF MATTER.

BY DR. H. A. MOTT, M. A. C. S., ETC.

But two theories of the constitution of matter are possible; the one asserts that it is con-

tinuous, the other that it is not. The former maintains that all bodies are made up of homogeneous matter, uninterrupted except by division into masses of visible size. The latter contends that all bodies are produced by the aggregation of minute particles, individually invisible and incapable of division without decomposition. Professor J. C. Maxwell* says: "In certain applications of mathematics to physical questions, it is convenient to suppose bodies homogeneous in order to make the quantity of matter in each differential element a function of the co-ordinates, but I am not aware that any theory of this kind has been proposed to account for the different properties of bodies. Indeed, the properties of a body supposed to be a uniform *plenum* may be affirmed dogmatically, but cannot be explained mathematically." From this there is apparently a mathematical necessity for the second theory above given, which supposes "that all bodies, even when they appear to our senses homogeneous, consist of a multitude of particles, or small parts, the mechanical relations of which constitute the [physical] properties of the bodies."

If we take for granted that *all bodies* are aggregations of small particles (or molecules, as they are termed), and that every homogeneous substance has a molecule peculiar to itself, then there are only as many kinds of molecules as there are kinds of homogeneous matter. The definition, then, of a molecule is—the smallest particle of a substance that can exist and still retain the properties of the substance. If divided, then we perform a division into atoms, and thus form some other kind or kinds of matter. As Maxwell has stated, the physical properties are due to the mechanical relations of their constituent molecules; "so," says Barker,† "viewing the molecule as an aggregation of atoms, we may assert that the chemical properties of molecules—and therefore of the matter which they constitute—are due to the mechanical relations of their constituent atoms." By an atom is meant the smallest particle of a substance that can take part in a chemical change within molecules. Molecules containing like atoms are elementary; those containing unlike atoms are called compound molecules.

This view of the constitution of matter is the one universally adopted in all text books on science, and by most all scientists. Let us glance for a minute at the other theory, and see if it is more reasonable than the above, or if it is untenable.

In ancient times Anaxagoras was among the first to propound the theory of the homogeneity and continuity of bodies under the name of the doctrine of *homœomeria*, or of the similarity of the parts of a body to the whole. The followers of Anaxagoras maintained that there is no vacuum—that every part of space is full of matter, that there is a universal *plenum*, and that all motion is like that of a fish in water, which yields in front of the fish because the fish leaves room for it behind. The advocates of the continuity of matter asserted that the smallest conceivable body has parts, and that whatever has parts may be divided. As a drop of water can be divided into two parts, which are each of them drops of water, so there was

* On Dynamical Theory of Gases. Phil. Trans. civii., 49—1867.

† On Molecular Classification, Vol. I., April, 1871. Am. Chem.

reason to believe that these smaller drops can be divided again, and the theory maintains that there is nothing in the nature of things to hinder this process of division from being repeated over and over again, time without end. This is the doctrine of the infinite divisibility of bodies, and it is in direct contradiction to the theory of atoms. In modern times Descartes held that, as it is of the essence of matter to be extended in length, breadth, and thickness; so it is of the essence of extension to be occupied by matter, for extension cannot be an extension of nothing. The identification of extension with substance runs through the whole of Descartes' works, and it forms one of the ultimate foundations of the system of Spinoza. Descartes, consistently with this doctrine, denied the existence of atoms as parts of matter, which by their own nature are indivisible.* Professor Cooke† says in reference to the atomic theory: "Beautiful and consistent as it appears, [it] is only a temporary expedient for representing the facts of chemistry to the mind. Although in the present state of the science it gives absolutely essential aid both to investigation and study, I have the conviction that it is a temporary scaffolding around the imperfect building, which will be removed as soon as its usefulness is passed." This candid opinion is entertained by some of the most eminent scientists who have carefully considered the subject—note what Prof. Mattieu Williams says:‡ "The atoms invented by Dalton for the purpose of explaining the demonstrated laws of chemical combination performed this function admirably, and had great educational value, so long as their purely imaginary origin was kept in view; but when such atoms are treated as facts, and physical dogmas are based upon the assumption of their actual existence, they become dangerous physical superstitions."

S. Caunizzano§ in an admirable paper on the progress of the atomistic theory, tracing its history through Dalton, Berzelius, Laurent, Gerhardt, and others, and bringing the discussion down to the present day, says that some of the followers of the modern school push their faith to the borders of fanaticism—"they often speak on molecular subjects with as much dogmatic assurance as though they had actually realized the ingenious fiction of Laplace, and had constructed a microscope by which they could detect the molecule and count the number of its constituent atoms." Wollaston and Davy rejected the theory of atoms, and numerous other scientists can be mentioned who hold that atoms in the science of Physics and Chemistry bear the same relation to these branches as x and y do to mathematics, and are to be discarded as soon as their usefulness in the deduction of certain problems has expired.

The idea of the infinite divisibility of matter in olden times was ably defended by Aristotle, Plato and Pythagoras, and is unquestionably the only correct idea, and is the one which will eventually be adopted.

The great mistake made by Anaxagoras was to suppose that all space was filled with material substance; if he had conceived of the

idea of an immaterial substance as pointed out in numerous articles in this journal, his view would not have been rejected so readily.

It is evident, then, from the above, that the present theory as to the constitution of matter must be abandoned.

This will be no great loss, "for Chemistry and Physics, which should be parts of one dynamical science of matter and energy, are still separated by a wide gap, and one great stride, says Daniels,* which the science of the future has to take is that of assimilating the theories of the physical and chemical molecules and thereby stepping over the gap." This stride, however, will never be taken—the gap will always remain, unless the whole theory of molecules and atoms is given up, and the constitution of matter is explained on some other basis.

In an able article by the Editor it was stated that matter (corporeal substance) was produced from the one primordial substance (incorporeal substance) which pervades all space by the great Intelligence who formulated the laws of nature.

It has also been intimated that the process which volatilizes a material substance so as to make it in its nature approach nearer and nearer to the border line of the immaterial may yet be extended so as to complete the transition. This is, however, a problem which remains in the hands of the future for solution.

We can, however, regard it as reasonable, from careful study of matter in its highly attenuated condition, as in odor, to assume as correct the idea that it was originally synthesized in the laboratory of nature by some as yet unknown laws, from the primordial force-element or substance in different directions and in different degrees of concentration.

Matter regarded as homogeneous throughout can be assumed to consist of infinitely small "particles" held together by cohesive force. And the definition we may correctly give to a particle—may be a small mass of a substance, which is capable of being divided into smaller masses and these masses into still smaller masses, and so on *ad infinitum*.

PASSING THE CRISIS.

BY REV. J. I. SWANDER, A. M.

How long will the gallant leader of the newly imbanned host be able to maintain his position at the head of the most invincible army that ever marshaled its forces for scientific warfare? Judging from numerous communications now at hand, we infer that the above question is foremost and uppermost in the minds of such readers of THE MICROCOSM who know the real point at issue in the remarkable discussion which for several years has been carried forward in its intensely interesting and edifying columns. The Editor's announcement in the November number that he was obliged to rest for a couple of months, and that he would consequently be under the necessity of suspending the publication of this journal for a corresponding length of time, served to intensify the general anxiety upon the subject, and to call forth expressions of solicitude and inquiry concerning the future of the Substantial Philosophy. During the interim, thousands of prayers went up to Heaven asking with sup-

* See Ency. Brit. Article "Atoms."

† The New Chemistry, p. 103—1876.

‡ Quar. Jour. of Sci., 1876.

§ Gazzetta Italiana No. 1—Jan., 1876.

* Daniels' Physics.

pliant earnestness that the founder of this new scientific faith might be spared to carry forward the work which God had given him to do, and for which he is so eminently qualified. Viewed from the stand-point of mere human agency in the operations of Providence, the retirement of Dr. Hall to the superannuated list, whether at this time or in the near future, would seem to inflict upon the cause of true science a loss almost, if not altogether, irreparable. The solemn silence of his magnetic pen would drape with gloom the new scientific heavens from which the sun of Substantialism has recently shone with an effulgence that promises to reveal the most veritable entities of nature, and bring to light many more of the hitherto undiscovered impulses of God's great universe.

There is, however, another and a better view to be taken of this and all other grand movements in the world's history. History has an objective power derived, not from the agents employed in its unfolding process, but from Him who is above history, and whose personal existence has no history. The essential features of all great world-movements are fashioned, not only after an inner pattern, but also by an inner plastic power. God has so constituted the economy of the universe with its dynamic forces and unerring laws as to secure the end from the beginning. According to this view, a failure of the divine purpose is placed under the category of impossibilities. Neither can there be an ultimate failure of any human purpose when such purpose moves upon a line parallel with that of the divine. Truth calls great minds to its advocacy, and through them it asserts its own mighty power. "Ye have not chosen me, but I have chosen you and ordained you" is the language of the personal and supreme Truth. Christ is the principle of all normal world-movements; other actors upon the stage of history, though not puppets of a mock drama, are, nevertheless, mere agents through whom the objective forces of creation's development assert themselves, and yet in such a way as that each rational agent is allowed to exercise the freedom of his own will, and enabled to harvest the reward of his own merit. Assuming the correctness of the foregoing view, there can be no abortion in the sphere of true science or sound philosophy any more than there can be a failure in the primary purpose of Almighty God, or a general miscarriage in the grand design of Him who is the author and finisher of the Christian faith. Whatever has its incipient being in the fecundous womb of eternal truth will come, through safe and certain delivery, to a legitimate and timely birth. The Substantial Philosophy can view itself in no other light without stultification and suicide. It has proclaimed from the high tower of its strength that truth is a veritable essence, that substance is before matter, that the mind, instead of being the function of the brain, uses the brain as its organ. The same line of reasoning will lead us to the position which in this paragraph we have attempted to maintain. To surrender this position would be to throw our excellent philosophy to the dogs, and crown materialism as both consistent in its claims and triumphant in the controversy which is now shaking the very heavens of honest, earnest inquiry and thought.

"That which is to be hath already been" is what "the Son of David" said of the Substantial Philosophy. It did not spring into existence from the recent revolution in science; al-

though it was prepared for the benefit of the world in the laboratory of a grand and noble intellect. Just as the Reformation produced the Reformers; just as the principles of popular freedom produced Washington and Jefferson as distinguished actors upon the stage of colonial history, so did the eternal principle of Substantialism lay hold of its most natural selection, and use him as an active medium through which to appear before the world and challenge the consideration of honest men. Fact is, the fullness of time was here, the new philosophy was ready to be born, and all the mercenary midwives of materialistic Egypt could not strangle it at its birth. And now, since it has been born, although it may be kept cradled for awhile among the bulrushes of popular prejudice, it will gain strength as a proper child, and finally go forth to lead the world from the bondage of scholastic corruption into its own higher sphere of philosophic truth and consequent freedom in the promised land.

The seed having been thus sown and germinated, the threefold question now is: Who shall water the plant, cultivate the crop, and garner the harvest? Notwithstanding the correctness of the position taken in the foregoing paragraph, it is none the less true that in a certain sense:

"By a slender thread hang everlasting things."

Neither is it unnatural that the question of Dr. Hall's health, mental vigor and consequent continued usefulness at the head of the greatest scientific movement of the age should be the source of intense anxiety and general inquiry among those who know what the said movement really involves. In common with others, we experience the torturous solicitude occasioned by some of the facts now under consideration. We have lost no faith in the scientific soundness of the principles announced and the certainty of their ultimate triumph, but at times our timid soul is found oscillating between hope and a fear that possibly our dear friend may be called from his work on earth before he is permitted to demonstrate the strength of Substantialism in this generation to such an extent that its power shall be acknowledged by every one that is to come. Indeed, at times we have felt that this generation will probably pass away before the kingdom of the new philosophy can be generally seen coming with that rising, spreading, and prevailing power and glory which its eternal verities involve.

While thus lingering and languishing in this disquieting purgatory of suspense, we received encouraging dispatches from the seat of war. The Editor informed us that his health was measurably restored, and his intellectual energies correspondingly recuperated. He also sent us the cheering intelligence that new recruits were joining the ranks, and marching with the imbantered hosts of regenerated science.

The February number of *THE MICROSCOP* confirmed what had been intimated through other channels of information. Dr. Mott uncovers his scholarly head, and makes obeisance to the majesty of truth. Letters come in from all quarters expressing the hope that he may be induced to speak directly through the pages of this journal.

It would indeed be highly gratifying to the contributory staff, as well as to the readers of *THE MICROSCOP* in general, if the Doctor's serv-

ices could be secured as its associate or assistant editor. The infusion of such blood would impart new energy to this magazine and widen its sphere of usefulness as the advocate of true science. Such an arrangement would confirm the faith of those who have already been translated from darkness to light, and convert others who are still bowing their idolatrous knees to the gods of popular nonsense. It would give the recent past a merited justification and arch the near future with a radiant bow of promise. The friends of Dr. Hall would be no less reluctant to part with the senior editor in the event that Providence should see fit to loose the silver cord, or break the golden bowl, but they could be more easily reconciled to such a possible dispensation when supported by the fact that his mantle would fall upon one whose intellectual shoulders have been symmetrically proportioned by all that nature and education could confer upon a highly favored son. Sustained and soothed by the cheering presence of such an Elisha, all the children of the old prophet would wait, in better submission, their summons to the stormy banks of Jordan, when Elijah shall be called to step into the chariot of Israel and take his expected ride through the skies.

Whatever the future may have in store for any of us, one thing at this writing seems evident—the Substantial Philosophy is passing the crisis with its banner on the breeze. Let us therefore hold fast the profession of our faith without wavering. We congratulate the Editor upon the valuable assistance he may expect from his new yoke-fellow. We congratulate all schools and colleges upon the forthcoming text-book on sound, now in the speedy course of preparation. We congratulate the world-renowned advocates of the wave-theory, on both sides of the Atlantic, upon the prospect of meeting a foe man worthy of their steel; and it will now soon be seen whether the probable scientific set-to will not force them to renounce a cause unworthy of their valor. We congratulate the truth that it is about to have free course and be glorified. We congratulate the cricket that it will no longer be required to perform impossibilities under the penalty of losing its position as an important agent for the windy firm of Tyndall, Helmholtz, and Mayer. We rejoice in the emancipation of the atmospheric molecule, since it need no longer be cut and carved and punched and prompted to squeal music for the march of false science. * * *

The writer has just recovered from a severe spell of laughing over the ridiculous in the popular theory of sound. And now, our face having settled back into its normal expression of constitutional gravity, we proceed with all seriousness and candor to congratulate Dr. Mott upon the persecution for righteousness' sake that awaits him. He has seen too much of the world not to expect the inevitable. The paradise of substantial immortality in science has always been reached through the purgatorial fires of persecution. This is the baptism in which Heaven consecrates its "coterie of cranks" before they are fully prepared "to confound the things that are mighty" in that wisdom which is "foolishness with God." We welcome him to our tonic feast of bitter herbs, and also to a rare dish of the most substantial and savory viands ever served to that select class of guests who hunger for the unleavened bread of sound philosophy.

To the wave-theorists we offer the terms of surrender at discretion. The master minds of their opaque system are searching after a more luminous sun, in whose light they reasonably hope to find a more satisfactory solution of the world's leading scientific and religious problems. Come in out of the darkness, gentlemen. Turn your faces toward that commanding summit where Truth's proud temple shines afar. Do not continue to teach the self-contradictory theory, and thus bequeath to your children the humiliating intelligence that their distinguished fathers knew not the day of their most favorable visitation. The surrender of your legions is a mere question of time. It is only a few years since the new philosophy appeared as a root out of dry ground, and now it has its intelligent advocates in every State of the Union, and upon nearly every continent of the world. At this rate how long will it take to marshal its friends by the million and put all the armies of the aliens to flight? In answering this question, let us apply the principles and ratio of God's arithmetic. If one can chase a thousand, two shall put ten thousand to flight. And there are more to follow. Some are just now drilling for their respective positions in the mighty phalanx. They will soon attain to the proper measure of ability and fitness to become leaders in the war. Why should the heathen rage, or the people imagine a vain thing? Wait until Keplart, Munnell, Hoffer, Carter, Lowber, Hamlin, Van Dyke, Hand and others of equal promise shall buckle on the armor in all the might and majesty of their attainable mental manhood. What a grand skedaddling of unscientific fugitives may then be seen chasing down the dark valley of the shadow of materialistic philosophy! The rout will be without a parallel in history, except in the pell-mell stampede of those materialists which 1800 years ago, under the power of their peculiar inspiration, rushed violently down the Gadarean hills to destruction. We hope that the founder of the Substantial Philosophy will live to toot his bugle in the final charge upon the demoralized ranks of the enemy. Should Providence order otherwise, we shall still be content to know that he will have gone to witness the decisive battle from beyond the stars, and shout the glorious victory home among the hosts of heaven. He will there have leisure and health and all the necessary facilities to continue his second volume upon *The Problem of Human Life*—a volume which can neither be measured by the terrestrial latitude of space, nor limited by the uncertain longitude of time.

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WILFORD'S MICROCOSM.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent. EDITOR.

THE SUBSTANTIAL NATURE OF SOUND DEMONSTRATED.

There are numerous arguments which go to prove that *force*, in whatever form it exists and operates, must, in the nature of things, be substantial; that is, that it must be an objective something—a real entitative existence—rather than the non-entitative motion of some material body. Upon this assumption the Substantial Philosophy was originally based, and to elucidate and prove its correctness much of our editorial labor in the conduct of this magazine has been devoted. To assume *force* to be insubstantial or a nonentity is to attempt to conceive of the most manifest and gigantic physical effects as without a cause, such, for example, as the shivering of a forest tree to splinters by a touch of electricity, or even the pulling of a satellite or planet from its tangential course by an invisible and intangible mode of motion called gravity. It is impossible for the mind to conceive of anything less than a real substance, and a powerful substance at that, which is capable of disintegrating a giant oak and scattering its fragments broadcast. To say that this destruction can result from a mere mode of motion, without substantial contact of the acting agent, is nonsense, for there is nothing in this case that moves to produce any such effect if the electric force be not an entity. The air, surely, which surrounds the oak, does not move unless as the *effect* of the destruction, instead of its cause. And even if we suppose that the splintering of the tree was the effect of an aerial motion which we might thus call electric force—still, what was it that caused such motion of the air? Could the air move without an adequate force to cause it? If it required force to put the air into motion and thus create electricity as another force or mode of motion, then the first force must have either been a substance, or a mode of motion of some other substance, which moved the air, and thus caused the motion called electricity. Was this prior substance *ether*? If so, what force put the ether in motion to cause motion in the air, and thus produce motion called electricity? Such pre-etheral force must also either be a substance or a mode of motion; and if the latter, then what body was it that moved to cause the motion of the ether by which to move the air, and thus generate electricity as a mode of motion to move the fibers of the tree, and thus scatter its splinters over acres of ground? Clearly *ether* cannot be thrown into waves to produce such tremendous results as would be thus attributed to it, without a moving force; and if we attempt to account for that force which moved ether as a mode of motion of some other body, then we have to account for

this still prior force in the same way, and so on back, till finally the only sensible solution is that the first or primal force which caused the first substance to move must itself have been substantial. Why not, then, exercise common scientific sense and philosophical judgment, and say that the electric force which shattered the tree was a real substance, which acts by a fixed law of nature, making its substantial contact with the oak adequate to the result accomplished?

Thus the "mode-of-motion" philosophy, with its "house-that-Jack-built" logic, runs itself into the ground in attempting to make electricity a mode of motion of some other substance. Each and every such attempt inevitably involves a previous substantial and active force to cause the resulting motion, till we finally get back to the foundation of all force, where the immaterial force element of Nature blends with and becomes incorporated as an integral part of the primordial and self-existent intelligent force of the universe, by and from which alone all forms of manifested force have derived their moving power. No other solution comes anywhere near meeting the difficulties involved.

How weak, then, to talk of *light* as ethereal undulations, and thus be obliged to invent a real substance to undulate, when light itself, as an imponderable immaterial substance, would have answered every purpose, and thus dispensed with all circumlocution! The same logic which has just driven electricity, as an insubstantial mode of motion, into its theoretical hiding-place, would also drive light, or heat, or sound, or magnetism, or gravity, as now universally taught, into the same obscure retreat. What propriety is there, for example, in teaching that light is only the motion of ether-waves, to get rid of accepting light as a real immaterial substance, when the ether, if such a substance exists at all, being, as Tyndall teaches, an *inert* substance, cannot move unless some substantial and real force acts upon it to throw it into vibration? As well talk about sound being the motion of air-waves with no vibrating substantial body to move the air, and without any previous substantial force to throw this sounding body into vibration by which to move the air! *Ether*, if there be such a jelly-like substance, can no more vibrate itself than can the ocean move itself into water-waves without the contact of the substantial air-currents acting upon it; or than the air can move itself into currents by which to produce such ocean-waves, without the substantial heat-force which expands the air and causes it to assume the character of wind. No scientist seems ever to have thought of rationally accounting for the force that moves the ether into

waves by which to cause light. The only supposition ever hinted—that the ether is agitated into light-waves by the action of heat in producing incandescence in the luminous body—is more absurd than any Irish bull ever perpetrated. Tyndall tells us that heat is but the motion of ether-waves, the same as light, only of a lower order, and that when we feel warmth from the stove it is because it sends out waves of ether against our cuticle. How can ether vibrations of a lower grade, called heat-waves, generate incandescence by which to start ether-waves of a higher order or more rapid vibration, called light-waves, when the first-named waves have no force but their own self-acting mode of motion to cause their undulations? Possibly if one of our great authorities in physics were pinned down to it, he would find himself whirling in a logical circle by first assuming that light of a low grade of ether-vibrations causes light of a higher grade of the same vibrations, and that the ether in the first instance vibrating itself causes itself to vibrate in the second instance. Lord Rayleigh would, no doubt, by his profound algebraical resources, have no difficulty in demonstrating such a proposition to the entire satisfaction of our colleges, if he were only allowed to start off with a sufficient number of assumed mathematical data.

With these introductory remarks let us come to the question we have proposed to discuss—namely, to prove that sound, instead of being the wave-motion of the air, is one of the substantial forces of Nature, and as entitative and real as is light, heat, magnetism, gravitation or electricity. It is positively indisputable, and will be conceded by every intelligent and candid investigator of physics, that if external sound be not air-waves or atmospheric pulses sent off from the sounding body, then it must be a substantial force somewhat analogous to electricity, and like it requiring a conducting medium, and having a velocity of travel of its own through different media. This is an irresistible alternative, since there is no middle ground for standing room between *motion* and *substance*. We have challenged scientists to draw upon their fancy and guess, if they can, any possible ground save one of the two named. Some of our readers have written us that they have no hesitation in conceding from our arguments the complete overthrow of the wave-theory of sound, but that they are not prepared to accept the substantial theory! Now we protest that unless these objectors can imagine some middle ground between motion and substance, it is worse than quibbling to concede the wave-theory broken down, and still object to the general truth and necessity of the Substantial Philosophy. Sound, after

having been generated at a distance, comes to us at a given velocity, showing that it is an objective something which travels, consuming time in transit the same as does light or lightning, only much slower. Plainly, as before stated, it must be the pulses or wave-motions of the air, or else it must consist of an immaterial sonorous substance traveling by its own law of conduction and radiation somewhat analogous to that of light, heat, electricity, magnetism, etc. To demonstrate its substantial character, therefore, it only needs to be proved beyond doubt that the *pulse* hypothesis of the current theory is an impossibility. This we now proceed to do in a manner in some respects new to our readers.

To send off a pulse or condensed wave through such a medium as air, whose particles are mobile and free to regain position after displacement, necessarily requires a motion so swift as to more than equal the mobility of the medium or its tendency to restore disturbances. Now we deny that any motion of a body moving through the air in open space, even as swift as a rifle-bullet, is swift enough to start a pulse that will travel to any distance, though it might be swift enough to condense the air immediately in contact with its surface. We regard it as pure assumption without a shadow of proof to support it that the vibrations of sensitive flames, or even diaphragms at a distance from a sounding body, causing sand to dance and form figures upon them, are caused by air-pulses sent off from the sounding instrument; but we hold, on the contrary, that all such motions are produced sympathetically by the substantial contact of the sound pulses themselves, somewhat as magnetism will act on a distant bit of iron. As proof of the correctness of this view, no such effects on distant diaphragms can occur when the rate of motion of the sounding instrument is below the sound-producing vibrational number. Whereas, if the wave-theory were true, it is manifest that any rate of periodic vibrations, of equal force as when producing sound, ought mechanically to act upon a diaphragm and disturb sand at the same distance precisely, if mere condensed air-pulses are the cause of such phenomena. Physicists have had this crushing challenge staring them in the face in the *Problem of Human Life* for years, to which they have turned a deaf ear, a fact only explicable on the ground that they dare not put the current theory of sound to the crucial test of experiment.

In our recent review of Sir William Thomson's barometric theory of sound-pulses, in which he unwittingly staked the whole sound-theory on a simple matter of fact easily tested, we showed, and now repeat it, that no pulse

or repetition of pulses of the most powerful character that mechanics can produce, will affect in the slightest degree the column of mercury in an exposed barometer tube even in a closed room. How much less is such a thing possible in the open air? Yet an insect, with its incomparably more trifling movements, causes a tone that can be heard a mile away, and which that great authority says can only be caused by barometric changes. If Sir William was the great-minded and candid scientist that report makes him, we would suppose that some reply should have come from his pen by which to explain this damaging fact, since we learn that his attention has been personally called to our criticism.

But this is not the most marked feature of difficulty for the wave-theory to meet. The highest authorities on sound, including Tyndall and Helmholtz, have admitted a million times more than enough to break down that theory. They, with all other writers on sound, have labored under the monstrous misconception, though a necessity of the theory, that a tuning-fork's prongs had to advance and travel "*swiftly*" in order to compress the air and send off sound-waves; and they both were innocent enough to specify that the motions of clock-pendulums were too slow to send off such condensed pulses. Yet we had the honor of demonstrating by a new method of measurement, in reply to Prof. Stahr in the October MICROCOSM (1888), that the prong sounds audibly when not moving at a velocity of one inch in three hours, and which Capt. Carter carried out by his superior apparatus to an actual measured velocity of only one-and-a-half inches in four years. (See MICROCOSM for December, 1888.)

Now, it would seem almost a work of supererogation to tell the most superficial beginner in science that a motion as slow as that of the hour-hand of a clock, however many times repeated, could not condense the free air and drive off sensible air-waves; yet the fork sounds, as Capt. Carter proved, when its prongs were actually moving 25,000 times slower than the hour-hand of a common clock, or more than 1,000,000,000 times slower than the pendulum of the regulator-clock which Prof. Tyndall declared moved too sluggishly to compress the air and send off waves.

Here is another class of proofs against the wave-theory, some portions of which are so entirely new to science and fatal to the views of modern physicists, that it would be a dereliction of duty should we neglect to record them for the benefit of coming investigators. No class of facts are more destructive of the

doctrine of acoustics as now taught than those relating to *resonance*, or the remarkable phenomena of the augmentation of sound by holding the vibrating instrument in contact with a suitable sounding-board. Let us examine these facts for a moment.

It is claimed by Prof. Tyndall and other authorities that resonance can only occur by a greater wave-motion of the air caused by the larger vibrating surface of the sounding-board. A more fallacious supposition was never entertained. In the first place the sounding-board does not, and, in the nature of things, cannot, vibrate bodily or as a whole. It could not do this as the effect of holding a tuning-fork, for example, against it, because so large a body as a tensioned sounding-board has a vibrational number of its own very different from that of the fork, and should it vibrate at all bodily it would have to conform to its own vibrational number, making a corresponding pitch of tone, thus changing that of the fork to its own proper number. Whereas, the pitch of the fork is not changed or disturbed in the slightest degree, but merely its sound is augmented in intensity by diffusion through the resonator. The tremor of the board, as is well known, is among its particles, and not bodily motion such as could act on the air, in the manner the swinging prongs are supposed to act, while this tremor is only incidental to the fork's contact, having nothing to do with augmenting the sound by augmenting the atmospheric disturbances. And here let us present such proofs of our assertion as will forever silence adverse criticism. To do this intelligibly we need a diagram of a tuning-fork.



In the first place, if the stem of the fork (c) be held upon the resonant board, its motion up and down, or in the direction of its length, is but *one-fifth* the amplitude of the prongs laterally at *a*, as shown by Prof. Spice in the *American Journal of Science* for December, 1876. Thus, if the piece of wood were of just five times the surface area of the prongs, and were to vibrate bodily under the stem of the fork, it would only produce the same atmospheric disturbance as the fork itself, since the wood can receive but *one-fifth* the amplitude of motion. Yet, such a piece of dry spruce by actual test will make more than one-hundred times the volume of tone that the fork will make alone! This single fact forever destroys the theory that resonance is caused by increased air-waves sent off from the sounding-board; and, of course, with this

discovery falls the wave-theory itself. In addition to this fact, we may add that while such a piece of dry spruce will add fully one-hundred volumes to the tone of the fork by resonance, though only doubling the disturbance of the air, according to the wave-theory, yet a piece of iron of the same size as the wood, and held in the same way, will scarcely increase the intensity of the fork's sound perceptibly! Why is this, when the piece of iron, owing to the firmness of its surface and texture, really duplicates the stem's vibrations more accurately than can the piece of wood? The plain answer is that these supplemental vibrations are purely incidental, and have nothing to do with the phenomena of resonance, a fact which no physicist ever dreamt of before seeing the *Problem of Human Life*.

But here is a still more fatal discovery: Suppose a small projecting pin be soldered to the fork at the point c, where there is almost no vibration of the fork, and held loosely against the sounding-board, so as to slip freely over its polished surface, and thus not cause it to tremble, it still produces precisely the same augmentation of sound, by mere contact and radiation, as if any other portion of the fork is used which produces the greatest incidental tremor. Try it. Hence, it follows that the tremor of the sounding-board is merely incidental to the fork's vibration, and that its action on the air has no more to do with the reflection, radiation, and augmentation of sound than would the incidental tremor of a red-hot piece of sheet-iron have to do with the radiation and augmentation of heat in a room. Any student of science who will properly grasp and handle the facts here presented concerning resonance can silence all the advocates of the wave-theory in the country. By the way, when Capt. Carter proved that the fork still sounds audibly, held in the fingers, when its swiftest motion was only at a velocity of an inch-and-a-half in four years, he could have easily quintupled the result by placing the stem against a sounding-board whose motion would have been *five times less* in distance, according to Prof. Spice, or only at a velocity one inch and a half in twenty years! Thus every new fact evolved only adds to the impossibility of the correctness of the wave-theory of sound.

But even these facts, clear as they are, do not constitute the strongest evidence against the truth of the wave-theory. Dr. Henry A. Mott calls our attention to the startling admission of the eminent physicist, Prof. G. G. Stokes, D.C.L., F.R.S., professor of physics in Cambridge University, and a very high authority on sound, who declares that the reason why a tuning-fork produces such a weak sound, even at its greatest amplitude, when held in the hand, is because the air particles on account of

their mobility run around the prong taking their place behind it, thus preventing the fork from condensing the air and sending off waves! This admission is so crushing to the wave-theory, coming as it does from an authority indorsed and quoted from by Lord Rayleigh himself, that we will give our readers the exact words of Prof. Youmans, as found in the *Popular Science Monthly*, page 883, vol. 14 1879, as follows:

"It is well known that, when a mechanically-striking bell is placed under a receiver exhausted of air no sound is heard. Prof. Tyndall showed by experiments that, when a little air, about one-fourth, is admitted into the receiver, the sound is feeble only; but on introducing a little hydrogen the sound was again stilled. This fact was known to Sir John Herschel, and he gave the explanation that hydrogen *breaks the continuity of the medium*. But this is not the true explanation. Prof. Stokes, paying attention to the fact that when a tuning-fork is struck and held in air, it gives out but little sound, investigated the subject, and arrived at the conclusion that air is so *mobile* that it runs around the tuning-fork without being thrown into waves. Check this 'running round' by holding a card at one side of the fork and the sound is augmented. Now hydrogen is more mobile than air, and hence the probable explanation of the bell not sounding in it is, that the hydrogen 'runs round' so readily that it is not thrown into waves."

Thus stands the admission in all its impoverishing force, that on account of the "mobility" of the air, a prong sounding at its greatest amplitude and velocity of travel is prevented from sending off waves or pulses, owing to the tendency of the air in front to "run around" and restore equilibrium without being condensed or thrown into waves! Now, if a prong traveling with an amplitude of the sixteenth of an inch, and at a velocity of five or six feet in a second, cannot condense the air to any extent, but allows most of it to "run around" and restore equilibrium, what, in the name of science, must be the effect when the prong moves only the 64,000,000,000th of an inch at a swing, and travels at a velocity of only *one inch and a half in four years*, as demonstrated by Capt. Carter? This single statement of facts, coupled with Prof. Stokes' admission as indorsed by Prof. Youmans, editor of the *Popular Science Monthly*, must settle the wave-theory in the mind of every intelligent investigator, showing him that sound is not caused by the condensation of the air and the propagation of waves, as the theory claims.

If the fork at full swing really produces a weak sound because it fails to compress the air and send off waves, as Prof. Stokes insists, then clearly no other instrument, however loud it may sound, should do any better work which makes no greater vibrations. Reader, do you see the point? Yet the *locust*, as

shown in the *Problem of Human Life*, with a vibratory motion of its sounding apparatus so small as to be wholly invisible, as proved by our own close observation, generates a sound almost deafening when near to the insect, and which is clearly audible for a distance of a mile in all directions! Surely the air ought to "run around" this insect's vastly smaller vibrations much easier than around the broad swinging prong of a tuning-fork, thus demonstrating that the generation and propagation of sound has nothing whatever to do with air-waves or atmospheric pulses, our best sound exponents themselves being judges!

May we not, therefore, claim to have fairly demonstrated, as proposed, in the heading of this article, "the substantial nature of sound," by proving from logic as well as the highest authorities on acoustics, the total fallacy of the wave-theory? Thus, all the natural forces harmoniously combine as real objective entities to constitute the basis of the Substantial Philosophy which, whenever and wherever put to the test, so beautifully and consistently solves the otherwise inscrutable mysteries of science.

TANGIBILITY AND INTANGIBILITY.

Much vaguity, so to speak, exists in the minds of most persons as to the meaning of the words *tangible* and *intangible*. The common definition, as given in our dictionaries, confines the meaning of these terms to the *tactile sense*, or the sense of touch, commonly called *feeling*. This, however, is not sufficiently broad. The five senses constitute a chain of gradations of tangibility, or, more properly, modifications of the sense of touch. In its lowest phase we feel the material body by its actual contact with our tactile nerves. A still higher phase of this lowest sense of the animal economy is experienced in feeling the touch of immaterial substance, such as heat, radiating against the cuticle. But the highest phase of this sense is experienced in the contact of the *mind* upon the nervous system of the body, causing physical pain or pleasure, according to the mental impressions made.

Next above the sense of touch comes the sense of *taste*, which any one, with a little reflection, can easily resolve into a modified form of touch, requiring, as we know, the actual contact of the flavorful substance with our gustatory membrane and nervous system to produce the sensation. *Smell* is still a higher form or modification of touch, requiring the same actual contact of odorous substance with the nasal membrane and the olfactory nerve to cause that peculiar sensation, no difference whether the odorous particles be material or immaterial substance. Odor cannot, therefore, by any stretch of theoretical fancy, be construed into a mode of motion either of air, ether, or anything else, nor can the sensation of smell be resolved into the mere vibratory motion of the nasal membrane, but can only be the simple effect of the substantial contact of the odorous particles themselves. Hence odor is tangible to this sense alone.

With this rational analysis of the three lower

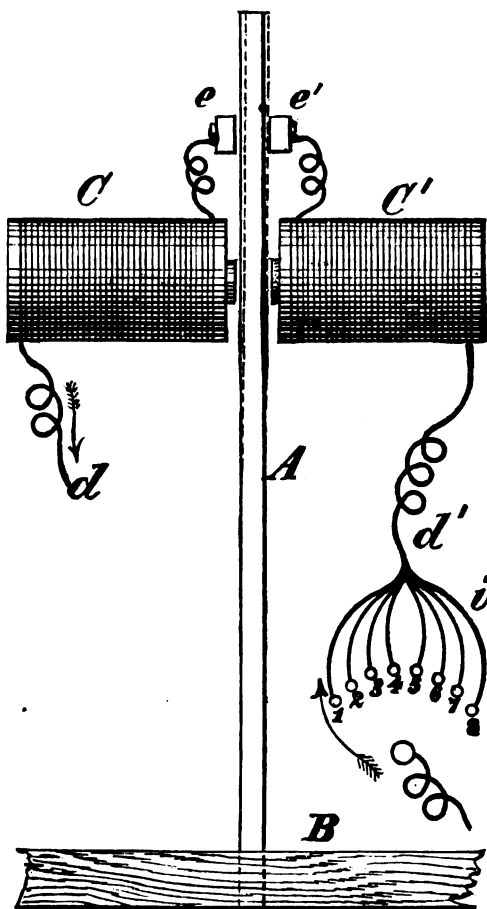
senses and the substantial manner in which the sensations must be produced, is it not reasonable to suppose that the remaining two higher senses are governed by the same substantial laws, merely shifting to a more elevated plane and range of action, from the mixed contact of material and immaterial substances to a pure contact of immaterial sound and light corpuscles with their appropriate sense-nerves? To suppose that these two higher or more refined senses have left the substantial basis or plane of action which demonstrably exists in the three lower senses examined, and leaped abruptly to a new principle of action, unless some absolute necessity exists for such assumption, is to fly into the face of reason and discard the analogies of science as well as the uniformity which everywhere exists in God's natural system of things. Hence we conclude that sound and light, the same as odor, must produce their respective sensations by substantial contact with the nerves affected, and, therefore, that even sound and light are *tangible* in the true sense of the term as applied to the senses involved.

But there are forces which, though substantial, are really *intangible* to all our senses, and but for processes of reasoning could never be known to exist. Magnetism, for example, can only be known to exist by its observed effects, not upon our sensations, but upon inanimate objects. The same is true of gravity. The same also would be true of light, were there no eyes, and of odor, but for the single sense of smell, no possible experiment within human reach enabling us to prove its existence except by that sense alone. How many other real, substantial entities, with wonderful properties and powers, may exist in surrounding nature, but wholly intangible to any of our senses, it is impossible for us even to imagine. With the insight we already possess in carrying forward this line of research, and the knowledge we have already attained of the intangible as well as tangible entities which exist all around us, many of which we know to be immaterial substances, since they act and are acted upon in defiance of all material conditions, we can readily imagine the vast and far-reaching scope of the Substantial Philosophy. Though it does not pretend to solve all problems or clear up all the mysteries of science, we venture to believe that it comes nearer doing so than any other system of philosophy ever formulated by man, and as such we submit its claims to the thoughtful student of science.

A NOVEL MUSICAL INSTRUMENT.

We present to our readers as a scientific curiosity a novelty in the way of musical instruments, which we have stumbled upon in our researches upon the sound problem. It consists of a single plain metal bar like a prong of a tuning-fork, upon which plain music may be played by means of electricity, manipulated and controlled by a suitable key-board. We do not attempt to record and describe this invention because of its merits as a musical instrument, but only on account of its scientific value to show what is possible to be done as a simple achievement in physics, hit upon more by accident than design in seeking for other and more important solutions, which we will refer to at the close. To convey an intelligible idea of the instrument, we are obliged to present a rough sketch of a portion of the apparatus by which to describe verbally the re-

mainder so that it can be understood with a little thought:



Imagine an upright iron bar, *A*, of such suitable length and thickness as to vibrate easily, secured to a frame and sounding-case at *B*. The other end of this bar is free to vibrate, and passes up between and near to the poles of two electro-magnets, *C*, *C'*, suitably connected with a battery or dynamo machine by the wires *d*, *d'*, and firmly secured to the same frame. Now, if the electricity is allowed to pass over the magnet *C'*, it is evident that it will draw the bar, *A*, toward it. But there is a forked and suitably hinged current-switching device straddling this bar, but not touching it when at rest, the ends of which are seen at *e*, *e'*. As this bar is magnetically pulled toward *C'*, and before coming near enough to touch, it comes in contact with the prong of the shifter, *e'*, which shunts the current from *C'*, to *C*. This in turn pulls the bar back, toward the pole of the magnet, *C*, bringing the bar in contact with *e*, which again diverts the current shunting it to *C'*, thus alternately and with great rapidity vibrating the bar to and fro, causing a pure tone to issue from it of a pitch corresponding to the number of its vibrations produced in a second. This number of vibrations will, of course, be in exact proportion to the strength of the electric current acting on the magnets, since the stronger the current the quicker will the bar travel from one point of shunting to another.

We now come to the curious feature of this device, namely, the process of playing a tune upon the single bar, a thing never before accomplished. We divide the current into eight branches as shown at *i*, corresponding to the eight natural tones of the vocal scale, including the octave. By a simple graduating method which may be called a tuning device and process, any suitable portion of this subdivided current may be directed over each of these branch wires to correspond with the different notes of the scale to be produced. Now, as the lowest note is produced by the weakest current, which causes the slowest rate of vibration of the bar, our plan is to allow but about one-eighth of the current to pass over the magnets through wire No. 1, which is done by pressing the first or lowest key of our scale-board, the remaining seven-eighths, or thereabout, of the current in the meantime returning to the battery without doing work. To cause the bar to vibrate more rapidly, and thus produce the next higher tone of the scale, the second key is pressed, thus shunting currents 1 and 2 over the magnets, leaving six branches to return their quota of electricity to the battery. And thus each note is produced by pressing the proper key, which sends the corresponding number of branch-currents over the magnets, by which their force and action upon the bar will be varied to suit the vibrational numbers of the different tones required for a given tune.

Having thus stated the general scope and nature of the invention, any scientific electrician with proper mechanical facilities could easily work out the details for dividing and shunting the current as intimated, thus practically producing an interesting piece of philosophical apparatus for the use of colleges, schools, etc.

It now only remains to explain as promised, the nature of the research which led us to discover this singular musical instrument. It is claimed by all acousticians who have written upon the subject of sound and discussed its higher mathematical aspects, that the air-particles in the supposed condensations and rarefactions of sound-waves have necessarily a *simple harmonic to-and-fro motion*, the same in all respects as that of the prong or string which actuates them. By *simple harmonic motion* is meant periodic motion such as that of the pendulum, which begins slow, gets faster till it reaches the center, then retards in velocity to the end of the swing, repeating the same order of movements in equal times. This is the kind of motion made by most, if not all, vibrating instruments which produce tone, such as strings, prongs, reeds, rods, etc. Hence the claim that in order to produce sound-waves in air, they must partake of this same *simple harmonic movement* in the assumed to-and-fro motion of the air-particles, if they are thrown into waves at all. Believing as we do, from various considerations that no waves, with to-and-fro motions of the air-particles, are necessary to constitute sound, we resolved to invent a method of generating sonorous pulses by a kind of motion the exact opposite of the simple harmonic principle, namely, a motion commencing slow and getting swifter and swifter to the end of the swing, then repeating the same periodically. This we accomplished in the device we have described, by the pull of the magnet, which necessarily increases in force and velocity the nearer the approach of the bar (*A*) to

the pole of the magnet. As the air-particles in a sound-wave, according to the wave-theory, can only move by the law of *simple harmonic motion*, and as they must necessarily partake of the same kind of motion as that of the instrument which actuates them, as distinctly taught by higher acoustics, hence the tone radiated from our electric bar cannot be caused by the to-and-fro motion of air-particles at all, its movement being on a principle of vibration entirely different from that of *simple harmonic motion*. Will Prof. Stevens, of Packer Institute, Brooklyn, and Prof. Mayer, of Hoboken, give their special attention to this knotty problem, and explain how it is that sound can consist of air-waves, in total defiance of the law of *simple harmonic motion*? When they shall have failed to explain it, Substantialism will stand ready to receive them with open arms.

AMBITION FOR LONGEVITY.

OF the physical possessions of which man may be justly proud on earth, *longevity* stands prominent in point of grandeur and sublimity. It implies, in the first place, an unusual measure of good health, and the two together make up the recorded historical evidence of a life of moderate indulgence in the pleasures and gratifications of the appetites and passions, with temperance in the use of food, drink, exercise, pastimes, and work, mental as well as physical. Few persons find it easy to control themselves from childhood up to mature manhood or womanhood without serious impairment of the physical organization, by either over-work, over-play, or the over-indulgence of some appetite or propensity. Self-control is, therefore, the true key to longevity and to the grandeur of true manhood and womanhood, and which forms the high standard of that physical, social, and moral excellence to which humanity may rightfully aspire. Unfortunately, the vast majority of the race, as maturity approaches, or even in earlier life, are tempted to discount longevity at a fearful rate, by adopting the motto of the epicure: "Live while you live, and seize upon the present pleasures which are *sure*, rather than barter them, by self-restraint, for those of the future, which are *uncertain*." Not one man in a thousand of the young or middle-aged possesses enough ambition for good health and longevity to induce him to forego any present gratification in view of the prospective indemnity from pain and fleshly ills which such self-denial guarantees in old age. This comes from a want of the true appreciation of the glory and grandeur which attaches to unimpaired longevity. With us, however, the most profound gratification is experienced in standing in the presence of an aged man or woman who is free from dotage or physical decrepitude. We are proud of such a sight, and contemplate the hale nonagenarian who stands erect and in his right mind with a feeling of awe and sublimity akin to that which one feels in looking at an ancient castle or cathedral, against which the storms of many centuries have beaten in vain. Nothing affords us such refined pleasure as to look upon one who actually lived contemporaneously with Washington and Jefferson; and we have gone many miles to enjoy the majestic sensation of shaking hands with a veritable centenarian. We are surely not alone in this reverential feeling of esteem for the aged. We believe that thousands feel the

same, and that it will always be thus, even among the youth of our land, for we were always similarly infatuated with the idea of great longevity in man since our earliest recollection.

This feeling of veneration and respect for the old does not arise necessarily from our horror or dread of dissolution, but, as before hinted, from a feeling of wonder and awe, such as inspires one's soul standing in the presence of Cyclops. Realizing this reverence, therefore, within our own bosoms toward the aged, should not a feeling of selfishness, if nothing nobler could come into play, induce us so to cultivate and husband our mental and physical powers as to attain great age, if possible, and thus add to the gratification of friends by our own venerable presence. Sir James Paget closes his able address before the recent International Health Exhibition, by the remark that "*We want more ambition for health—a personal ambition for renown in health as keen as is that for bravery, or for beauty, or for success in our athletic games or field sports.*" Yes, and we may add—"ambition for health" most of all for what health legitimately leads to if fully utilized, and barring accidents, namely, the proud distinction and satisfaction of having personally achieved a full century of time, while still capable of enjoying the pleasures of life, to which we conscientiously believe men and women normally entitled by charter-deed from the priceless treasury of Nature. In pursuance of this belief in the normal possibilities of the human organization, some of our own articles in *THE MICROCOSM*, as well as those of our contributors, will hereafter add their influence. Preliminary to health and earthly longevity in a marked degree belongs a proper understanding of the fundamental questions of food, drink, raiment and exercise.

And finally, and superior even to the laudable desire for health and physical longevity, is an ambition for the longevity of one's influence and reputation for having been a benefit to mankind during one's life-time. Of all the ambitions of an earthly character, that stands highest for moral excellence which looks forward to an imperishable monument—one which will stand recorded in history's page to prove that the subject thereof had lived for a purpose, and that his life had been of permanent advantage to his race. To live to a full hundred years we confess to having been a high ambition of our own, and one which we regard as worthy of calling forth our best powers and the exertion of our greatest ingenuity and self-watchfulness; but far higher than this is that aim of life which all should cultivate, to carve one's name upon history's inerasable page, and to stand there remembered by posterity as a real benefactor to the generation in which one may have lived. To achieve something during a lifetime which will elevate the race to a higher plane, socially, morally, civilly, commercially, or intellectually, is such an ambition as can reconcile us philosophically to resign the worn-out body to its mother earth when the time shall come, even if no other immortality than that of the *positivist* were possible to man. But add to this the most sublime ambition of all—that which looks forward beyond earthly attainments and results to an *immortal longevity* which will continue to invigorate the living soul when parchment and marble monuments shall have crumbled to

dust and ceased to be! That is the longevity of the eternal ages to which the Substantial Philosophy points its prophetic finger, and to which its adherents may look forward with an ambition radiant with jewels that will out-scintillate a crown of stars. This really *positive* immortality causes that of the *positivist* to pale its ineffectual light, while the *substantial* longevity involved is what the new philosophy holds out to its adherents as the legitimate aim for their highest earthly ambition.

THE NATURE OF ODOR.

BY REV. F. L. NAGLER, D. D.

DR. A. WILFORD HALL:

In "*Recreations in Astronomy*," page 255, we read the following: "A grain of musk gives off atoms enough to scent the air of a room. You detect it above, below, on every side. Let the zephyrs of summer and the blasts of winter sweep through that room for forty years, bearing out into the wide world miles on miles of air, all perfumed from the atoms of the grain of musk, and at the end of the forty years the weight of that grain has not especially diminished, though uncountable myriads on myriads have gone."

Now, these *facts* are not to be disputed; but is the *explanation* unquestionably correct? I should like to ask the Editor of *THE MICROCOSM* whether *odor* is a material part of the substance or of the body from which it comes; and how do we *know* it to be matter? A bell, for instance, may give off *sound* pulses for forty years and not diminish in weight, because sound is not a material part of the bell's substance. May not the same be true of the grain of musk and its odorous emanations? I am inclined so to think until the opposite is proven. Please give me and the readers of *THE MICROCOSM* light on this subject if you can.

Did you notice the able article on your work by no less a scholar than Dr. O. Zoeckler, in the *Beweis des Glaubens* last spring?

PORTSMOUTH, Ohio.

REPLY TO THE FOREGOING.

Of late we are becoming somewhat mixed, so to speak, or undecided, as to the true status of odor among the demonstrable substances of nature. Prof. Tyndall, Dr. Carpenter, and most other physicists have held the old view that odor is constituted of the material particles of the odorous body, and which are so very minute as to be practically imponderable, and to pass off through the air by some law of diffusion which enables them to come in contact with the nasal membrane, and thus produce the sensation of smell. Such has heretofore been our own view; but this very uncertainty, as now emphasized by Rev. Dr. Nagler's argument, we regard as of the utmost value to science, and especially to the Substantial Philosophy, since it shows the existence of a confessedly entitative, semi-force which, whether material or not, can be nothing less than a real substance, and which no mode-of-

motion theory, however construed, can explain. The fact of its almost infinite tenuity, as proved by this limitless diffusion of the sensuous particles from a grain of musk, makes it almost impossible for us to believe it to be a material substance, while its limit to the conditions of material obstacles, penetrating or passing through no solid body, as so readily done by other imponderable forces, makes it equally difficult for us to accept it as a purely immaterial entity. Would it not, therefore, be the most rational conclusion for us to accept odor as the *missing link* connecting the material and the immaterial realms of substantial entities, and, as we had occasion to remark recently, the *natural bridge* intended by an Allwise first cause to form the pathway for man's intellect to direct him from the material *here* to the immaterial *hereafter*? That it constitutes not only the borderland of material existence but the very arch that spans the chasm separating material and immaterial substances, we are strongly inclined to believe; and we repeat that the very problems and mysteries involved in the process of reaching this central avenue to human intellect among the *five senses* is well calculated to call out discussion and investigation, which in any possible event can only tend to reinforce, strengthen, and, finally, confirm the general truth of the Substantial Philosophy.

TELLING INDOORSEMENTS.

Rev. J. S. Smith, Waldron, Mich., writes us:—

"I am a 'Substantialist' physico-theologically from center to circumference. Your Substantial Philosophy strikes this scientific nineteenth century with all the cogency, lucidity, and originality of a new revelation from the invisible but substantial spirit-world. May the choicest benediction of Heaven rest upon you in your valuable labors."

A FRANK WORD FROM PROF. JACKSON.

"DR. HALL:

"MY DEAR SIR,—I write to know if you publish 'The Nature of Sound' separately. 'The Problem of Life Here and Hereafter' is a somewhat bulky volume, and I wish to have the examination of the 'Wave' Theory interleaved if I can get it issued apart from the chapters on Evolution.

"It is needless to say how charmed I have been in the perusal of your immortal work. Such an exhibition of free and independent research, I hold, does not exist in the scientific world of modern times.

"That I read the chapters seriatim through and through and never paused till I reached the last word of the last page is saying very little.

"Being an Englishman of a somewhat determined type, I have not rested with the reading and digesting of your incontrovertible arguments. Every scientific student, every intellectual friend, almost every intelligent neighbor

has been attacked by me on the points of 'Creation! Evolution! and Undulation!'

"Several have been so roused that they have purchased the book, and Mr. Mayne here informed a young student friend of mine whom I have all but converted to your views, that he had sold about one hundred copies of your marvelous work—*The Problem of Human Life*.

"I have already made arrangements to deliver a lecture on 'Sound' this coming month, and I do not intend the ball, once set in motion, to stop rolling if any effort on my part can keep it going.

"Have you any agent in Ireland or England for your MICROCOSM? Will you kindly send me a specimen copy of last or this month, for which I inclose stamps?

"And now allow me to sincerely thank you for the book which, amongst all scientific productions, has afforded me the highest delight.

"I have indeed reveled in its pages, arguments and exposures, and I anticipate in a second and third reading to reap two other harvests of similar if not equal enjoyment.

"I remain, my dear sir,

"Yours faithfully,

"JOHN JACKSON.

"THE SCHOOL, Belfast, Ireland."

ERRATUM.—In noticing Dr. Mott's lecture last month, and in speaking of the various scientific positions held by him, we inadvertently made him Professor of Physics in Columbia College. It should have been Professor of Chemistry and Physics in the New York Medical College and Hospital for Women.

By the way, let no reader forget that we have now a full supply of Dr. Mott's sensational book on Sound. The price has been raised by the publishers to \$1 per copy; but as we promised to supply it free, as a premium for a single subscription to THE MICROCOSM, etc., or for 50 cents cash, we will continue to do so till further notice, even though we may incur loss by so doing. Those wanting this beautiful work at such trifling cost had better embrace the opportunity while it stands open.

THE WAY IT IS VALUED.

We have had more than three hundred letters from subscribers during the present volume, thus far, declaring in one form or another that they consider any single number of THE MICROCOSM worth the year's subscription. Yet it is a suggestive fact that only four persons have volunteered to pay more than \$1 for the volume, while hundreds have kept back twenty-five cents out of the dollar on the plea of acting as agents. These are among the interesting incidents attending the career of a journalist. Oh! for the wealth of a Vanderbilt or a Gould, or a thousandth part of it, that we might send out THE MICROCOSM to all who would read it at the cost of postage, and thus spread the glorious truths of the Substantial Philosophy!

THE REPLY TO REPERT.

Captain Carter writes us with thanks for our defense of him against Professor Reppert's arguments, and thinks the Kentuckian's batteries silenced for all time to come. Should he open fire again, he will hear from the captain himself.

WILFORD'S MICROCOSM.

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THE FIRST RESURRECTION AS VIEWED FROM THE STANDPOINT OF THE SUBSTANTIAL PHILOSOPHY.

BY REV. J. I. SWANDER, A. M.

The "Resurrection of the Body" is a problem of science no less than an article of faith. If not, theology, the queen of sciences, has been meddling unwarrantedly with a question that does not fall within the compass of her proper mission. We arise to defend the queen against the unreasonableness of any such insinuation. If God has revealed one truth to faith and another for the investigations of science in such way that each is to be kept partitioned off from the other, then man has nothing to do in matters of religion, except to shut the eyes of his rational inquiry and judgment, and open the throat of his credulity for everything that claims to be an utterance from some supernatural oracle of revelation. Such a position is not for a moment tenable. Eschatology opens its gates for all the legitimate inquiries and investigations of Christian science. Reason, when accompanied by its proper guide, may enter the very Eden of revealed truth, and without danger of eating the forbidden fruit, proceed to pluck the rarest and the ripest clusters from the vines of God.

Perhaps there is no season in the whole year more opportune for a profitable discussion of this topic than during this present and passing Easter-tide. Now, as if by common consent, the whole world of Christendom turns its faith and affection toward the vital Keystone in the grand arch of Christian hope—the resurrection of Him who, by his own such signal victory, demonstrated the solution of the world's most interesting problem, proclaimed himself as the omnipotent Saviour of men, and heralded his own imperishable fame as the greatest philosopher in the high school of the universe. Well may we rise in the buoyancy of rational faith, and pour the music of our gratitude and hope before the throne of Him who by his own inherent power dispersed the darkness of the grave, became the first-fruits of them that slept, and carried our humanity within "the crystal ports of light, to dwell in endless bliss."

The subject now about to come under a limited discussion cannot yet be fully mastered in the way of a clear and complete apprehension of all that it involves. It belongs properly to the science of theology, which, while it reflects light upon its sister sciences, is sometimes obliged to wait upon the slow progress of its auxiliaries. Anthropology and pneumatology are among the vestal virgins lagging sluggishly along with lamps whose light is indispensable to the final solution of some problems not found properly within their domain. The advancement now being made in some of these more secular sciences will contribute largely toward a more perfect theory of the resurrection. In this advance movement the Substantial Philosophy is now taking the lead. The views hereinafter expressed are largely on a line parallel with its claims, which in some

particulars are in harmony with the teachings of the lamented Dr. Frederic A. Rauch, who was probably the greatest anthropologist that ever taught philosophy in an American college.

The first step toward a scientific solution of this question is to secure a clear and distinct perception as to what constitutes the *body*. It was the old orthodox idea that the resurrection body is the outward frame composed of various material substances, and that it would be raised from the grave by some sort of synthetic process in miraculous chemistry. This section of the old theology, like our outward tenements of clay, is now fast passing away beyond the power of resurrection. It was born under the reign of a materialistic planet, and has managed to live through the past materialistic ages, but can no longer command the respect of thinking men, since the light of a more *substantial* luminary has made its appearance in the scientific heavens. It has been weighed in God's great balance and found wanting. If theologians had not been blind to the existence of an unseen universe, the idea would never have been born. Besides, it based itself upon the abstract power of Omnipotence. We do not deny the unlimited power of God, and yet we pity any "body of divinity" that has no organic conception of a concrete truth. We admit that Omnipotence might make a successful search after all the mummies in Egypt and gather up all the original ingredients of men whose material bodies have been analyzed in the chemistry of fire, but if this is what the creed of Christendom implies as essential to the resurrection of the body, our faith needs a tonic of the most powerful sort.

It is evident, therefore, that by this time and in this age of proper progress, both rational faith and Christian Science demand a more satisfactory conception as to what constitutes the essential body of a human individual. That the term *body* is applied in expressing our idea of this outward frame, and that it is a scriptural term used in the same sense we readily concede, but that the material of this outward frame is to be the subject of resurrection power we do not admit. It is, then, in order to inquire: "With what body do they come?" The answer is: "Thou sowest not that body that shall be;" and yet, "God giveth to each seed a body of its own." What is this "seed?" It is not merely the soul, for the soul, as but one side of man's being, does not build for itself a body, neither does it develop itself into a bodily form, any more than it can be the product of molecular motion or nervous efflorescence, as materialism teaches. The body is a life-principle originating in God, and, carrying with it the impress of its Great Original, involves the power—the *necessity*—of endless continuance in the identity of its individual being.

The key to this interesting question, so far as philosophy can contribute anything toward its solution, is found in that tenet of Substantialism which teaches that there is a pre-existent, immaterial and substantial form or type for each and every individual in the organic world. In a modified sense, each human in-

dividual may use the language of the Second Adam: "A body hast thou prepared me." The heathen need not rage at these declarations, for the Psalmist taught such philosophy three thousand years ago. "Thine eyes did see my substance, yet being imperfect; and in thy book all my members were written, which in continuance were fashioned, when as yet there was none of them." Yes, "fashioned;" first in the all-comprehensive purpose of God, afterward by the plastic power ordained by God in man. This plastic power is not a material germ or starting point in the process of individual evolution, neither is it a mere mental germin breathed into embryonic nostrils at some instant previous to or during the period of gestation, but a life principle involving both mental and material possibilities, and a pattern holding its existence as an organized entity, and, as such, under God, the author of its being, whose will is the law of its well-being, proceeds to complete itself in the way of a two-fold development: viz., the inward, looking to the supersensible side of human nature, or soul, and the outward, as the putting on of this tabernacle, which on account of the poverty of the English language, is sometimes called "body." The organic union of all mental and physical entities and activities thus developed, constitutes *personality*.

Exceptions may be taken to the foregoing view, on the ground that the human individual is viewed as originating in a single principle of life, in apparent conflict with Gen. ii. 7, which is sometimes tortured to teach a ridiculous dualism and false anthropology. That God in the beginning used dust to form man, and that he continues to use some of the same material in building tabernacles for each human being, we do not deny, but that such dust is any part of man's essential being, sound philosophy cannot for a moment admit. While Substantialism proclaims that both immaterial and material substances enter into the constitution of each individual, it admits of but one source—a single divine thought, or "a drop of God's pre-existing substance, molded into a vital organism." This theory, or rather some of its unusual terminology, may be open to objections, yet we regard it, not only as having a tendency in the right direction, but also as already nearer the millennial truth than most of the accepted teachings upon the subject. "A dualism," says Dr. Rauch, "that admits of two principles for one being, offers many difficulties, and the greatest is to unite these principles in a third." A river may originate in two fountains, but individual life cannot. And because life cannot be scraped together it cannot be separated into parts.

We repeat, therefore, that this life principle, this immeasurable "drop" of the divine substance of which God creates an individual is of necessity the source of a being that must remain identically the same through all the possible stages of its development, and all the possible changes in its environments. It remains what it was while it becomes what it was not. In personality the original principle finds itself—awakens sooner or later to self-consciousness—becomes both the *subject* and *object* of itself, so that "the one cannot be separated from the other, because each one is the other." A person may lose an eye, a hand, and a foot, yea, all the timbers of the tabernacle may be taken down, and its curtains folded up and laid away forever, but the person is not destroyed. Con-

sciousness may (possibly) be suspended for awhile, but life remains with all that it essentially involves, because life is deeper than consciousness, sensation, or experience, the wide reign of Empirical philosophy to the contrary notwithstanding. The infant is a person, not in mere possibility, but in passivity—a man in search of himself. We believe in the *immortality of the person*, rather than in the immortality merely of the soul. It is clearly established. That which the material of the tabernacle could not give, it cannot take away, even though the frame should dissolve into a score of elements, and pass into numberless atoms of dust.

We, therefore, with some others deny that death is a separation of soul and body. It is rather a separation of the material body from its original type and pattern. But why should there be such a separation? Is not the power which clothed itself upon able to keep itself clothed? Is not the workman which built the earthly house of this tabernacle able to keep up repairs? At this point the discussion passes over into the sphere of theology. A new power has appeared to complicate the problem of human life, and make its solution more difficult. This power is sin; and whether it is regarded as something foreign to human nature, or a perversion of native powers, its presence and effects cannot be reasonably denied. Why sin was permitted to have an existence, is a question the discussion of which does not fall within the scope of this paper. Suffice it to say that finite personality, involving reason and will, involves also the necessity of rational choice. Choice involves the possibility of transgressing the divine law. Such transgression is also a violation of the law of human well-being. Sin was not, therefore, a necessity, but an indispensable possibility in the constitution of a being like man. Why such a possibility became an actuality in human history, is a question whose only answer is the record of a fact. To recognize this fact is essential to a successful search after the philosophy of death and the resurrection. Indeed, without such recognition the whole subject becomes an enigma, and the philosopher a fool. "By sin came death," and the first resurrection is the fruit of its antidote. The house is taken down and the constituent parts taken asunder, by the very power of this moral leprosy which makes the dissolution necessary. Sin, however, is something deeper than a cutaneous malady, and affects the tenant as well as the tabernacle. The old serpent strikes his fang into the vitals of our personality, wounds us in all the incipient functions of soul and body, and, because the pitcher is thus broken at the fountain, and the wheel at the cistern, the dust, not the proper body, returns to the earth as it was.

But while sin abounds unto death, there is an attribute of the Creator which reaches sinful man in the form of grace, and much more abounds unto eternal life through Him who is the resurrection. The first resurrection roots itself in the person of the man Christ Jesus, who alone hath such immortality, and who by virtue thereof abolished death. In Him humanity not only escapes the ultimate consequences of sin, but also attains that true dignity and glorious destiny which never could have been reached, with or without sin, by all the possibilities and powers lodged constitutionally in the first Adam. But sin having entered as the incipency of death, the grand problem

of man's proper destiny involved the necessity of his redemption. Such redemption was possible only in the reorganization of the race. This reorganization is a real creation—not on the outside but in the very bosom of the old creation, that the essential substance of the old might be incorporated in the new, and the identity of the race be continued. The beginning of this Creation of God is "the Lord from heaven"—"of one substance with the Father." The incarnation was the hypostatic union of this divine substance with the essential substance of man, and yet in such a way as to perpetuate human nature as something distinct from the divine. This theory of organic redemption is fast coming to the front, and is already making room for itself upon the stage of the scientific future. The old doctrine that the Son of God became man, principally to make it possible for God to satisfy his justice and exhibit his consistency, by laying the lash upon the shoulders of one who was able to endure the Father's punishment at the pillory of a father's vengeance, did very well in those dark ages when the wave-theory of sound and other vagaries prevailed in the sphere of science; but it cannot stand before the vigorous investigation now being made by a philosophy which proceeds according to a more organic mode of thought in search of a more enduring substance.

We repeat, therefore, that whatever there is of a blessed or first resurrection for humanity hinges not on some colossal stride of God's abstract omnipotence, but roots itself organically in the last Adam. It is in Christ, not merely as a fruit of his own personal victory over death, and his consequent ascension into the higher sphere of glorified humanity, but also and rather as a fountain of substantial sinless life for each individual in organic union with him who is the "quickening spirit." Thus "in Christ shall all be made alive," because "the quickening spirit" begets a substantial spiritual body in the very womb of the psychical or inward type which we, in this paper, have tried to define. "There is a spiritual body." It is not merely the immaterial body, which, according to Substantialism, is the inward pattern of the outward and material, but the inward body quickened and made spiritual in virtue of a personal life-union with the Second Adam, which the science of theology calls regeneration. In this new relation or translation to Christ, the life-principle or body of the individual does not lose its identity, but begins to unfold *normally*, according to a different law of development, even "the law of the spirit of life in Christ Jesus, which makes it free from the law of sin and death." At the very moment of such regeneration "this mortal" begins to "put on immortality," and, therefore, when the earthly house of this tabernacle is dissolved the new Adamite is clothed upon with his habitation which is from heaven. "God giveth it a body as it pleaseth him." "To each seed a body of its own." This body, though "celestial," will be material. It cannot be otherwise. We would not be unclothed—indeed cannot be, until a life-principle can be divided against itself without creating an absurdity in science.

It is scientifically settled, therefore, that the resurrection body involves the necessity of its being identical, perpetual and material. No thanks, however, are due to the materialistic philosophy as such. Substantialism is the key to the problem. Before its rising light, the

difficulty of the question begins to flee away. If the same life-principle, by the workings of its plastic power through the period of gestation, complements itself in an outward body, develops that body through the periods of infancy and youth, and, without exchanging, changes it a dozen times in fourscore years, why should it be thought a thing incredible that the same body should retain its identity and perpetuate its demand for materiality through that one final change, when all that is mortal shall be swallowed up of life, and the immortal clothed upon with its heavenly habitation? Men may take exception to this teaching. They may call it Swedenborgianism, and thus betray their ignorance of what the Baron actually did teach. Such caviling is much easier than to write a treatise upon the interesting subject. For our part, we expect neither carnal notoriety, church discipline, nor glorious martyrdom, for announcing right here that we do not believe in a resurrection of flesh and blood; and we charge nothing whatever for the very valuable information hereby furnished to all materialistic philosophers and theologians, that the field of eschatological science can never fertilize itself with bone-dust.

The only question remaining to be touched upon in this paper is *when* shall the last psychical change take place in the history of each Second-Adamite. Down to this time, the weight of theological sentiment, as formulated in the confessions and taught in divinity schools, has favored its postponement to some unknown future period, when the dethronement of death and the aggregate rising of the dead is to constitute the grand and final act in time's great theater. There is now, however, a gradual breaking away from all such interpretation of Scripture. Many believe that the doctrine never had any fellowship with the truth. As soon as an individual becomes a member of the Second Adam there is a beginning of the process by which "this mortal shall put on immortality." The more loyal and obedient hearts in the Redeemer's family are beginning to rebel at the senseless thought that any part of man's real being must go down into the grave and sleep away unnumbered years in the cheerless chambers of sepulchral solitude. What saith the Scripture? "We all shall not sleep, but we shall all be changed." (New Ver.) Who are included in this "all"? The address of the Epistle (1 Cor.) defines the limit of the promise: "All that call upon the name of our Lord Jesus Christ in every place." This idea of a "change" is making room for itself in the more organic thinking of Christendom. Scientific faith holds that the "change" is the consummation of a process going before, as much as the commencement of, the second and more excellent volume of human life. The hour "cometh" for some, "now is" for others; and, notwithstanding the merited condemnation of the heresy of Hymenaeus and Philetus, who will dare to say that for some others it is not "already past"? This is the first resurrection as viewed in the light of the Substantial Philosophy. Blessed and holy is he that hath part therein.

FREMONT, O.

As important changes in terms, club-rates, premiums, prices of books, and other offers will be made at the commencement of next volume, those desiring to take advantage of present prices will examine 8d page of cover.

HALL & CO.

INQUIRY INTO THE THEORY OF LATENT HEAT.—No. 4.

BY PROF. E. A. LUSTER, A. M.

In the former articles we have aimed to place just enough of our view before the public to appear plausible, and thus cause an examination by more competent parties. The object of the present and final paper is to examine the relation between the theory of latent heat and the modern definition of sensible heat.

In Steele's Physics we read: "Heat is motion. The molecules of a solid are in constant vibration. When we *increase* the rapidity of this oscillation, we heat the body; when we *decrease* it, we cool the body." This may be taken as a fair statement and explanation of the present theory of heat.

Again, further on, p. 187: "It must not be supposed . . . that the sensible heat which becomes latent is lost. It is occupied in doing work, as in neutralizing the force of cohesion and in overcoming the pressure of the air which opposes expansion."

It is clearly claimed that latent heat exists in some form. At one time it is called motion—not that which *causes* motion, but motion itself. At another time it is called force, whatever that may be. Now, if the vibration of the molecules and the force which causes this vibration are both heat, then are cause and the effect the same thing. Also, if this mysterious force is powerful enough to vibrate the molecules of a piece of steel, why could it not reach out and vibrate the molecules of a body at a short distance from the steel? But if this force is so powerful, and so distinct from vibration, why have any vibration in the theory? Why imagine some ethereal, heat-bearing element pervading all space? Why not say this force, like that observed in magnetism, constitutes both the power and effect? That is, we feel the power of the magnet pulling us toward it; we feel the power of the fire penetrating and tearing asunder the atoms of our bodies—a sensation we call heat.

If heat be strictly a *motion* of molecules, in what sense can latent heat differ from sensible heat? Are the vibrations of latent heat slower than those of the normal state; or are they of different amplitude? or do they move in different directions? When heat is said to become latent, is it that the *vibrations* enter the body, or does simply the *effect* of these vibrations enter and become latent? When these vibrations enter, do they cease to be vibrations and become force? If the effect enters, then just what is this effect? Then, when the latent again becomes sensible, does this effect change back to motion? The molecules of matter are said to be held apart by latent heat; is this done by stronger vibration?

For instance, a piece of ice at 0° C., is melted; 80° heat are said to enter, and hold the water in solution. Do the molecules of the water vibrate faster or with more amplitude than those of the ice did? They are said to be farther apart in fluids than in solids; then either this increased amplitude or some substantial power must cause the distance. Suppose the cause to be the second of the two. Then, when the water is again formed into ice, does this power become vibration? Or, if we suppose the first cause, then does the vibration become power? Now, which is the *prime* agent—this mysterious force or the vibration

of molecules? If force be the prime agent, then heat is simply an effect. Now, could this effect be independent of the force which generated it, so much so as to exist in another body without force and actually produce force? For, according to the latent-heat theory, 80° of vibration, or effect, go into the ice and become force to change it into water; and when the water is to be turned back into ice, these 80° of force become vibration, or effect, again, and pass away. When the water is ready to freeze, what causes this force to become vibration? Does some power extraneous act on it? Then is this power heat or cold? But if the force in the water simply flows out to other bodies with less heat, then heat is not vibration or force *per se*, but an entity.

It does seem that a close examination of this motion theory brings to light so many difficulties that we are compelled to regard it with great suspicion. And besides all this and many other grave objections which can easily be produced, there is one fact alone which holds the theory from destruction as by a hair. Physicists have allowed themselves to *imagine* the existence of a heat-bearing, gaseous substance, they call ether. They have never, by their own confessions, been able to find any independent proof of its existence, though they have searched with the utmost diligence. They have been able to weigh and measure hydrogen, and other gases, but can get no clew to the bare existence of a gas producing such tremendous effects as heat. It would be much easier to prove the existence of heat in a condition similar to that of electricity, which is spoken of as a fluid. This would be to drop the vibration theory, and become the advocate of a doctrine very close kin to that of the Substantial Philosophy in THE MICROCOSM.

We have endeavored in this series of articles to state a few objections to the latent-heat theory with that degree of boldness the undertaking would seem to demand. With great respect for the noble army of learned physicists who have given us the results of their toils, we cannot but think that amongst their gifts of gold they have left some bits of dross. They would not have been human were it otherwise. We believe this theory of latent heat to be one of these bits.

Any objections made to the views of the author will be met with candor and to the best of his ability, hoping, though, that others may be inclined to form similar opinions with himself, and shield him against the hard knocks of the enemy.

FINCASTLE, Va.

CAMPING TOUR TO YO-SEMITE VALLEY AND CALAVERAS BIG TREES. No.—5.

BY PROF. I. L. KEPHART, A. M., D. D.

Two P. M. found us again seated in our wagon, and our first business was to cross the river. This passage was made on a rope ferry. The boat is made with square ends and flat bottom, after the plan of a common barge. A wire rope is stretched across the river at a height of about fifteen feet, on which run two large pulleys fastened in a frame. To this frame two ropes are attached which wind around a windlass attached to the boat. Then ropes pass around pulleys, one at the bow and the other at the stern of the boat, in such a way that by

turning the wheel attached to the windlass, the bow or the stern of the boat can be turned up stream at will. In this way the current is brought to bear against the side of the boat so as to propel it across the stream. The boat is provided with substantial railing on either side, so as to prevent accidents. Upon this craft we bravely drove our team, and in a reasonably short time the roaring Tuolumne River was flowing between us and our horses, and we were wending our way up Moccasin Creek. For some distance the road lies mostly in the bed of this creek, which, during the greater part of the summer, is nearly dry; but in winter is a wide, roaring, rushing torrent, and sometimes impassable. In this creek-bed the road is very rough, owing to the drift and cobble-stone.

After a drive of about three miles over this rough road we cross a bridge and arrive at Newhall and Culbertson's Vineyard, situated at the base of Rattlesnake Hill. Here we halt, water our horses (and ourselves) and take in a long breath preparatory to beginning the long, steep ascent. Presently we move onward. The afternoon is excessively hot, the sun lies almost vertically against the face of the immense hill, and for two hours—panting, sweating, roasting—we climb the steep, long grade. The road zig-zags, curves and winds around one point after another, affording, every now and then, grand views of the wonderful Tuolumne Gorge and the rolling hills on the opposite side of the canon, which, owing to the evenness of the dense chaparral with which they are covered, have all the appearance of beautiful and evenly-clipped lawns.

At 5 P. M. we gain the summit and draw up in front of Priest's Hotel. Here we water our horses and purchase hay for the night. We then move on, ascending some more hill, being on the lookout for a good place to camp. A mile beyond Priest's we come to the fallen trunk of an immense oak tree, from which the place has taken the name of Big Oak Flat. This tree is thirty-six feet in circumference near the ground. Here was at one time a rich mining region. A mile beyond the Big Oak we went into camp for the night, having seen plenty for one day, and being sufficiently tired to "sleep without rocking." From a Scotch rancher's well near by we procured water, and having cooked our jack-rabbit and quail, and prepared a substantial "square" meal, we sat down to and enjoyed our "tea."

Supper over, the dishes washed, the horses attended to, our beds were spread in the wagon, and we, weary, and feeling as if we were "quite a distance from home, and strangers in a strange land," lay ourselves down to pleasant dreams. Without any interruption we slept soundly until, as day dawned, we were awakened by the cooing and whistling of the quail in the dense clumps of chaparral. The Professor and I were soon on our feet, he to look after the horses and I to play Chinaman in the culinary department. In due time a sumptuous breakfast was prepared, the women had their toilet made and we were all seated around the table, dispatching the viands thereon with appetites wondrously keen. As our watches indicated half-past six we were all in the wagon, and at the word our trusty horses drew out in the direction of First Garrote, which we reached after one mile's drive, the second town of this name being two miles beyond the first. Only a few years ago this was a rich quartz-mining district, and still there is some

mining done in these parts. Here also the plumed partridge of California abounds in great numbers, and it is one of the most beautiful birds of flight and a great table luxury. These quail are not found in the vicinity of San Francisco, nor in the Coast Range Mountains, but are found in the foot-hills of the Sierra Nevadas and on the main mountain range as high up as 7000 feet, and as far north as the Columbia river in Oregon. Their color is ashy-gray, with a reddish chestnut brown on the breast and patches of the same on the sides. They are of stout build, larger than the quails of Iowa, and on the head of the cocks is a crest of two straight feathers about three inches long, turned backward. In habits, these birds are about the same as the quail in the East, and there are seldom more than fifteen or twenty in a flock.

The towns Garrote took their name in early days from the fact that the country here abounded with footpads who frequently garroted travelers and robbed them. Efforts have been made to change the name, but thus far without success. Second Garrote was at one time quite a town, but is now reduced to three or four houses. First Garrote is a town of some twenty or thirty houses, has a good store, post-office and a very fair-looking hotel. Having passed these towns, the appearance of the country changes. Leaving the mineral belt we enter the rolling hills of the higher timbered regions of the Sierra Nevadas. Five miles beyond Second Garrote we pass Sprague's ranch. This ranch lies in a small fertile valley, encompassed by pine-clad hills, and is well improved with good buildings and modern conveniences. Having passed this ranch the scenery becomes more beautiful and grand. After proceeding a few miles we find ourselves on a graded road that winds along a steep mountain side. In the gorge, two thousand feet below, dashing over its rocky bed, roars and foams the South Fork of the Tuolumne River, and in the distance we see a white speck against the dark, green mountain side which we are told is a waterfall one hundred feet high. Winding around the mountain side, we continue up the gorge, sometimes going at a clever trot; and, it being the "glorious Fourth of July," we all join in singing the "Star Spangled Banner," "My Country, 'tis of Thee," "Rally Round the Flag, Boys" and "Hail Columbia, Happy Land." About 11.30 A. M. we crossed the South Fork of the Tuolumne, and, a little above the bridge, we turned in for a Fourth of July dinner. The occasion being an important one, a special meal must be prepared; consequently, a fire was started, water was brought from the foaming, roaring river (clear as crystal and cold as snow), and the entire culinary department was unpacked. The women busied themselves at cooking, I stood by as "man of all work" and the Professor looked after the horses. The result was, in a reasonably short time our camp-table groaned under a load a sight of which would have started into lively activity the salivary glands of the most fastidious epicure. Soon the campstools were arranged and we were all busily engaged in partaking of the best as well as the most romantic Fourth of July dinner it had ever been our good fortune to enjoy. The mountain air, the out-door exercise, and the refreshing odor of the towering pines had wondrously sharpened our appetites, and we ate with a relish.

Two P. M. found us again all intact, seated

in the wagon and "driving on." About six P. M. we drew up at Crocker's (formerly Hodgden's) where we camped for the night, having traveled a distance of 24 miles during the day. Here we procured very good barley hay at a cent and a half per pound; and excellent milk at ten cents per quart, good butter also at 50 cts. per pound. In due time we had supper over, and in that beautiful grove of immense sugar pines we spread our beds in the wagon and lay down to sleep. During the night a gentle breeze began to sigh through the pines and every now and then one of the immense cones would fall and go skipping down the hill, sounding exactly like a man walking a fast walk. These cones are about three inches in diameter and from ten to fourteen inches in length. The Professor was sleeping soundly with our fowling-piece by his side, when one of these cones came tipping and skipping down among the limbs of the tree and dropped close to our wagon and then leaped away down the hill. The noise so far awoke him that he mistook it for a man coming to our wagon on a fast walk, and quick as a flash he grabbed the gun and sprang to his feet. But when fairly awake, he comprehended the situation and, feeling just a little "sold," put up his deadly weapon and lay down again.

WOODBIDGE, Cal.

P. S.—This is the twenty-seventh day of December. We have had a warm, drenching rain storm, lasting more than a week, and the streams are at flood height. To-day has been warm, clear and summer-like, but this evening it begins to threaten rain again. The grass is growing, and all nature begins to don her Spring garb.

W., C. Dec., 27, 1884.

POLITICAL ECONOMY.—No. 1.

BY REV. D. OGLESBY.

Political economy pertains to the social state, or to society. Man has a social nature, and this necessitates rules or laws for the regulation of society. Science is the classification of all known truths in reference to any given subject. Political economy is the classification and statement of the rules and laws that should govern society. Not the laws that *do*, but the laws that *should*. For, while society is a natural thing, laws for the government of society are artificial, or human. God makes no mistakes, but it is "human to err;" hence the endless wrangle in governing the world of society. Society is not an inanimate something, to be governed by fate. Being composed of intelligent beings, they are left to form laws for their own government. Man's nature demands society, and society demands law or government—hence PAUL tells us that the "powers that be are ordained of God." But while law or government is an ordinance of God, the kind of laws, or form of government, is to be determined by the governed. These words, used in the Declaration of Independence, viz.: "Governments derive their just powers from the consent of the governed," are true only in a qualified sense. It means this: The rulers are the servants of the people whom they govern, and cannot *justly* transcend the power delegated to them. But it is also true that no society or people can justly delegate to their servants or rulers authority or power to enact unjust laws. A man,

or society of men, cannot delegate what they do not possess. Every man has the power to do wrong, but he has not the right to do wrong. While it is absolutely necessary to have some kind of government (for society would destroy itself without), it will be seen by the foregoing that the government must be established on the bed-rock of justice. Any political science that falls short of this must fail. The old doctrine that every one must "give up some of their natural rights," in order to form a government for all, was never true. Man, having a social nature, in order to his highest development and greatest happiness, civil government was "ordained" of God, but not the form. This is left for society to determine. Government must of necessity be adapted to the condition of society. The lower the state of intelligence and morality, the more rigid must the laws and government be. The higher society rises on the plane of intelligence and morality, the less need of government. Inspiration tells us "the law (or government) is made for the lawless and disobedient, for murderers," etc. Good men, of the highest order of intelligence in our world, don't need much governing.

As a foundation upon which to construct a correct system of political economy, we lay down a few facts or principles as self-evident:

1. Each and every person born into this world has the same and equal rights in it as any other.
2. Each one has the same right to the fruit or result of his labor as any or every other.
3. Each one has the same right to the free use of the free gifts of God his Creator as any other.
4. No man, nor combination of men, have a right to deprive any other man of his God-given rights.

A member of society may, by the commission of crime, forfeit his natural rights or his life, but society nor government cannot deprive him of them justly unless he does forfeit them.

The great mistake of writers on, and framers of, political structures, has been an effort to ignore the moral economy or government of God. They assume that there is no connection between politics and religion. While they may believe that man is individually responsible to God for his acts, they do not believe that corporations, societies or governments are. They assume that civil government, out and out, is a human invention; that society by agreement makes governments, and of course by agreement can unmake them. But we reply, that while it is left for society to determine what form of government they will have, they cannot decide to have no government at all. The Creator has so constituted the race that government by law is a necessity. No government is anarchy. Anarchy would be destruction to the race.

Civil government being ordained for the government of society, the moral for the government of the individual, hence it follows that they must harmonize.

The moral being God's government, and of course superior, the civil must not conflict with it.

The moral is the law between man and his God. The civil is the law between man and his fellow-man. They are wheels within wheels. No correct system of Political Economy can be constructed that ignores the moral. It is the greatest factor in the problem. "If iniquity be

framed into law, what can the righteous do? This is the disturbing element that produces turmoil, wrangling and trouble in society everywhere.

Isaiah tells us that the "Nation or Kingdom that will not serve God, shall be destroyed; yea, those Nations shall be utterly wasted." Nations have ever been on probation as well as individuals, and very many have forfeited their right to existence, as the wrecks strewn all along the stream of time prove.

Where are the great cities of earth—Babylon, Tyre, Sidon, Nineveh, etc.? Who were the mound builders? Where are the Nations that once flourished so grandly in Central and South America? Echo answers, Where?

RICHVIEW, Ill.

THE DOCTRINE OF ELECTION.

BY REV. M. STONE, D. D.

This theological term is descriptive of God's choice of a nation, race, family, or individual, for his use or service. We cannot conceive of him as a free, rational, intelligent being without this liberty of choice, and without the use of that liberty. It is inseparable from the nature of rational beings. All men use the liberty of choice, and there can be no possible objection to it, unless the choice is vicious. Theologically there never has been any objection to it except when that choice takes the form of predestination. All seem to be agreed that choice is well enough among things that differ, when the preferable qualities are discovered, and it would surprise every one (even if it did not excite a worse emotion) to see the worse chosen after it was detected, and we always expect to see the choice determined just as soon as the preferable qualities are discovered. We should then expect confidently that God would decide in favor of that which is best as soon as he knows what is best. Now if God knows everything, is omniscient, as he claims to be, we should expect him to exercise choice of the best of everything whenever he knows all about it. The subject then resolves itself into the single question, is God now, and has he always been, omniscient? If so, then we are prepared to accord to him the right to have a settled plan even from eternity. This is the very ground upon which his predestination is said in the scriptures to rest. Whom he did foreknow he also did predestinate to be conformed to the image of his Son, that he might be the first born among many brethren. Moreover, whom he did predestinate, them he also called; and whom he called, them he also justified; and whom he justified, them he also glorified. What shall we say, then, to these things? All men are inclined to do to the extent of what they think they foresee. Merchants study the markets, and buy when, where, what, and how much they think can be made profitable. And he is the successful merchant who foresees best, and adjusts his purchases to the incidents of trade, and he would be perfectly successful who could foresee infallibly.

We compliment foresight, not blame it. We blame the man who does not look ahead, or who chooses foolishly what he ought to have foreseen must prove disastrous. Farmers always predestinate their crops—that is, they choose the field for each crop, with reference to

what they foresee. Any man who does not look ahead and predestinate on his best foresight, is rated a fool. The successful general is the man who studies the character of his adversary, and his probable movements, and adjusts his own by what he thinks he foresees. This provident foresight is the very thing we call talent.

It is that to which we bow down, and to which we erect monuments to commemorate the achievements of our great men. Intelligent predestination is the very element that constitutes greatness in men. Little men sometimes censure the plans of great men, till the outcome proves them right. Children often think their parents foolish, because they lay plans that seem to them to be unwise, or needless, but when their own minds have been chastened by experience and observation, they know there has been a fool somewhere, but they excuse their parents. Even fools who criticise the plans of others, do it on the supposition that they themselves can see further into the future than he seems to, whose plans they condemn. Every intelligent move we make, is the offspring of a supposed foresight, election, predestination. Every purpose of ours is of the precise nature of that which is so bitterly hated and condemned in the character of God, in the Bible abundantly taught. Many a man, if he dared, would eliminate many a passage from the Bible, that manifestly contains this doctrine. Rom. viii. 9 and 11, and Eph. 1st chap., would not abide their criticism, because they teach what is not in their creed. These very scriptures teach just what is *their own* most highly valued attribute, as being exercised by God. Before we can with any propriety complain of God's election, we need to know all that God knows, and then be sure that we can make a better plan to meet all the exigencies that may arise. In other words, we need to become God, and be able to give him a lower place, so impudent is this critical theory. It is astonishing impudence in poor short-sighted mortals, to call in question the right of God to look ahead, and predetermine in this complicated universe. What sublime folly to suppose that this vast system of worlds could be managed by an extemporaneous process. Who that has learned the A, B, C, of astronomy is not prepared to be glad that God geometrized before he put this vast system of worlds into motion? What disasters might not have involved the complete destruction of millions of worlds, had not God foreseen the possibilities that must attend the movements, weights, and velocities of such vast bodies running wild. He foresaw these possibilities, and prudently, and wisely, predestined weights, magnitudes, velocities, distances, directions, and relations so exactly that for thousands of years they have whirled without collision and variation of a second of time. Their exact place can be determined a thousand years beforehand, or a thousand years in the past, as is perfectly proved several times a year by the occurrence of eclipses at the predicted moment. Has God employed all his foresight in the management of brute matter? Did his mechanical taste so far prevail over his moral, that he would leave the moral world to chance, or to the caprice of fallen men and infernal spirits? Nonsense! God made man and endowed him with a voluntary nature, and placed before him incentives, adapted to move him, and to induce him to obey the right and the true. Man feels that he

is free; his neighbors treat him as free; Satan treats him as free, and God addresses him as free. What other witnesses can we bring to disprove it? It has sometimes been said that if God has predetermined his future, his freedom is taken away.

We shall see that that does not necessarily follow. The Godward and manward relations may reach out beyond our present comprehension. We are compelled by our own consciousness, and by that of everybody about us to admit that our choice is unconstrained, except by vicious affections for which we feel to blame, and everybody else blames us too. God's freedom to choose is taught in nature as well as in Scripture, and in our own consciousness; but just how these two things can co-exist, we may not know, but we know this just as well as we know a thousand other things which we act upon continually. If we knew all that God knows, we might see a perfect consistency of the two facts. He had too much at stake in man, to risk his destiny without a plan. His plan never interferes with the freedom of men in drawing them after him, and when they perish they do not perish in violation of their freedom. It is the use of their liberty that destroys them. The sagacious parent or teacher, often detects the dawnings of mischief in children, and lays plans for treating them, but that does not interfere with their freedom, or diminish their guilt, or impeach the justice of their punishment, because it has been foreseen or anticipated.

A sagacious police-officer or detective often foresees a whole chapter of the plans of villains, and is able to lay his plans to detect, apprehend and bring them to punishment. His foreseeing, or his predestination of his punishment, or other treatment has nothing to do with the free plot of the villain, nor does it impeach the punishment when it comes upon him. So God's perfect acquaintance with the character and acts of men beforehand has nothing to do with their voluntariness. "Whom he did foreknow he did predestinate." It is perfectly proper for God to decide what he will do in a case as soon as he knows all about it. We require the same of our magistrates when all the accessible facts are before them. The knowing beforehand has nothing to do with the perpetration.

Teachers often anticipate the success of a diligent pupil, and in mind predestinate a reward, all unknown to the pupil, and to everybody else. Is that unjust to a lazy pupil who habitually plays away and trifles away his time? Is it wrong in a teacher to determine what he will do with such students, when he has been with them long enough to foresee what they will both do? God's foreknowledge is the foundation of his decisions, exactly as those of a parent, teacher, or detective, only that his knowledge is perfect, infallible, which theirs is not.

Men have to wait to find out facts before they decide. God has all the facts before him. We never find fault with a manifested purpose, when the reasons for it are within the scope of our capacities and intelligence. We admire and approve a far-reaching anticipation of events, and a judicious preparation for them, and we call it sagacity, the farther the better. No doubt all our objections to God's predestinations would vanish could we but be let into all the reasons for them as he sees them. All our objections are the offspring of ignorance and conceit, and the utter-

ance of them is proof positive of a want of faith in him. Children often clamor against the predestinations of parents, guardians and teachers for the very same things for which they honor them in riper years, and build monuments to their memory. God's predestinations and sovereignty are often spoken of in terms of shocking impiety, as if even the Bible itself is not to be respected if it contains such doctrine. Says one, "Your God is my Devil!" That may sound very strange coming from the lips of a minister of an acknowledged Christian Church, but it had its birth, not in contempt of God, but in ignorance of God's reasons for election, and some thoughtless presumption, that God could have no reasons above his comprehension and intelligence. We elect our friends among a multitude of acquaintances, and possibly often when we could not give even to ourselves a very satisfactory reason for our choice; and yet there are doubtless reasons deeper than our consciousness. Shall we deny to Omniscience a liberty which we freely use? We mean, and do no harm when we adopt intimates among our acquaintances. Are we at liberty to suppose that God could have no reasons for choice, but such as we short-sighted mortals might know? Especially so when we know that mortals are endowed with conscious freedom of choice, and have an infinity of motives offered them, for accepting salvation, which they persistently neglect. Shall we condemn God for electing those who gratefully accept his offered mercy, and for leaving those who spurn it, to the fate of which he had faithfully forewarned them? God will have no subjects but such as have heartily elected him as their Guide, Leader, Friend, Saviour! His friends are such in the conscious use of their liberty, and the lost are such in the use of their liberty. No violence has been used.

The final sentence of the lost will be the confirmation of their own deliberate choice, "We will not have this man to reign over us." The sentence will be in substance, *Have your own way*. There is nothing in the Bible to indicate that God deprives any one of eternal life, nor that he saves any in violation of their liberty. "Every mouth will be stopped." Every man will be practically the author of his own sentence, it will echo his own choice. If God elects those who choose him, and rejects none but such as refuse him, who shall find fault?

If God's election embraces any other reasons, we are not informed of them and have no business to discuss them in our ministry. We are incompetent to judge them. These are the reasons he has put in the message which he gives us to declare, and we are authorized to be ignorant of all others, and may therefore be excused from troubling ourselves or our hearers with speculations about them—for nothing but mischief can follow such speculations. The fact of God's foreknowledge and predestinations, may be declared as facts, as our ground of confidence in his ability and intention to take care of us. Very many rush into metaphysical disquisitions, to clear up the relation of the sovereignty of God and the freedom of man, and another class rave against what is clearly revealed in the Bible as facts in respect to these matters, but left without explanation. Both are alike guilty of unwarrantable presumption. If God had thought it best for us to know all these things, he would have given them to us with his reasons. His silence should be a bar

to our interference with these speculations. We may preach what he has revealed. Very few young men enter the ministry, and remain long in it without attempting these profound mysteries. The writer, many years ago, was foolish enough to try it, but very likely convinced nobody but himself, and himself only, that it were better to let it alone altogether. If God must wait for men and devils to develop their plans before he can decide what his shall be, we should be in a sad case. Arminians have a strange God to rely upon, and therefore make large dependence upon their own purposes and perseverance. No wonder apostacies are very frequent with no better security. The God of the gospel knows all things, is everywhere, has all power, his plans are all laid and cannot be surprised. Though he chooses to conceal some of his plans from us, some of his counsels and reasons, he has given us enough to assure us that we may trust him for the rest till he shall see fit to reveal to us whatever else it may interest us to know in the clearer light of a higher sphere. "He that spared not his own Son, but delivered him up for us all, how shall he not with him also freely give us all things?" Every prophecy in the Bible is a proof of the doctrine of God's foreknowledge, and by consequence of his predetermination of what he will do in the premises. If there is anything that God does not know, that very thing may imperil the stability of either or both the moral or physical universe. Who knows what might spring out of that very thing?

Adam Clark once made an attempt to sweep away at a stroke the doctrine of election and predestination by disposing of his foreknowledge. A minister in South Carolina, as the story goes, undertook to echo his logic on this wise: God is omnipotent, that is, he can do all things, but there are many things he does not choose to do, so God is omniscient and can know all things, but there are many things he does not choose to know. When he descended a shrewd old negro approached him and put this question: "Massa, you tells us God is omnipotent, that is, he can do all things, but there are many things he does not choose to do. So God is omniscient, that is, he can know all things, but there are many things he does not choose to know. Will you please to tell us how he know what he want to know and what he don't want to know?"

If God should undertake to tell us all about himself he would very soon get beyond our powers of comprehension, so he has wisely limited his communications to such things as are needed to make us able to trust him, and such things as concern our duties here, and has reserved the rest for a period when we shall have assumed a body like his glorious body in the clearer light of heaven.

OMAHA, Neb.

PLATO AND PAUL.

BY J. W. LOWBER, M. A., PH. D.

Plato was born in Athens; Paul in Tarsus of Cilicia. Plato lived more than four hundred years before Christ, during the Peloponnesian war; Paul was contemporary with Jesus, and lived just after the age of Augustus. Plato belonged to the most intelligent race of the great Indo-European family; Paul was a He-

brew, the most advanced race of the Semitic family. The native language of Plato was Greek; that of Paul was Hebrew. Plato was the greatest of philosophers; Paul the greatest of preachers. Plato was great, but Paul was greater. The superiority of Paul to Plato consisted in the superiority of his profession to that of Plato. Had Paul never been anything more than a disciple of Gamaliel, he would never have reached a higher position in this world than did the disciple of the great Socrates. It was in the fact that Paul became a disciple of Christ, that he has wielded such an influence over the nations. His influence towers above that of Plato's as does a great mountain above the sea. The time has not been when Paul had as great influence in this world as he has at the present time. It is because the influence of Christianity is greater now than it has been in the past. The religious element in man's nature is the highest, and as this is developed by the pure religion of which Paul was the greatest advocate, the more powerful will his influence become as time passes.

It is claimed by some that Christianity was borrowed from the philosophy of Plato. How does it happen, then, that this religion rises so much above what has been called the divine philosophy? In nature, we know that a stream cannot rise above its source. If this position with regard to the origin of Christianity were true, the stream must rise above its source and contradict an established fact in nature. A miracle would, then, have to be introduced in order to account for the progress of Christianity, and for its universal spirit, in contrast with the narrowness of the Platonic philosophy. A careful study of Plato and Paul will convince any reasonable man that Paul had a source of inspiration far superior to anything known to the intellectual Greeks.

Paul had a knowledge of immortality unknown to Plato. Among the Greek philosophers, the Epicureans were Materialists, the Stoics were Pantheists, while the disciples of Socrates, Plato and Aristotle were believers in the immortality of the soul. The doctrine of Materialism was as ably presented then as at the present time; and considering the then condition of physiological science, the doctrine of immortality was as ably discussed by the Greek philosophers as by the philosophers of the present time. Philosophy has no new arguments to present on the subject. The distinction which Paul makes between the spirit and the soul was not clearly made by Plato, nor does philosophy at the present time fully recognize it.

The Christian doctrine of the resurrection gives immortality a force which was but poorly understood by the ancients. There is a great difference between the dreamy spirit-land of Plato and the eternal house of Paul, where will dwell in the countless mansions those who have been redeemed, body, soul and spirit. Paul clearly teaches that in the future state man will have a body. It will be incorruptible and perfectly obedient to the mandates of the spirit. We will be permitted to enjoy the whole universe—the heavens as well as the earth. While Plato's philosophy provides for the soul, that of Paul takes care of body, soul and spirit. We should not look with contempt upon matter, for these bodies have each a grand principle that will be associated with the spirit in the eternal state.

LOUISVILLE, Ky.

CORROBORATION OF "REMARKABLE INCIDENT."

BY COL. GEO. D. ALEXANDER, A. M.

I desire to corroborate the "Remarkable Incident" related by Col. Jno. M. Patton in the October number of *THE MICROCOSM*, as I was an eye-witness on that occasion.

The 83 Arkansas Regiment of Infantry, in which I was the captain of Co. I, had been ordered on our arrival at Charlottesville, en route for Manassas Junction, to forthwith proceed to Staunton, and thence march to the Greenbrier River and report to Brig-Gen. Henry R. Jackson, to prevent Gen. Rosecrans from crossing the Alleghany Mountains. This order was received with many an open murmur—and many a deep and low-muttered oath. We had left our homes in Arkansas and hurried with all haste to be in time to participate in the expected battle of Manassas. To be so sadly disappointed was too bad, and the regiment obeyed the order changing its destination with no animation and no *esprit du corps*. On the second day after leaving Staunton, we were marching leisurely along on that memorable Sunday morning, July 21, 1861, and had proceeded about half way up the steep mountain, some several miles southeast of the little village of Monterey, when the sounds of heavy guns in rapid succession broke on our ears. On our left and below us was a small valley through which a little stream flowed, and on the other side ran a mountain apparently higher and more rugged than the one we were ascending. The sounds seemed to come from this west mountain. It was perfectly evident a fierce battle was raging somewhere, and our men, previously sullen, became wholly ungovernable. They were wild with excitement, officers as well as men. An involuntary halt was made, and the command did not move forward until all guns had ceased. Conjectures at first were rife that the firing was caused by the Confederates opposing the advance of Gen. Rosecrans from the top of Cheat Mountain. Field-officers rode to Monterey to ascertain the truth of this supposition, while squads of privates straggled across to the top of the opposite mountain to have a better hearing of the battle. Officers returned and reported meeting with citizens coming from Greenbrier, who denied any advance of Gen. Rosecrans, and privates came back stating no firing was heard when they reached the top of the mountain. Yet it was then being distinctly heard by us. Soldiers of the rear guard came up from the foot of the mountain on which we were, and reported not having heard a gun where they had halted. It was perfectly evident to us that the sounds came from the north-east, across our mountain, and striking against the sides of the opposite mountain were echoed back to us.

It was strongly conjectured the firing came from an engagement between Joe. Johnston and Patterson in the neighborhood of Winchester. It never once crossed our minds that sound could rise above the Blue Ridge Mountains and be conveyed from so long a distance as Manassas.

After all firing had ceased, the regiment marched on, and encamped that night at Monterey. Two days after that, travelers from near Staunton arrived and reported not having heard

any guns in that direction. But some four days after the 21st a dispatch came from Major Harmon, Quartermaster at Staunton, announcing the battle and victory of Manassas. I was one of the excited witnesses of this incident, and no doubt over fifty of the survivors of the regiment are yet living to verify the statement.

I must differ with Col. Patton as to the distance. It was a subject of frequent discussion during all that year, and generally supposed to be some 110 miles. The late map of the United States, made from actual survey by direction of the Commissioner of the Land Office, corroborates this distance.

I am not sufficiently familiar with the configuration of the country between Manassas and this mountain to account for the distinctness of the sound made by those heavy guns—the Parrotts used in that battle. But I feel satisfied the position we had on that mountain must have been higher than any part of the intervening country, and naturally adapted to distinct echoes from the opposite mountain.

Another incident of the great distance sound is conveyed came under my own observation while stationed at Arkadelphia, Ark., in 1863. I was engaged in manufacturing powder at that post, and having occasion to have some timber cut on the highest part of the bluff ridges overlooking the Ouachita River, near that town, had ordered some workmen to perform the work, going with them myself. Shortly after I reached the place, we heard for several hours distinct sounds of heavy guns coming from the direction of Helena on the Mississippi River. I knew Gen. Holmes had marched there to attack that post, and was expecting to hear of a battle at any moment. I also knew there were no hostile troops between Arkadelphia and the Mississippi River. The firing was as audible and distinct as if the battlefield was not ten miles distant. That evening, when I returned to my office, several prominent citizens of the town informed me they heard the guns very plainly, while hunting on the same bluff ridges. Two days thereafter I was officially informed of the battle and defeat of Gen. Holmes, at Helena, the 4th day of July, 1863.

The air line distance between Helena and Arkadelphia is exactly 140 miles, and when we consider the country between the two places is generally low and heavily timbered, it is remarkable that sound should so distinctly have been heard so long a distance, and at no intermediate places between the Arkansas and Ouachita Rivers, about 80 miles apart. There is a high dividing ridge between the Saline and Ouachita Rivers, east of Arkadelphia, yet no one heard the battle from that ridge.

I have become a convert to Dr. Hall's theory of sound, and I give the incident merely to elicit from him some explanation of the causes that led to the hearing of those guns at that part of the country, while none were heard either between Pine Bluff on the Arkansas River, or on Tulip Ridge, 50 miles further west, or in the town of Arkadelphia, 20 miles west of Tulip.

It is well known the time of the day and the atmospheric conditions have a great deal to do with transmission of sound. I heard distinctly every morning, if clear and frosty, the roar of a water-mill as soon as it commenced grinding; an hour after sunrise, it could be heard only by painful listening. This mill was situated on White River, Ark., and distant 6 miles from

my house on the air line. It could not be heard in cloudy, foggy or damp weather.
MINDEN, La.

THEOLOGY'S GORDIAN KNOT UNTIED.

BY REV. T. WILLISTON, M. A.

The Bible represents God as having both a purpose and an agency that extends to all the doings of finite actors; and to some readers of that Book this union of a divine and human agency in one and the same act, or event, is a Gordian knot which, as they say, cannot be unfastened, but must be cut. Let us see whether it cannot be untied.

For one example of the twofold agency alluded to, let us examine what God says of Himself and of an Assyrian king in Isaiah x. 5-15. In verse sixth God affirms that *He "will send"* this king "against the people of His wrath" as a devastating invader; and yet in verse twelfth we learn, that when the Lord had, by means of this invader, executed His own avenging purpose on "Mt. Zion and on Jerusalem," He would "*punish*" this conquering braggart; yes, and what may at first seem utterly unjust, He would punish him for those very deeds of violence and devastation which he was divinely commissioned to perform! Now none will deny that in these devastating raids of the Assyrian king he was God's co-agent, a co-worker with the Lord in bringing about an event that the chief Agent had foreordained. By some, however, it is confidently affirmed that since this king was "performing the Lord's work on Mt. Zion and on Jerusalem," he could not possibly have been a free agent in so doing: God must, for the time being, and for the fulfillment of a certain purpose of His, have transformed Sennacherib into a passive machine! But if this be so, how are we to vindicate the justice of Him who said that after performing His whole work, He would "punish the fruit of the stout heart of the king of Assyria"? Would the "Just One" *punish* an actor who was, for the time being, only a passive, helpless machine? God forbid. Does not God's threatening to punish this arrogant boaster make it indisputable, that in this case, and in all his conquering raids, he was a voluntary agent, acting out his own selfish designs? And besides all this, the language this man is represented as using, in verses 8, 9, 10, 11, 13, 14, is proof that he viewed himself as free, and even independent, and that he did not even dream of his being the executor of God's purpose. We have, also, God's testimony that it was in this king's "heart to destroy and cut off nations not a few."

In Sennacherib, then, we have one example of a free sub-agent who, while obeying his own base inclinations, was unconsciously fulfilling the purpose of the Supreme Agent. The facts of the case are indisputable. Here are two distinct agents, whose combined agency is employed in effecting a certain result. The two interfere not at all with each other, and yet, strange as it may seem, the human agent does not even know that his doings "are of the Lord," or that there is any other agency in the case than simply his own. Now, as I have already said, in the estimation of some, these Bible facts are a Gordian knot, an unfathomable mystery, a theological puzzle that not even a Solomon could unravel. How Sennacherib

or any other actor could be free in doing the very thing that God had predetermined, or answerable for doing it, is to some so incomprehensible a truth, that they stand ready to deny its being a truth. Well, what if it be admitted that this truth is among "the deep things of God," and "hard to be understood," do we not firmly believe some other things that are to us mysterious or unfathomable? We all believe that God has had no beginning, and yet how even He could exist without ever beginning to exist, who of us can explain? If we are to believe nothing that we, the creatures of yesterday, cannot fully comprehend, why not say that since other existing things have had a beginning, it cannot be true that God has existed from eternity? "Canst thou find out the Almighty unto perfection?" asks Zophar; and the question is one which addresses itself to man's consciousness as being eminently pertinent.

If the case I have adduced stood alone, and if the Bible presented no other of the kind, it would be enough to prove (1) That, as Solomon says, "Man's goings are of the Lord," and that in all earthly affairs His agency and man's are combined; and (2) That God's controlling influence in human affairs bears no resemblance to Mohammedan fatalism, but leaves human actors totally free; in other words, that there is no discord between man's freedom of will and the predetermining purpose of God. For the narrative shows that in Sennacherib's pillaging raids he was unconsciously, and with a motive wholly unlike God's, fulfilling the divine purpose, while the boastful language that this king used proves that he was conscious of entire freedom. And that he *was* free, and consequently culpable, is made certain by God's saying, "I will punish" this stout-hearted braggart. But the case of Sennacherib does not stand alone. The Bible abounds in cases where self-prompted human actors are represented as unconsciously executing what God had purposed. The infatuated Rehoboam in heeding the counsel of his young and misguided associates, and giving the Israelites an insulting answer to their reasonable request, was obeying the promptings of his own proud heart; but he was subsequently told that "the cause" of his unwise act and of the secession that resulted "was of God." 2 Chr. x. 15. The advice of Hushai the Archite was better in Absalom's eyes than the "good counsel of Ahithopel," for it was more flattering, and in choosing to follow it he was "free as air." We learn, however, that his preferring Hushai's counsel to Ahithopel's was because "the Lord had (by his choice) appointed to defeat" Ahithopel's wise advice that He might thereby bring evil upon Absalom. 2 Sam. xvii. 14. In wanting to obtain a "woman in Timnath" for his wife, Samson was an unfettered chooser, for, said he, "she pleaseth me well." But when his father and mother remonstrated with him for preferring a *Philistine* maiden they "knew not," we are told "that it was of the Lord, that He," by means of Samson's choice, "sought an occasion against the Philistines." Judges xiv. 4. That the Sabaeans and Chaldeans *chose* to despoil Job of his oxen, asses, and camels, and that they merited punishment as lawless freebooters, none will question, yet even in that part of his loss Job discerned the purpose and agency of God, and hence, losing sight of those heaven-directed robbers, he exclaimed, "The Lord hath taken away." So when David was contemptuously treated and cursed by the false-hearted Shimei,

and when he was asked by Abishai to allow him to behead Shimei, his meek reply was, "Let him curse, because the Lord hath said unto him, 'Curse David.'" His meaning was, not that God had literally told Shimei to curse David, but that Shimei's wicked act was ordained of God as a means of chastising and humbling him whom Shimei cursed.

What object had God in view when He gave the proud Nebuchadnezzar "a beast's heart," and for seven years caused him to eat grass as oxen do? To thus transform a man into an irrational brute, and at the end of seven years to render that brute a man again, was a stupendous miracle, and God must have had some very important end in view in this unusual act of His. What was His prompting motive? It was "that the living may know that the Most High ruleth in the kingdom of men, and giveth it to whomsoever He will." He wished to convince the world, it seems, that "the heavens do rule," and that "He doeth according to His will," not only "in the army of heaven," but "among the inhabitants of the earth." From these passages we learn that while the agency of man is everywhere visible, and while human affairs are seemingly managed by men, they are in reality controlled by Him who says, "I make peace, and create evil," and who "worketh all things after the counsel of His own will." The Bible claims for Him a "purpose that is purposed upon the whole earth" (Isa. xiv. 26), and this all-embracing purpose of His is, in all the concerns of earth, being executed by human agents; yet in no instance is the freedom of these agents interfered with, or in the least impaired. Men are *now* just as free in unconsciously fulfilling the designs of God, as the boasting Sennacherib was in his predatory raids, or as Christ's crucifiers were in bringing to pass what God had "foreordained," or, "determined before to be done." Acts iv. 27, 28. Peter charged the Jews with having *wickedly* slain Him who, "by the determinate counsel and foreknowledge of God," had been "delivered" into their hands.

I see not how it can be denied by unbiased, painstaking students of the Bible, that with equal distinctness it teaches the all-pervading purpose and agency of God, on the one hand, and the entire freedom of all finite agents, on the other. Both of these truths stand conspicuously out in the Scriptures I have cited, and both will be found to virtually pervade the whole Book. When God threatens a regal marauder with punishment for doing what He had himself commissioned him to do, and when Peter's hearers were "pricked in their hearts" and conscious-smitten for conduct that was embraced in "the determinate counsel and foreknowledge of God," what more need I, or others, to convince us that man's freedom and God's pre-determining purpose are both distinctly taught in the Scriptures, and must therefore not only be true, but harmonious?

Do I hear some one say, "I cannot see how the two doctrines harmonize, and I therefore believe they clash; and since they clash, I am convinced either that they are not both taught in the Bible, or else the Bible is a book of contradictions, and not to be believed." To be consistent with himself, that person ought also to say, "If it is God that giveth me my 'daily bread,' why should I slave myself to earn it? If He it is that maketh poor and maketh rich, why need I exert myself to acquire property? If it is God which worketh in men both to

'will and to do,' then how can I have any will or choice of my own, or how can I 'work out my own salvation,' with 'fear and trembling? If 'all that the Father giveth the Son shall come to Him,' how can I 'come to Him,' or why should I even try to come, so long as I know not whether I have ever been given Him of the Father? Since 'no man can come to Christ,' save as he is drawn to Him by the Father, must I not wait till I am drawn before I can come?" If such questions as these are sensible ones, then, *and not till then*, is it sensible for one to say that if predestination be true, then there is no such thing as free agency, and both angels and men are God's machines.

If in the opinion of any reader the Gordian knot remains untied, may it not be owing to his having a wrong conception as to what free agency consists in? Have not some conceived of free agency as being identical with *absolute independence*? I think this mistake is sometimes made, but that it is a mistake is to me quite obvious. And since erroneous views respecting free agency are believed to be entertained by some, permit me, in conclusion, to briefly show what *free agency* does not consist in, and then a few words will show us what it really is. It does not consist in the mind's being *free from all bias for or against* the object of choice. If free agency requires the mind or will to be in a state of equipoise, then neither God nor man are free agents. They have both ever had, and ever will have, a strong bias, a decided preference of mind, either for holiness or for sin. In respect to objects that call for either love or hatred, our wills are never in a state of equilibrium. Again, free agency does not consist in one's being able to choose *in direct opposition to his heart's desires*. In the very highest sense God is a free agent, yet it is impossible for Him to will or to act contrary to His holy preferences, or the reigning desire of His mind. Is man's will so independent that when his heart turns the scale one way, he can by an act of the will turn it the other way? He cannot. The heart, and not the will, is the master, and what one's heart prefers his will will choose. Once more, free agency does not consist in being able to *act without any prompting motive*, or in deciding *what motives* shall or shall not come before the mind, or in an ability to be *uninfluenced by motives* when presented. Neither God nor man can act without a motive, or fail of choosing when motives are presented. And it is not optional with men to say what motives are to be presented before them. That question is one that the Divine Being decides. He it is that decides what shall be the circumstances, surroundings, and lot of each one of us. He it is that brings opposing motives into contact with our minds, and then says, "I have set before you life and death, blessing and cursing, therefore *choose* life." Reader, in that word "choose," which God is whispering and trumpeting in our ears, is found the very essence of free agency. We have seen what free agency *is not*, and here we see what *it is*. It consists, we see, in being allowed to act as we wish or choose to act; and the Lord himself has no greater freedom than that. Since, then, we are individually allowed to devise our own way, shape our own character, and decide our own destiny, ought not that to satisfy us? Would it have been better for us, or for the general good, if God did not govern the world He created, or if He had no all-embracing, "eternal pur-

pose," and had not "foreordained whatsoever comes to pass?" And do we honor God in accepting such Bible truths assuit us, and rejecting such as do not? Is this entirely safe? Judge ye. And now, reader, if in your opinion the Gordian knot remains untied, get Alexander's sword and cut it, if you will. As for me, I rejoice that the Lord reigns, and that I am by Him invited to "choose life."

ASHLAND, N. Y.

DOES MAN POSSESS A MIND?

BY HON. B. J. PENGRA.

(Concluded from last Number.)

Here, too, let us ask the *one important of all questions*: How could the *rational entity* in man arrive at or attain to perfection except by way of the antagonism to which the mind is "subjected?" And vice-versa: If the mind was not constituted, as we affirm, of attributes of faith, love, etc., how could the antagonism be overcome and ultimate being attained, since it is evident that that which is incompatible with perfection could not exist as a thing of immortality or infinite being, and without the struggle there could be no consciousness of perfection arising from conditioned life. Presuming, therefore, that relation will be admitted as the general primary form of mind, as in all orders of conditioned being, then the relation of sequence to primary co-existence is in the operation of consciousness conforming to that which has begotten it.

But here, where the arguments in respect to the relations open up with overwhelming grandeur and magnificence, we are compelled to draw away from them to present other results of general manifestations, as they have existed with us to the present. In the general manifestations of mind in man, in respect to what it has begotten, and what attempted, we must ask the reader to bear in mind what has been said as to the antagonism of mind, so that we may be saved, for want of space, from extending the argument unnecessarily. We only add to it this one further consideration—that with us there are very few, if any, who are so far gone in degradation as not to desire to be thought innocent of crime. And however great the falsehood they may perpetrate, they still *hope* to be believed, and are offended if not believed.

This shows that they are not only conscious of the right, but still retain an aspiration to be thought to be right in a general way, and is an evidence that in them still exists that which takes cognition of the right.

The argument to the present has progressed upon the hypothesis that the attributes co-exist as inherent parts of the mind, and that together they form the entity *mind*. If we find now in the general manifestation of mind in its products, that there is direct co-existence of operation of these faculties by sequence in all that is begotten, then it follows as an inevitable conclusion that the entity is always present in the conception. For if these further universal forms are thus explicable, it would be unphilosophical and, to say the least, superfluous, to assign to them any other origin. And it must not be forgotten that that which ends in sequence is cause. In continuing the argument from the line of general manifestation, we assert that every line of philosophy in the Sciences, in Theology, in Medicine, in the Pro-

fessions, in Literature, and in Law are all conceptions of the mind. The faintest conception of each is, however, indefinite, first presented to and formulated by the mind. Not that the facts contained are new when considered as parts of the universal whole, but that these facts are formulated in the mind as it is able to take cognition of them in conception. And the work of formulating—arranging into order—is more or less perfect according to clearness of perception, and however great and numerous the imperfections or lack of clearness in the conceptions, every one of them stands as a testimony of the mind and the order of its existence. This field of testimony is broad and deep. Every product is the record made by the mind. It is the field in which it operates, and not one scintilla of it exists except as a conception and evidence of existence. But it is not required that we should go over its several parts in the argument. It is sufficient to call them up in this general way. The final evidence in this line, and that by which we again reach the abstract reason where all conceptions coalesce as one in cognition of the primary, is the transmission of the concept of one mind to another, the substance of which is received by the second party as cognition of that which originated in the first as conception. It then passes into conception in the mind of the second person. The transmission may be in various forms. Either by words or by signals, as with the Deaf and Dumb, or by such other signals as are sometimes resorted to in times of great disturbance, as in war. The words, or signals, may be taken cognition of first, by means of the *five senses*, as in *sight, feeling, by touch, hearing, etc.*

Take a case where the transmission is by words, conveying in their meaning the concept of the first mind, which is received through the sense of hearing by the second, as cognition which passes into conception in the second mind, and by the same means is transmitted back and received by the first as that of which his mind takes cognition and conception as the correct answer to that sent. The brain is the great nerve center of the physical body. The mind is enthroned in it and acts from that center. That which takes place in conception is that which exists as *primary* inherent power to conceive, and is the *abstract primary evidence of existence*. And whoever shall attempt to deny this abstract truth, will either do so from lack of mental force to conceive, or he stands as the negation to the truth, and denies his own existence. In the transmission of the conception by words, we take cognition of it in conception (primary) as that which has been conveyed by the force of the will of the sender, as cause or force operating (secondary) through media, viz., media of the first person—intervening space—through media (ear), to the brain and the mind, and its several effects, sound, hearing, and cognition, are the *final evidences* of mind in the first person; likewise the *conception* in the second mind of that which was sent, is for the same reasons the Primary Action. In the repeating Secondary and results produced final evidence of mind in the second person, via cognition of that received back as correct answer to that sent, is again the *abstract primary* evidence of existence of that which receives it back. The repetition of this evidence in man throughout his daily existence, has ever been, and is still, that datum of consciousness within

from which arises the universal conviction that the mind is, and is the ego—the *I*. It is likewise evident that that which first sends the message along the media may act or withhold action as it chooses, and that which receives the substance of what is sent may answer or not, as it shall determine which settles the question of existence and volition, and volition is only possible in conscious being. And furthermore, we see here, and here only, how it is that every rational action, and every result that has been begotten in the act, in Science, in Literature, in Medicine, in Theology, and in Law, and all physical constructions in mechanics, stand as *secondary* and *final* evidence of the existence of the *primary* from which they emanated, and that they co-exist during their being with that from which they emanate as evidence, not only of existence, but the inherent *creative power* of finite rational existence which begot them.

For the last twenty years it has been asserted over and over that there is a "gradual transition" from inorganic to living matter, but although often attempted, no one has yet explained what is meant by the assertion, and we now know that the reason why it cannot be explained is because it is utterly untrue. We are likewise familiar with the phrases, "Vital Mechanics," "Vital Physics," and we are equally at a loss for an explanation of their meaning that will harmonize with the philosophy of known facts.

Again we have the hypothesis of the operation of the physical and vital forces set before us, and the world of mankind has come largely to the conclusion that in their supposed operation they possess the key to a large amount of phenomenal action. But the natural condition of matter is that of inertia. It possesses no inherent power of motion, and only moves as it is moved upon. What we take cognition of, what we term physical action, in the Animal Kingdom, is that which is produced through physical media, either by the force of the will, as a mental operation, or as a conscious action of instinctive being, or both together.

Where such action takes place in the Animal (below the rational), it is an act of instinctive consciousness. When it takes place in the rational, it is both instinct and mind, and what we have supposed we recognized as physical force never transcends in amount the amount of force operating as instinct, or from the mind or both. What shall we say then? Is mental and physical force thus manifested, one? If so, then what we have cognition of as physical force in the Animal Kingdom is conscious force, for the reason that the cause precedes the action, and is the force which, operating through the physical media, produces the action.

The same reasoning holds good in reference to what we have hitherto known as vital force. Not that the mental force in man moves the *bioplast*, but an intelligence which so far transcends that of man, that he with all his conscious power stands appalled in its contemplation. We take no stock in the fearful blunder of Rev. Joseph Cook (see page 314, Cook's Biology) where by his figure of the deep sea, he represents the dark, unconscious soul as moving the bioplast in its work of wearing the physical body.

If it were possible that the soul has the inherent power, and could build its own material inawathment, and afterward supply the waste

in the form by moving the bioplast to its work—and if this "unconscious soul" is "immortal" because of these powers, then the "unconscious soul" which moves the bioplast to weave in every separate vegetal and animal form is, for a like reason, immortal. If such hypothesis were true, then man has been his *own self creator* since Adam. And we submit for the consideration of the learned world, that the matter in dispute between the Theological, and part of the Scientific Schools (headed by Haeckel), has thus dwindled down to a very fine point, viz., the first germ, in Adam, or the Moneron—which? We must indeed accept it as granted that in every movement hitherto known as physical it is either the product of mind or instinctive consciousness in the Animal Kingdom, or of antecedent cause; and what we have taken cognition of as vital force, must at last be accepted as evidence of the immediate presence of the antecedent and unconditioned creative force—nay, more, that there are no other forces but that which emanate as cause directly from created and creative causation, and that the *work of the bioplast is the work of creative force, the same now that it ever has been, from its beginning in the Symbolic Rational, and was in THE Adam*. Here, then, the argument reaches Spencer's "most abstract field" of conceptions, where the scientific and theological conceptions are at one, and where the arguments are not *exhausted*, but begin to merge one into another, each more and more cogent. Where the "fragmentary proofs" begin to "fuse into the general," where all the symbolic evidences of conditioned existence array themselves as "postulates of the existence of unconditioned cause," and where, under the guidance of philosophy, we must again reach the abstract "*primary evidence of the existence of mind*" in the *object for which it was created*.

Our readers must now be told, too, that the arguments partake more of the unseen by the physical, but the seen by the mental; and that we are now at the point where the *confusion arises* in the *philosophic* conception of Spencer, expressed by the term *unknownable*.

In speaking of these evidences, Spencer affirms that they are of "a *higher nature* and *far more conclusive* than the forms of conditioned evidence" (see his Philosophy, pages 96 117 to 123-145-174-236 and 287, and thence to the end). Under the heading "Indestructibility of Matter," chap. 6th, Spencer lays down the proposition that "the annihilation of matter or creation of matter is unthinkable."

The reason of this is, that the finite mind is so constituted as only to be able to take cognition of what is, and we add that no condition of mentality could do otherwise. And the conception of the unconditioned reality is conception by *faith, hope, love*, etc., these properties being the actual constituents of mind which operate to produce the conception. He likewise affirms "the indestructibility of matter, the negation of which is inconceivable." This proposition is accepted as proven, and likewise affirmed: But we must not conclude from this premise that therefore the physical *entification of finite forms* is per consequence indestructible, for the reason that death or final separation of every particle of substance that forms the *physical entity*, is absolutely inevitable.

But this is only one of the *relative parts* of our *final premise*, which is, that for the same

reason that matter is indestructible, so likewise is *life* and *mind* indestructible, when considered as *properties* of infinite existence.

If we are fully able to conceive of this existence by its relations, that it is, we should be able to state more clearly and fully what the whole premise is. For, by the same parity of reasoning that we arrive at the conclusion that matter, as substance, is indestructible, we should be able to perceive that *life* and *mind* are likewise properties of the universal whole, and indestructible for like reason. What then shall we say, but that the indestructibility of matter, life and mind as subtle, substantial elements of the universe is a truth, the negation of which is unthinkable, and the conception of which must soon be conceded as a truism of rational philosophy. Spencer should therefore have covered the whole ground instead of leaving out two of its parts, either of which was of equal necessity to the premise in order to a thorough conception of it.

The tendency of the operation of mind in man, in all lines of thought, religious and scientific, has always been more or less toward that of materialization, and the inability of Spencer, was the inability to overcome or pass this tendency, to a more perfect conception of the *unconditioned order*, out of which the *conditioned* was formulated and entified.

It was the inability to recognize the fact as a matter of science and philosophy, that as it is conceivable that the *conditioned* was formulated and entified out of the *unconditioned*, *subtle*, *substantial*, eternal elements, which were *without beginning or ending*, by a "*birth*," it is just as rational and conceivable that by a new "*spirit birth*," these eternal substances could be formulated and entified into the inheritance of *immortal life*.

It is not only conceded but affirmed by Spencer, Darwin, and all the most thoroughly advanced thinkers of the scientific school that all of the physical orders of conditioned existence "*postulate* the existence of the *unconditioned*, and are symbols and types of it." And, furthermore, that the "*antecedent unconditioned*" cause is the source from which emanated conditioned being.

This being taken as granted, and being the most abstract conclusion of science, and the point at which the lines of the theological scientific schools and coalesce, and come to agreement, and on finding what it includes in all its parts, let us see if we are now able to make a brief formulation of what the *predicate* of the *postulate* proclaims.

It is as follows:—Proclaims: First, That the *life*—the *mental*, and all of that which we now conceive of as *substance*, are indestructible eternal properties, and exist without beginning or ending. Second, That all entified conditioned existence, the *vegetal*, the *animal* and the *rational*, were formulated and entified, brought forth out of these three indestructible, infinite properties of existence. Third, That conditioned existence is the result of *antecedent* cause, emanating "from the *unconditioned living intelligence*." Fourth, That the *rational* or highest state of conditioned entified being, is so constituted as to be able to take cognition of the existence of *unconditioned intelligent being* as that which brought forth or caused their conditioned entification, the evidence of which is *in-surm-mountable*.

It may be true as a matter of fact, that these four propositions have never before been fully

stated in this form, but the statements, with all they include, are in strict harmony with all we know, and are the abstract embodiment of the conclusions of science and philosophy. They cannot, therefore, and will not be rejected by any consistent scientific mind. For, if science could refuse to accept the living and mental principles of the universe, she stultifies herself and denies her own existence. What then shall she say of the concept which follows, and is affirmed as a further and final act in the order of creation? Shall science stand halting at this point in the conception, and deny the power of Omnipotence to bring that which is first entified from the indestructible and immortal into finite life back by a *new entification* or "*Spirit birth*" into "*immortal life*"? Would such an act on the part of the *unconditioned* unlimited power be unscientific and irrational? or would such act be rational and infinitely scientific as well as philosophic, inasmuch as when accomplished it would be in strict harmony with all other general truths to which it would bear relation as the most eminent truth and act of all, as now seen. See then this being conceded, as the ultimate and final act in creation; an act which is in strict harmony with every fragment of what we know; our "*postulate*" is now become our *predicate*, and from the ultimate premise in belief by faith, man cries out, *behold my life which was* "Hid in God!" By faith I bring it near. I hope for it. It is the aspiration of my utmost thought. I love it; the ways of which will be the ways of pleasantness and peace. Its dwelling place is with God and the righteous. In charity and justice will I reach out mine hand to those who wander in darkness and know not the way of life.

In this change there is nothing which is substantially new. There are no new elements, nor new first principles, but only new forms of the old substances and elements, begotten by the same unconditioned cause that begot the conditioned. Physical existence by itself, when considered alone, falls short in several ways of being an adequate explanation of anything. It had a beginning and must come to an end. It had a beginning which it did not inaugurate. It is laboring under laws which it did not ordain, and comes to an end from which it cannot itself emerge.

But the rational has in it a hope of the "gift of eternal life," as a promise of Him "who alone hath immortal life dwelling within," that by "working together with Him, he will be enabled by faith to lay hold of the unseen reality." And of this reality—where "death cannot enter," a reality that transcends the physical just to the extent that the *unconditioned* transcends the conditioned.

"Marvel not that I say unto you you must be born again," is the language of infinite intelligence to finite intelligence.

To this end, and for this purpose, the mind was constituted, and is a conscious entity, able to perceive its possible ultimate existence, and strive for it.

SPRINGFIELD, Oregon.

MATTER AND LIFE.

BY J. R. HOFFER.

The Substantial Philosophy, as well as common sense, teaches that there is no existence without substance; or that whatever exists, is,

or consists of, substance. The most real of all existence on the earth is life. Therefore life is substance.

To the physical senses, which recognize material things, life is only known in its connection with matter, or by its effect; therefore life is not material. In nature are therefore life substances and matter-substances; or living and dead substances—life and death.

That all forces are from life is self-evident; and consequently all sensation and knowledge. Life is therefore the only cause, and matter is all effect.

Life manipulates matter, which it produced; but matter has no control over life, its own cause; therefore matter, under certain conditions, is tangible to life, but never life to matter; consequently life-substance is not known to the physical senses.

Matter cannot develop that in which is life; but the seed or life-germ which is the first hold that form of life takes on matter, if properly associated with matter, will fill its whole form with matter; and thus become tangible to the physical senses.

But when life withdraws itself from this material organization the matter again seeks its own natural relations, and the life-substances being intangible to the physical senses, are no longer known to man, except through the faculties of the mind, which is his real life or spirit.

Matter being the production of life, and being also manipulated and kept in existence by life, must be in harmony with it or correspond to it. Life-substances are consequently also capable of assuming the solid, liquid and gaseous states. And as between material substances is attraction, cohesion, contact, combination, etc., so must life-substances be tangible to each other. But in life-substances is sensible, living contact and commingling, while in matter is only dead touch and combination.

The cause being always superior to its effect, it is reasonable to believe that there are many things and relations in pure life that cannot appear in nature; not even to the mind or real life of man, while he is held to dead matter.

The first, or infinite, self-existent Cause must be pure Life. "I am THE LIFE," said Jesus, who is the "God with us," or God manifested, and by whom "all things were made." All other degrees and forms of life are finite, and, therefore, are the reaching forth or extension from The Life, as matter exists by the extension or reaching forth from finite life.

The forces known as the laws of nature, by which matter is maintained in existence, are evidently the lowest or most extreme action of life. By taking hold of these laws or forces the plant degree of life organizes its material form; and here creature life takes hold and builds for itself a body. To this latter class or kingdom belongs also the physical body of man; and the humanity, the living, spiritual man, through this body has access into all the kingdoms of nature; and being thus connected with death, it is enabled "to choose between life and death."

Reversing our position so as to begin with The Life, or "God with us," we see an extension downward or outward, of degrees or strata, first into the realm of spirit or mind, the eternal home of the real man; then into physical or creature life; next into plant life and lastly into earth life.

Jesus said of God, the Father, or his inner life, that He is a Spirit, while of himself He said, "I am The Life." This seems to indicate that there is some distinction between spirit and life. Spirits are often mentioned in the Scripture, and man is said to have a spirit. God has a side toward creation which seems to be called life; and man has a side toward his Creator called spirit. "Then shall the dust return to the earth as it was; and the spirit shall return unto God who gave it," Eccles. xii. 7. The spirit is therefore the side of man which is toward God; and "God with us" who is "The Life" is the side of God which is toward man and creation. But as the Son is in the Father and the Father in the Son, and the two are One, life and spirit are or constitute one; life the outside and spirit the inside.

God is spirit and life; man has spirit and life; God is Divine or Infinite, while man is finite. The extended or proceeding life is evidently not life in its infinite purity, so that there must be a difference between the Life of God's Being, and the proceeding or creative life. But man can only know that there is an Infinite, not what He is, beyond that which is manifested; therefore we can only deal with life and matter substances.

MOUNT JOY, Pa.

EXAMINATION OF THE PRESENT THEORY OF FORCE AND ENERGY.—No. 1.

BY HENRY A. MOTT, PH.D., F. C. S.

According to the present theory, the forces of nature are spoken of as moods or affections of matter. It is distinctly affirmed that they are not "things" in themselves, in the sense in which paper, wood, stone, etc., are "things," and that they are only known or can be known or investigated by their effects upon matter. The so-called various forces of nature are regarded as different manifestations of a *power of doing work* (i. e., causing change), residing in, or acting through, matter, and to represent them all, the word "Energy" has been adopted.

Energy, therefore, means the *power of doing work*. Energy is recognized, just as life is recognized, in various forms, but of the exact nature of either, nothing is known according to the present science. According to this view then, all the so-called forces of nature, or the various moods that affect matter, are so many kinds of energy, which is capable of assuming various forms, and being changed from one to another by apparatus arranged for the purpose by man, but is *never created afresh or destroyed entirely*, by any contrivance of his. This is the idea intended to be conveyed by the modern phrase, "The 'Conservation of Energy' (in place of that of the 'Correlation of Forces')."

Carpenter defines force as "*any cause which alters or tends to alter a body's natural state of rest, or of uniform motion in a straight line.*" The state of rest here referred to, as also the state of motion, are not merely molar but also molecular; i. e. not merely motion of the body as a whole, but of the motion among themselves of the molecules of which the body is claimed to be made up. Force, then, is simply the expression of the rate or speed at which any change takes place in matter; what its essence, or primordial cause is, is a problem that the

* See Force and Energy, William Lant Carpenter, p. 8—1883.

present science does not attempt to solve. Energy and force do not therefore mean the same thing. The pressure of a weight on the ground is force and not energy, but the operation of lifting the weight involves the expenditure of energy. When a force is said to act, what is really observed is a transference (or a tendency to transference) of energy from one portion of matter to another, and the so-called force in any direction is simply the rate of that transference.

Power is considered as any form of *directed* energy. Prof. Osborne Reynolds,* to illustrate the difference between Energy and Power—i. e., undirected and directed energy—compares the difference between a mob and a trained army, the individuals in whom the energy resided being, in both cases, the molecules or ultimate particles of matter.

Heat, Radiant Energy, Moving Electricity, Electrical Attraction, Magnetism, Cohesion, Mechanical Energy, Gravitation, Animal Energy, Vegetable Energy, Chemical Attraction, and Light are all manifestations of Energy, and any one form can be transformed into another. It is also accepted that another form of Energy may be included in the above: *the Energy displayed in the phenomena of Vitality*—i. e., the so-called *vital forces*.

Inertia is considered as the property of Matter, in virtue of which it can neither start in motion of itself, nor, when once in motion, can it stop itself.

We will now proceed to study the different forms of Energy, when we will be better able to criticise the merit or demerit of the now generally accepted theory relating to them.

Two distinct forms of Energy are embraced by the word Heat. Energy of a wave motion in the ether, passing from a hot body to surrounding objects across the intervening space, as from the sun to our earth, or from a hot fire to the colder objects on which it shines—this is called *Radiant Heat* or *Radiant Energy*. The other form, says Daniel,† “is a confused oscillatory disturbance of the particles of a body; in virtue of this molecular movement a body may appear to our cutaneous sense of heat (a sense quite distinct from that of touch) to be more or less hot or warm; or in the converse case it may, on account of the small amount of this movement, appear to be relatively cool or cold.” The latter form of heat is called *sensible Heat* or *simply Heat*. We are to understand, then, when a body is sensibly hot, the so-called molecules are in an active state of motion, they strike one another and rebound, and the more rapidly they do so, the greater is their mean velocity and the greater is the kinetic energy of the whole mass. As the molecules, after striking, are supposed to spin: to the *energy of translation* must be added one of *rotation*. As molecules are supposed to be made up of *Atoms*, and as atoms are not supposed to be stationary in the molecule, part of the energy of a heated body is attributed to *intra molecular Atomic oscillations*. Again, as the assumed ether is supposed to be entangled in molecules, and as this is supposed to be set in vibration and absorb some energy, this appears as *kinetic energy of ether vibrations*. The sum of all these “is found,” says Daniel, “by the agreement of experi-

mental results with calculations based on the hypothesis that such is the law, to be proportional on the average—an average not perceptibly departed from any appreciable interval of time—to the kinetic energy of translation alone.”

By Kinetic Energy is understood the Power of doing work by bodies in motion. It is Energy of Motion or Actual Energy, and may be illustrated by the power of doing work possessed by a bullet in virtue of its motion.

“When* heat is applied to a body, it increases the kinetic energy of the molecules (raises the temperature), and increases the potential energy, by forcing the molecules further apart against their mutual attractions and any external forces that may resist expansion.”

Potential Energy, or *Static Energy*, or *Energy of Position*, or *Energy of Stress*, may be illustrated as when a weight is lifted up and suspended; the energy stored up in this way, i. e., its power of doing work, is called *Potential Energy*.

Temperature then is due to the molecular kinetic energy of a body. When this is doubled the temperature is also doubled.

As in all gases the pressure diminishes by about 1-273 for each centigrade degree of cooling, the temperature of 0° C. (32° F.) being the starting point, and the volume being maintained constant. It is argued that if a gas could be cooled down in this way to -273° C. (453.5 F.), it would have no pressure, and therefore no temperature, for it would have no kinetic energy, no heat. The absolute zero of temperature is therefore taken as -273° C. (or more accurately -273.72 C.) so that the absolute temperature of water at the boiling point is 100° C. +273°, or 373° C.

Before proceeding to a brief consideration of the other manifestations of Energy, it will be necessary for us to familiarize ourselves with the medium called the *Luminiferous Ether* or simply *Ether*. Clerk Maxwell says:† “There can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge.”

Some of the properties which theory demands that the supposed ether must be possessed of, are—that it can convey energy; that it can present it at any instant, partly in the form of kinetic, partly in that of potential energy; that it is capable of displacement and of tension; and that it possesses rigidity and elasticity.

Clerk Maxwell calculates its density as $\frac{936}{1,000,000,000,000,000,000}$ that of water, and its rigidity $\frac{1}{1,000,000,000}$ that of steel, hence it is easily displaceable by a moving mass; that it is not discontinuous or granular; and hence, as a whole, it may be compared to an impalpable and all-pervading jelly,‡ through which the particles of ordinary matter move freely, encountering but little retardation, if any, for its elasticity, as it closes up behind each moving particle, is approximately perfect.§ If ether be considered molecular, the grouping of the molecules must remain of the same type, the

* Lec. on Trans. of Energy. Delivered before the Soc. of Arts.

† Princ. of Phys. Alfred Daniel, p. 814—1884.

* El. Text Book on Phys., Part 1. Anthony & Bracket, p. 177—1884.

† Ency. Brit. Article, Ether.

‡ Tyndall on Light, pp. 57-60.

§ See Daniel's Phys., pp. 208-209.

configuration of the groups being only slightly altered during motion.* Clerk Maxwell says: "Whether this vast homogeneous expanse of isotropic matter is fitted not only to be a medium of physical functions of which, perhaps, we have as yet no conception, but also, as the authors of the *Unseen Universe* seem to suggest, to constitute the material organism of beings exercising functions of life and mind as high or higher than ours are at present, is a question far transcending the limits of physical speculation."

IS LIFE MERE MECHANISM?

BY REV. J. S. VAN DYKE, A. M., D. D.

Life has been defined by Haeckel as a connected chain of very complicated material phenomena. . . . of atoms placed together in a most varied manner.†

This may be accepted as a specimen of the definitions furnished by the purely materialistic school of philosophy. It assumes, as materialism invariably does, that science is competent to assert that there is nothing in the universe except matter and its forces. These physical forces, modern materialists are disposed to regard as modes of motion. Consequently, there are but two entities, matter and motion. Life, accordingly, must be viewed either as "a particular arrangement of the molecules of matter," or as "one of the modes of motion."

Any theory which regards life as "a particular arrangement of the molecules of matter"—an arrangement having such measureless diversities that each species of plants and animals, indeed each individual plant and animal, by virtue of a slightly different arrangement, possesses characteristics differing from those possessed by others—is seemingly radically defective. The material and the vital, though frequently united, are quite manifestly two distinct realities; and their mysterious union is more readily explained on the assumption that life is a substantive entity, capable of employing chemical and physical forces in the production and maintenance of an individual material organism, than by assuming that life is a phenomenon of material molecules when arranged in certain ways. The chasm between the living and the non-living is too broad to be bridged by molecular arrangement. To regard life, not merely as an evolution, but as a particular phase of material evolution, furnishes, as we apprehend, no explanation of the origin of conscious existence; nor is it possible to believe that the will, which is capable of setting the entire machinery of the individual organism into motion, is the result of a specific arrangement of material atoms. Hence, Prof. Tyndall concedes, "the continuity between molecular processes and the phenomena of consciousness is the rock upon which materialism must inevitably split whenever it pretends to be a complete philosophy of the human mind." He approvingly quotes the language of Du Bois Reymond: "It is absolutely and forever inconceivable that a number of carbon, hydrogen, nitrogen, and oxygen atoms should be otherwise than indifferent to their position and motion past, present, and future." Prior to 1875 Prof. Tyndall evidently

viewed materialism as an inadequate explanation of the phenomena of conscious life. Indeed, even Mr. Herbert Spencer, whom materialists would regard as competent authority, concedes that "the proximate chemical principles, or chemical units, albumen, fibrine, gelatine, or the hypothetical proteine substance, cannot possess the property of forming the endlessly varied structures of animal forms."

The mechanical theory of life, even when aided by the hypothesis that the universe is pervaded by "mind stuff"—a hypothetical, impouderable, impalpable, exhaustless, invisible material potentiality, having subtle influences, discoverable through the microscope of a powerful imagination, from the infinitely minute particles of which individual organisms are produced by physical agencies, each organism being capable of evolving a definite number of harmonious combinations—is about as satisfactory an explanation of life, as is the assumption, as an explanation of musical phenomena, that the music of the piano is the result of mechanical forces operating in the instrument itself, no skilled hand directed by an intelligent will being needed to evoke symphonies, even those of Mozart or of Beethoven. We can affirm that the music is evidently due to successive vibrations of merely material substances; that there is an intimate relation between the keys, the strings, the pedals and the sounding-board; that the form of the instrument facilitates music and consequently must be a result of "the survival of the fittest," that the primordial piano in its material structure, must evidently have been an effect of "the fortuitous concourse of atoms" during the cooling of some planet in the dawn of eternity; that its marvelous musical power must have been evolved in intimate correlation with its material form from a quasi-musical material, "harmony stuff," which must have once pervaded immensity, and probably does yet, as it evidently still lurks in steel-strings; that, consequently, the music of the piano is an effect of mechanical forces operating in the instrument itself—all of which we challenge the scientific world to disprove.

The teleologist, if indisposed to accept this elaborate explanation of the origin of musical instruments in general, and of pianos in particular, may answer: "Effects, evincing intelligent design, cannot be produced by purely mechanical agencies. Blind forces cannot prove instrumental in the production of intelligent results, except as they are directed and controlled by an intelligent will." This assertion I am not called upon to prove. If any one expects me to believe that material molecules can so arrange themselves as to originate life, or that physical forces can produce life, he must present such evidence as compels belief, or such at least as renders this theory credible. Until this is done, reason impels one to believe that design, which is clearly manifest in everything having life, implies the existence of a designer; intelligent results presuppose an intelligent cause. Consequently, though I may not be able to see the pianist at the key-board; though I may be convinced that he does not sit on the stool in front of the instrument, I know he exists somewhere, even though it may be in some distant city, the determinations of his will being conveyed to the keys by electrical currents. Even though I should be unable, after the closest inspection, to discover any connection between the instrument and the

* See Maxwell, Ency. Brit. Article Ether.

† "History of Creation." Vol. 1, p. 199.

player, I should still be forced by the principle of causality to believe that a pianist existed somewhere. If, however, I am not constrained to believe that every effect must have an adequate cause, I have still as valid a right to make assertions as the materialist has. My assertion that life is the pianist is a sufficient refutation of his assertion that life is the piano. Whilst he is calling upon me to disprove his assertion, I may call upon him to disprove mine. As the pianist may live after the piano has crumbled to dust, I may invite him to prove that the soul is not immortal; which I am emboldened to do inasmuch as he has frequently challenged me to prove a negative. Before he has succeeded in proving that the soul cannot be immortal, life in every conceivable form being only a fleeting phenomenon of ever-changing material molecules, planets, and even suns, may go on cooling till they have become eternal icebergs. Before the preponderance of evidence shall be in his favor his hypothetical "mind stuff," diffused through hypothetical ether, by the aid of which he seeks to eliminate God from a universe in which every living thing testifies to his existence, will have time sufficient, if it only has power adequate, to evolve an Infinite Intelligence, of which it seems to be giving promise in that it has already evolved finite intellects equal to the task of proving that the interstices between the atoms of metals, even of the densest, are filled twice, once with ether, once with "mind stuff." If we should assert that the principle of evolution—which is apparently the only thing in the universe which does not need to be evolved, and in which most modern materialists have perfect faith, though disposed to ridicule a principle of vitality—had already succeeded in evolving an Omniscient Personality, could the materialist disprove the assertion? If we asked him to bow reverently at the footstool of this Infinite Majesty, whom his own principle of evolution, acting through unnumbered eternities, may have long since evolved into being, could he present valid reasons why he was at liberty to charge us with raving fanaticism?

Every effect must have an adequate cause. An effect evincing design must have an intelligent cause. If there is any axiomatic truth more clearly inwoven with human reason than another it is this. It deals, however, a death-blow to materialism. When the alternative is presented of regarding life as a mere mechanism or as a substantive entity, capable of directing physical forces, we are not left in doubt which to accept. The testimony of reason is clear and emphatic.

CRANBURY, N. J.

OUR WORK INDORSED.

A series of articles, fully indorsing the Substantial Philosophy in its new departure on Sound are now appearing in the *Republican Standard* of Uniontown, Pa., by a writer signing himself "Truth." We copy the first article herewith, to show the reader that Substantialism is not fighting its great scientific battle alone in THE MICROCOSM:

SOME SCIENTIFIC REVELATIONS.

IS THE OLD WAVE-THEORY OF SOUND TENABLE?

The large majority of persons, old and young, for 100 years past have been stupidly content to accept as truth the dicta of so-called "scientists," not caring whether the propositions were

true or false. This has naturally resulted in a sophistical, fallacious and superficial mode of teaching in nearly all places of learning, high and low. Science, as admirably defined by an able writer, "is exact, ultimate, demonstrated, conscious knowledge; selected according to kind, and accurately classified into systems." As a prefatory point to a possible future article on the subject, we will venture to quote from an able article, written by Prof. Henry Olin, M. D. (and we particularly call the attention of "M. D.s" to the matter), a noted professor of otology and ophthalmology in the Bennett Eclectic Medical College of Chicago. He says:

"It has long been supposed and is yet thought that the tympanic membrane of the ear vibrates from the action of sound-waves, and that its presence is essential to hearing; but such is not the case, as I shall attempt to show in this brief article. In the first place, persons, born without a tympanic membrane hear as readily as those with one; and again, the absence of it does not produce deafness where the cavity of the drum is not changed by disease. The 'membrana tympani' is not elastic, but is absolutely inextensible membrane, chiefly composed of tendinous fibers. Its curved form renders it essentially different from all other membranes hitherto studied in acoustics. It will be seen that it is a concavo-convex membrane and cannot vibrate without dislocation, being of a fibro-tendinous character and inelastic, and would by its vibration produce such a crackling sound that all other sounds would sink into mere nothing, compared with the sounds itself would produce, were it to vibrate as physiologists tell us it does. I take the ground, then, that the object of the tympanic membrane is not for the purpose of vibrating and conveying sounds to the auditory nerve, but for the purpose of collecting sound, and also as a protection to the cavity of the drum, the same as the eyelid is a protection to the eyeball and its delicate mucous surface."

Prof. Olin's article appeared in June, 1879, two years after the wave theory of sound was refuted by Dr. A. Wilford Hall, of New York, in "The Problem of Human Life," and we do not know that he was aware of the existence of Dr. Hall, or his book. His article has the essence of pure science in it, and overthrows unscientific hypotheses. One other quotation more recently from the pen of the able physiologist, Prof. H. Raymond Rogers, M. D., of New York City, than whom there is no higher authority living, will prove pertinent to the matter. He says:

"Already the minds of thoughtful men are being freed from the iron dominion of the old theory of the mechanical action of waves of air upon the vibrating drum of the ear. The essential irrationality of the theory makes itself seen and felt. Men are now ready to listen to the fact that the drum of the ear is, in no sense, a resounding drum beaten by waves of air. A membrane diminutive and flaccid, it would never have been supposed to play the part of a tense drum head, except in blind support of a theory. The imagined vibratory action of the 'membrana tympani' is a mechanical impossibility. Those membranes are not flat, as popularly supposed, but funnel-shaped, with a depressed center, surrounded by sides gently convex outward. They cannot, therefore, act like stretched membranes and vibrate like

drum heads. And, too, the auditory ossicles are so attached to those membranes, as to be subject to a synchronous vibration. This is impracticable. These facts alone are sufficient to destroy the accepted theory of sound."

In future we will give, if permitted, abundant reason for deeming this subject of paramount importance.

ANOTHER INDICATION.

[The following communication from the Rev. Mr. Evans will speak for itself.]

CLAY CITY, Ill., March 10th, 1885.

DEAR DR. HALL,—I inclose herewith a clipping from the *Commercial-Gazette*, one of the ablest and most widely circulated daily newspapers in the West, noticing Dr. Mott, Jr.'s late publication on transmission of sound, and from it you will see that you get the due credit of the first attack on the old wave-theory, and that Capt. Carter's great experiment is also referred to. So you see that justice will yet be done you, although it may be a little slow in coming—yet come it surely will, and I hope you will live to see those "silent philosophers" brought to acknowledge their errors by the force of public opinion. The light is breaking, and your reward will surely come.

I can not close this without telling you that I think the February *MICROCOSM* is a perfect gem. Prof. G. R. Hand's article on the "Substantial Philosophy" is supremely grand, as are many others. I can hardly wait for the March number. It has not arrived yet. May the God of all grace keep you for your great work's sake.

As ever, yours,

J. T. EVANS.

[From the *Commercial-Gazette*.]

WANTED—A NEW THEORY OF SOUND.

Dr. Henry A. Mott, Jr., of New York, is not the first person to insist that the truth concerning the transmission of sound has not yet found its way into works of natural philosophy. He has taken up the subject, however, with increased boldness in his publication entitled, "The Fallacy of the Present Theory of Sound," printed for the author by John Wiley & Sons, of New York. The wave-theory of sound, inaugurated by Pythagoras, has been accepted by scientists for twenty-five hundred years, and it is found in all the text books of the day. In 1877, Dr. A. Wilford Hall published a work on the "Evolution of Sound," in which he undertook to overthrow the long-established undulatory theory. His views have been accepted by a number of scientific men, Dr. Mott being one of them. They deny that sound is propagated by air-waves. They do not deny the air-waves, but claim that the waves are the incidental effect of the motion generating the sound, and not by any means the sound itself. The step of a fly miles away can now be made audible through a delicate electrical instrument. The marvelous feats of the telephone and phonograph are well known to the public. Mr. Edison has said that his own experiments prove that sound-waves can be transformed into electrical pulses without the movement of any intervening mechanism.

According to General Duane and other officers of the Signal Service, fog-horns and steam sirens are often heard many times further against a violent gale than with it. Tyndall verified this fact by his experiments off South Foreland, and said: "Plainly something else

than the wind must be influential in determining the range of sound." Dr. Mott gives one chapter to experiments with the tuning-fork, which alone, in his opinion, destroy mathematically the wave-theory. The fork produces audible sound, while its prongs, at their swiftest motion, do not travel at a velocity of more than one inch in two years. Let physicists, Prof. Carter exclaims, dispose of these figures, or forever hold their peace. If these dissenters be correct in their mathematical calculations, the present hypothesis of sound compels scientists to assume that there are two entirely distinct principles of wave motion in the atmosphere; one suited to their sound-theory, which will travel 1120 feet a second, and another class, adapted to common sense, which will not move more than four or five feet a second, both manufactured in substantially the same manner. When a band of music is heard at some distance, the harmony reaches the ear as a whole; and Dr. Mott argues that if sound consisted of wave-motion, we should hear, even in the sustained musical tone of one instrument, explosive bursts caused by king-waves. The insect known as the locust, weighing less than a quarter of a pennyweight, makes itself heard for a mile by rasping its legs across the nervures of its wings, converting (according to the wave-theory) four cubic miles of atmosphere into waves consisting of condensations and rarefactions. The locust is thus supposed to agitate one hundred and twenty million tons of air, and keep up the feat for a full minute. If the locust were stridulating in the center of a mass of iron one mile thick in all directions it would be heard sixteen times quicker than in the air by placing the ear in contact with the iron at the surface.

The usual theory concerning the tympanic membrane of the ear is also attacked. Persons who have lost the membrane are not always deaf. Dr. Mott says its real value is to keep the cold and dust out of the middle ear. The microscopic processes so essential to the wave-theory of sound have no existence at all in the ears of birds. Yet the mocking-bird can distinguish, analyze and imitate the finest shades of pitch. Dr. Mott proposes that the wave-theory be abandoned at once, even though a satisfactory theory be lacking. He is at work on a theory which he promises to make public at some future time.

ANOTHER INSTITUTION OF LEARNING ALL RIGHT ON SUBSTANTIALISM.

A correspondent from Kentucky writes us:—

"There has been established in Louisville an institution called 'The Southern Institute of Mental and Physical Science.' J. W. Lowber, Ph. D., its President, and nearly all the leading members are believers in Substantial Philosophy. This institution bids fair to disseminate the principles of Substantialism throughout the South and West."

PUBLIC OPINION CHANGING.

We clip the following from the Buffalo (N. Y.) correspondence of *The Sixteenth Amendment*, as a specimen of many similar notices, not because we feel flattered or elated by such kindly references to our work, but as a sort of stand-off against the bigoted charges of "ignorance

and conceit" of such professors as Young, Stevens, etc.:

[From *The Sixteenth Amendment.*]

"This morning I caught a glimpse of Wilford Hall, the world's greatest thinker, as he was ascending the steps of an elevated railroad station. He looks years older than when I first met him scarcely a year ago. He is aging fast, but there may be, and doubtless are, years of hard work wrapped up in his great brain and burly form. But what a worker, and what a work he has wrought! Unknown, and yet known, as but few men have ever been, or can ever be known. When the history of science shall have been written, among (if not at the head of) its great apostles, will stand Wilford Hall, the author of the '*Problem of Human Life*,' and at present editor of *THE MICROCOSM*. In the '*Problem of Human Life*' may be found Dr. Hall's scholarly review of all the problems underlying the origin of life and the destiny of man. But the work which has made him famed, at least among the great thinkers and physical scientists of two continents, has been his long and persistent attack upon the wave-theory of sound. The roar of the battle is not heard by the sleepy world below. Yet without doubt there are on both sides of this contest, the most powerful brains the world has ever produced. And will Wilford Hall turn physical science upside down as Kepler did astronomical science, more than two centuries ago? Without a doubt he will, and the revolution will bring with it sweeping changes, and a reuniting of almost the entire science of civilization."

NO END TO KIND WORDS.

Wm. Edgerton, of Dunreith, Ind., writes us that some time ago he sent a copy of the *Problem of Human Life* to a friend in the State of Iowa, and that although he had been an avowed infidel of more than thirty years' standing, yet since reading the book he had joyfully renounced his infidelity, and expressed his gratitude to the author "for grinding to impalpable powder the deceptive fabric of materialism." Proofs like this of the work being done by the "*Problem*" and *MICROCOSM* are of common occurrence, and are very gratifying to the Editor.

Rev. B. F. White, of Monroe, La., writes:

"DEAR WILFORD,—Wife and I are again reading the *Problem of Human Life* with deep interest. *THE MICROCOSM* also is still more than a welcome visitor to our table. *Victory* for the great truths you are teaching is at the door. May God's blessings attend you in your great work. I send with this my subscription for *MICROCOSM*, and for five new ones for the present volume," etc.

Robert F. Plum, 2419 Jeff. street, Philadelphia, Pa., writes:

"I have no disposition to flatter or to use extravagant language, but in my opinion *THE MICROCOSM* is a mine of inestimable intellectual wealth. Out of it I have dug gems which I shall ever prize. My faith has been strengthened and my mind fortified against all assaults of infidel scientists. Its fearlessness of attack and clearness of presentation of facts and principles, shine forth on every page, and challenge the admiration of every candid thinker. I would not be without it for many times its cost."

Eld. Miles' Letter from Clinton, Ill., will speak for itself.

A. WILFORD HALL:

DEAR DOCTOR.—I received your beautiful gift, *Problem of Human Life* as originally published in meter, and with all my heart I thank you. I am proud of the gift, and shall cherish it as long as I live (and so will my only daughter after me), as a token of regard from one of the great and good of earth.

I have read with intense pleasure the passage you marked. I think your metrical prose will live and give great pleasure to hundreds in the coming years.

I send an order for some "*Problems*," which I have engaged to preachers, the principal of our city school, lawyers and a country teacher at \$1 per volume, so as to circulate them. I have put one also in our city library.

Dr. Hall, do take care of your health, don't overwork yourself, and you will live to do the more good. You have started the ball of Substantialism rolling, and no earthly power can stop it. Your philosophy has gone abroad and it cannot die.

May God bless you and may you yet live many years to push on the glorious work.

Your Brother and Friend,

J. J. MILES.

[N. B.—Any one doing as did Eld. Miles, will receive the profound gratitude of the Editor and Author.]

Professor Wheaton, A. M., Principal of the Baileyville (Texas) Academy, writes:

DR. A. WILFORD HALL:

DEAR SIR,—I have just finished the *Problem of Human Life*. Would not be without it for any consideration. It has immeasurably benefited me, and with *THE MICROCOSM* as a *vade mecum*, one can begin the journey of life at any age, buoyed with hope. God bless you and preserve you; and may He strengthen you for your arduous labors, and, at each blow, nerve and direct your arm, so that the entire corps of materialistic scientists may not only be put to flight, but be rendered impotent for future harm. Sincerely,

H. NELSON WHEATON.

Rev. D. W. Hanna, Principal Seminary, Napa, Cal., writes:

"I have been a subscriber to your valuable *MICROCOSM* for nearly two years, and have read with unwonted interest all of the articles therein. I have been teaching the principles you advocate to my classes from the first, having become fully convinced by my perusal of the *Problem of Human Life* that you were not only right, but that you had discovered the lever that would completely overturn evolution and materialism. I give to my classes all the old experiments in sound, such as blowing out a candle at the small end of a long tube by clapping two books together at the other end, etc., thus showing the untenable nature of the wave-theory; and, in connection with the lessons, inculcating such principles as will prove a preventive against a tendency toward evolution, materialism, etc. * * * With the greatest admiration for the genius of him who has so successfully routed the enemies who were trying to undermine the Christian hope, I am, yours truly,

D. W. HANNA."

WILFORD'S MICROCOSM.

23 Park Row, New York, April, 1885.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

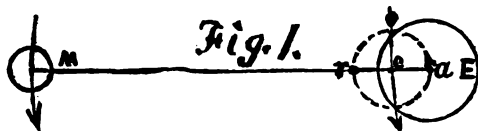
THE MOTIONS OF THE EARTH AND MOON AS RELATE TO THEIR COMMON CENTER OF GRAVITY.—A STARTLING ERROR IN ASTRONOMY.

That slight errors should occur in scientific theories, even when formulated with the most critical care, is not to be wondered at in the light of our imperfect facilities, and in view of the defective character of human observation. Particularly is this true of such theories as those of light, heat, and sound, involving both media and movements beyond the reach of human vision; while it is also true of astronomy, involving as it does such immense distances, deceptive appearances, and complex inter-influences of the spheres upon each other, as to put many questions of facts beyond the pale of absolute mathematical demonstration.

But the theory of astronomy, as formulated upon the discoveries of Copernicus, Galileo, Kepler, Newton, Laplace, and others, has long been regarded as so completely and mathematically settled in all its details as to justify designating it a *fixed mathematical science*. Hence it is always spoken of in the curriculum of the college and university as the "*science of astronomy*"—not as a theory. Yet it is a fact, as we undertake to show in this paper, that a fundamental and, when pointed out, self-evident error of the most vital and glaring proportions, and for which there is no sort of excuse, exists on the very surface of this so-called "*science*" in relation to the influence of the earth and moon upon each other and their respective motions. It is, in fact, an error not confined to the earth and moon, but it runs through the entire warp and woof of astronomy, involving the whole solar system and vitiating many of its finer calculations; and what is most surprising in the premises, this error is an essential feature of the science as inculcated by every authority on the subject, and as taught by professors of astronomy throughout the world, without, so far as recorded, one of them having suspected its misleading character, or even its existence. Let us then come directly to a statement of the details of the error referred to, before going further.

By close telescopic observation it was early discovered that the earth has a kind of oscillating or wabbling motion along its orbit around the sun, evidently caused by the moon's influence as it revolves around the earth once in about twenty-eight days. Even Newton and his immediate successors, detecting and proving this wabbling motion, inferred that it must be the result of the moon's disturbing influence, that sphere being one-eightieth the weight of the earth, thus attracting the earth one-eightieth as much as the earth attracts the moon from its tangent by means of which it receives its orbital

swing. To formulate this wabbling movement of the earth into scientific shape, it was an easy matter to fix upon a point on a line between the earth and moon as their common center of gravity which, of course, would be a point where the two, if connected by a bar would exactly balance each other, scale-fashion. This point, counting their weight as *eighty to one*, and their distance apart as 240,000 miles, would fall inside of the earth about 1000 miles below its surface, or about 3000 miles from its center. Thus:



The figure here given being the exact duplicate of those laid down in astronomical textbooks, and copied substantially from Lockyer's work, page 309, at once introduces us to the essential feature of the error we are endeavoring to correct. As before hinted, astronomers having determined this relative position of the common center of gravity (*c*) of earth and moon on a line between them, proceeded to locate it on the mean orbit of the earth (*o*) around the sun (where the earth's center, *a*, would be but for the moon), making this point not only the common center of gravity but the common center of motion of both earth and moon, thus assuming the earth (*E*) to travel around the center of gravity (*c*), in an opposite direction to the moon (*M*), as shown by the dotted line and arrow. By a moment's thought it will be seen that such a position and motion of the earth, on the opposite side of its mean orbit from the moon, is an impossibility in the very nature of things, as nothing but the moon's direct reciprocal attraction in proportion to mass can stir the earth an iota from its normal position on its orbit around the sun. No movement of the earth can be conceived of by such attraction but one directly toward the moon in consequence of this reciprocal pull. But strange to relate, astronomers make the moon's direct pull of the earth start it at right angles to this line of attraction instead of toward the moon, thus causing it to revolve about a small orbit of its own, 6000 miles in diameter, in a direction contrary to every principle of mechanics or philosophy known to men. They never, apparently, stopped to inquire by what means the moon, which receives its entire circular motion from the earth's pull, could shove the earth oppositely or at right angles to a line connecting the two spheres, as shown in Fig. 1. The only conceivable mental process reaching such a supposed motion of the earth must have originated in the fact, that after figuring for

this common center of gravity, by imagining two balls of proportionate size to the earth and moon, attached to the two ends of a bar and suspended scale-fashion, *they forgot to take away the bar*, and thus, unfortunately for science, left the earth and moon suspended at the two ends with a pivot at *c*, on the earth's mean or average orbit, *o*, around which both earth and moon might revolve as shown. In this way they supposed the moon, by the force of its swing toward the left, to *pry* the earth around to the right, by reeving this supposed bar upon the pivot or fulcrum, *c*, not thinking that the moon has no force or motion along its orbit by which to pry the earth in the opposite direction, except what it gets from the earth's direct pull, thus counteracting its projectile force and tangential tendency. Neither did they stop to consider how the earth, *e*, first obtained its abnormal position outside of its mean orbit (opposite to that of the moon) where its center must have rested before the moon existed. Of course no such position could possibly have been given to the earth, unless the moon had actually pushed it away by gravital repulsion before the pivot and bar act commenced. But as no such repulsion is known among the heavenly bodies, or hinted at in the *Principia*, but only attraction reciprocally according to mass, it is plain that by no possible law of science or principle of mechanics, could the earth vary from its mean orbit around the sun on the side of that orbit opposite to the moon's position and pull.

But conceding this abnormal position of the earth as represented on the wrong side of its orbital path, thus putting the astronomical cart before the horse, so to speak, a beginner in astronomy, unless blindly led by the textbooks, would naturally want to know how this pivotal prying process can be accomplished. No sane scientist, it would seem, could imagine that there was a real bar of a rigid nature connecting the earth and moon by which any such prying operation could be produced. Yet it is a positive fact that a leading professor of astronomy in one of the colleges of this city, when pressed by a friend of ours for an explanation of the present theory concerning the earth's wabbling motion along its orbit, could give no answer except to assume an actual rigid bar connecting the earth and moon by which the moon, in moving along its orbit, pried the earth around the pivot. He then coolly asked our friend if this principle of "action and re-action" was not a sufficient explanation of the difficulty!

To show that we do not misrepresent the universal teaching of astronomers upon this subject, we here quote the words of the eminent Prof. Newcomb, LL. D., professor of

astronomy in the U. S. Naval Observatory, as given in his *Popular Astronomy*, page 91, as follows:

"Now, strictly speaking, the earth does not revolve around the moon, any more than the moon around the earth, but by the principle of action and reaction, *both move around their common center of gravity*. The earth being eighty times as heavy as the moon, this center is situated within the former, about three-fourths of the way from its center to its surface."

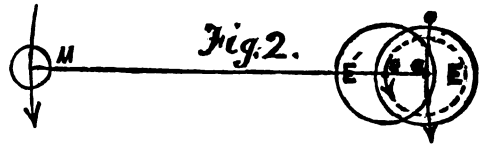
He then gives a figure showing the same pivotal point (c) as does Lockyer on the side of the earth next to the moon, and no doubt Prof. Newcomb, if he ever gave the matter a serious thought, supposed, like the professor just alluded to, that there must be an actual rigid bar or its equivalent connecting the earth and moon by which the latter could pry the former around this supposed pivotal center of gravity.

There can be no mistaking the real teaching of astronomy on the subject as here presented, and as illustrated in Fig. 1. By some inter-spherical and unaccountable process the theory first manages to shove the earth from the moon, locating its center, *a*, 8000 miles on the opposite side of its orbital line of travel around the sun, thus bringing the common center of gravity of earth and moon exactly on this mean orbital line as seen at *c*. Then by an equally mysterious process the moon is made to keep the earth pushed just that far away from its normal place on its orbit while the moon continues to revolve around this center of gravity, also prying the earth around every twenty-eight days. When the moon has thus traveled a quarter of its circuit, it will have forced or pried the earth as much above this pivotal center, *c*, as it is now to the right of it; and when the moon has made a half-circuit it will have pried the earth around to the opposite side of its orbit, as far to the left of its normal position as it is now to the right, thus bringing its center to the point, *r*, and so on continually, round and round. Is there any reason or rationality in this theory? We assert, without the slightest reservation of doubt, that no intelligent and candid astronomer, after his attention has been called to the prodigious frivolity and absurdity here pointed out, can accept the present theory, but must immediately cast about mentally for something that will harmonize with reason, known facts, and common sense. This we will abundantly show before we get through.

Having thus proved, on its very face, the fallacy of the teaching as put forth in all the text-books on this matter of the earth's wabbling motion along its orbit and its supposed cause, let us present the real motion and the real problem in the light of true science, and then explain the phenomena involved, so that even our New York professor will be able to

see that there is no necessity for a pivot or for a rigid bar connecting the earth and the moon.

Suppose, in the first place, the earth traveling along its orbit around the sun without a moon to influence its motion. Where would its center be located? It is plain that the earth would pursue its course with its center all the time exactly on this orbital line and without any of the present observed wabbling motions. Then suppose our moon to be instantly flung into its present orbit with its present projectile force, it is manifest that the earth would not only pull the moon from its tangential tendency into its present circular orbit, but that the moon, in turn, by its reciprocal attraction in proportion to weight, would pull the earth from its orbit around the sun just one-eightieth as much, or bring its center to the exact point of their original center of gravity, as shown by Fig. 2, which we will now try to explain.



This figure shows the true and only possible position of the earth both before and after having been acted upon by the moon's attraction. *E* shows the earth as it would be uninfluenced by any attraction save that of the sun, pursuing its course along its annual orbit, *o*; while *E'* shows the earth in its position under the attraction of the moon, with its center, *a*, pulled out to the point *c*, which is the real common center of gravity of the two spheres, as it evidently was before the earth had time to move under the moon's pull. But the moon's attraction comes in as a disturbing influence upon the earth, drawing its center, *a*, 8,000 miles from its normal position on the orbit, *o*, to the common center of gravity, *c*, thus representing a displacement of the earth one-eightieth of the distance to the moon, which corresponds to the real difference between the weights of the two spheres. How simple and true!

It is plain when the moon (*M*) begins to pull the earth (*E*) as it is traveling along its orbit (*o*), the earth must yield and be moved from this orbit toward the moon. As soon as its center has reached *c*, the extent of the moon's displacing power, the earth will of necessity be moving with the moon around the common center of motion, *a*, as shown by the arrow and dotted line. Yet, marvelous as it may seem, the universal teaching of astronomy is that this *pull* by the moon really *drives* the earth the other way, placing the mean orbit around the sun

between the moon and the earth, as we have already shown in Fig. 1, thus causing the earth to vibrate back and forth across this orbit as if it were pried around the common center of gravity by a rigid bar. One would think that the folly of this teaching would only require a hint to make any astronomer see it, and even to laugh outright at the absurdity of such a notion. But this proves not to be the case, so tenaciously do men persist in clinging to errors taught them in their class-rooms.

And here we meet with a very superficial objection to this correct view of the position and motion of the earth caused by the attraction of the moon—an objection which was actually raised by the same astronomer who supposed the earth and moon to be connected by a rigid bar. He objects that if the earth, *E* (Fig. 2), can be pulled out from its position on the orbit, *o*, 3000 miles by the moon's attraction, why does the moon stop with pulling it thus far? Why does it not keep on drawing it out further and further from the common center of motion, *a*, till it finally pulls the earth clear to the moon? And yet this childish difficulty was seriously urged by a professor of astronomy in a great college, who claims to be capable of instructing pupils in the science immortalized by Copernicus, Kepler, and Newton! Can he not see that should the moon be required to draw the earth still further out, it would of course have to carry it along with it on a correspondingly increased local circle around the common center of motion, *a*, through a greater distance, at a greater velocity, and consequently at a greater expenditure of attractive force? Can he not comprehend the simple fact that the pull of the earth continually around in a larger orbit than 6000 miles in diameter (which corresponds to the center of gravity, *c*) would require more than the one-eightieth force which the moon is capable of exerting? If the moon was not in motion around the earth at all, and if it was so anchored as not to be displaced by the earth's attraction while both were traveling around the sun, it is plain that it would finally pull the earth entirely to it, or a distance of 240,000 miles away from its present orbit at *o*. But with the moon circling around the earth, obliged as it is to draw the earth along with it, it ought to be plain to a beginner in astronomy, that as soon as the earth has reached *c*, its continuous circular displacement and travel at that distance from and around the center of motion, *a*, and at that velocity, necessarily utilizes all the attractive force that the moon can exert. If the moon were double its present size it would exert double its attractive pull of the earth, its common center of gravity, *c*, would be 6000 miles from the center of mo-

tion, *a*, and consequently it could pull the earth out and maintain it in an orbit of double the present size, or 12,000 miles in diameter. Really it is too bad that this great college, which we refrain from naming, cannot secure the services of some one to fill its chair of astronomy capable of explaining these fundamental principles of reciprocal attraction among the spheres. To oblige that institution, we would not mind riding up there once or twice a week to give short lessons on the elementary laws of astronomy, should the faculty so desire. We are open for an engagement.

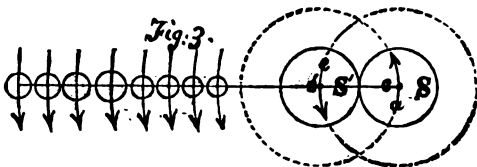
We have fortunately a most beautiful illustration and even demonstration of the correctness of our position from the teachings of Newton himself—an illustration which ought to open the eyes of astronomers to the value of the new theory, if nothing else will. Newton tells us in the *Principia*, that every planet, however small, tends to pull the sun out of its normal or central position in the solar system in proportion to its weight, and that the promiscuous distribution of these minor spheres around the sun in all directions, with their different weights, distances, etc., as it so happens, about equipoises the system, keeping the sun as a general rule near its normal center, but producing, however, very slight movements of the solar orb hither and thither as the preponderance of planetary weight occasionally accumulates in some one direction, thus pulling the sun slightly out of its central position more or less, while that normal central position is all the time the common center of motion of the entire system. (See *Principia*, page 401).

He further distinctly teaches that the common center of gravity of the sun and Jupiter, if these two alone existed, would fall at a point on the sun's surface, or 480,000 miles from its center; and hence, as a matter of course, if all the other planets were blotted out, Jupiter would at once attract the sun half its diameter away from its quiescent position, or would remove its center to where its surface is now, or to their common center of gravity, when both Jupiter and the sun would continue to revolve together around their common center of motion, and both on the same side of it. Nothing can be plainer.

Newton further shows what this displacement of the sun would be from its normal position by the combined action of all the planets, should they happen to fall into line and continue long enough in one direction; and he calculated just how far the center of the sun would be drawn from its normal position in such event. (*Principia*, pp. 401, 402, 581). This, of course, would be to the normal common center of gravity between the sun and planets thus placed

in line, based upon the latter's average distance, weight, and consequent attractive pull. As the planets in line would pull the sun out, as Newton distinctly teaches, a distance equal to that from the sun's center to their common center of gravity, it is plain that if all the planets could be kept in line, the sun would be kept that far out from its previous center, and as the planets would swing around in their orbits, the sun would also swing with them in a smaller orbit around their old center of motion from which the sun had been pulled, making the sun's original position the common center of motion of both sun and planets. Nothing else could possibly take place unless the planets should repel the sun, instead of attracting it, which Newton flatly repudiates.

All this harmonizes exactly with what we are endeavoring to inculcate with reference to the relative attractions and motions of the moon and earth. It is plain that the sun and the planets in line would all have to revolve around, and on the same side of, a common center of motion, as we have just described it, the same precisely as must the earth and moon. No astronomer would think of assuming one law of attraction and motion for the sun and planets thus in line, and another exactly contrary for the earth and moon. Newton declares that the same laws of attraction and motion must apply to suns, planets, and satellites. (See *Principia*, page 529). We can, then, easily settle the motion of moon and earth by a correct understanding of that of the sun and all the planets acting in one direction, as illustrated by Fig. 8.



Newton tells us that the common center of gravity of sun and the combined planets would be at a point one diameter of the sun from its quiescent center toward the planetary mass, or at c' , a distance of about 860,000 miles from c , its present center of gravity and center of motion with the planets as now distributed equally around it. This distance represents the weight and consequently the attracting or displacing force of all the planets pulling upon the sun in one direction, and, as Newton distinctly teaches, this center of gravity, c' , must be the actual point to which the sun would be removed by the pull of all the planets, leaving c , of course, the common center of motion for the whole system as before. This is plainly true; for suppose that all these planets should be kept in line, attracting the sun with their reciprocal force according to weight as they revolve

around the common center of motion, c , in their normal orbits, it requires no argument for an intelligent mind to understand that the sun would not only be pulled from the center of planetary motion, c , to the common center of gravity, c' , but that the sun's center would be kept there and would, as before stated, be carried around with the line of planets as shown by dotted line and arrow, e . By every principle of mechanics and philosophy the center of the sun at its new position, c' , caused by the united pull of the planets, ceases to be the center of motion of the system, the sun itself now becoming one of the revolving bodies around the common center of motion, c , following an orbit of its own of 1,720,000 miles in diameter, while each of the planets pursues its own orbit as of old. In a word, and to emphasize what we have said, suppose the solar system, first equally balanced by the distribution of the planets around the sun, making the sun's center, c , both the common center of gravity and common center of motion; then suppose all the planets, by divine fiat, to be instantly placed in line, as shown in Fig. 8, each to pursue its own orbit with such average velocity for the whole system as to keep them there and to effect their present pull upon the sun, can any one for a moment doubt but that the sun, under such united attraction, would commence moving from c toward c' , spirally keeping in line with the planets till it would finally attain c' , where, under the maximum attraction of the planets it would continue to revolve in the orbit, e , around the common center of motion of the entire system at c ?

In contrast with this most natural view of the subject, as indorsed by Newton himself, we are taught, according to the present theory of the moon and earth, that the instant the planets should be thrown into line, as shown in Fig. 8, the sun S , instead of starting toward the planets, according to the reciprocal and universal law of gravitation, would start to the left, as shown by the arrow, a , thus instantly changing the common center of motion of all planets from c to c' , and at the same time forcing all the planets to seek new orbits around this new center 860,000 miles away from their present orbits in the heavens! Why the sun, S , should start in the direction of the arrow, a , as the earth is claimed to do, and as seen in Fig. 1, sooner than in the opposite direction, or in a direction directly away from the line of planets, is one of the mysteries which astronomers should favor the world by unraveling.

Seriously, and without desiring to tantalize the advocates of the preposterous system, we would ask if ever a theory of science was so ridiculously and hopelessly at sea as in this present teaching of astronomy concerning the

"action and reaction" of primary and secondary spheres, and which so strangely forces them around the common center of gravity?

Thus the teachings of astronomy concerning the movements of the moon and earth melt away under the scorching light of Newton's *Principia*, as applied to the sun and planets. cases which the immortal author declares to be in all respects governed by the same uniform principles of attraction and motion, notwithstanding it turns Newton flatly against himself, since he was the first to teach the present theory of the earth and moon's relative motions, just as astronomers now insist, and as shown at Fig. 1.

Is it not clear, then, from this detailed view of the whole subject, and as represented in Fig. 2, that the point, *a*, on the earth's mean orbit, *o*, after the moon has accomplished its work of dislodgment, becomes of necessity the common center of motion of both earth and moon, around which both revolve together once in about twenty-eight days, the moon all the time carrying the earth around by its attractive pull between it and the common center of motion, instead of repelling the earth, as the present theory virtually teaches, keeping it on the wrong side of its orbit? In a word, is it not plain that the earth's center is now constantly kept pulled 8000 miles away from its old position, as seen at *o*, Fig. 2, *a* being the place it would occupy were there no moon to attract it? After the earth has been drawn, as shown in Fig. 2, to its new position, with its center at the center of gravity, we may, if we wish, theoretically imagine a new common center of gravity a little nearer to the earth's surface than before; but such fictitious center of gravity is without significance, since the moon has already done its work of disturbance in pulling the earth all that their original common center of gravity represented.

In view of these facts is it possible, is it conceivable, as a learned scientific man recently exclaimed when the alleged new discovery was pointed out to him, that not one astronomer, from Newton down to the present time, has detected this self-evident error? He declared that it was the most astounding revelation of modern scientific research, and the most startling strain upon human credulity to be compelled to think that such men as Prof. Charles A. Young, of Princeton College; Prof. Newcomb, of the Naval Observatory; Professors Lockyer and Proctor, of England, and scores of others, had failed to detect the error, when the theory as taught was on its face such a glaring absurdity and impossibility. Yet astounding as it seemed to be, he was forced to confess that the whole scientific world

was at the present time, and had been for more than a century, laboring under this prodigious misapprehension of astronomical facts.

What makes the error more surprising and inexcusable, is the fact that all astronomers admit that there are many lunar irregularities in apparent motions for which no satisfactory cause can be detected. Newton, in his *Principia*, distinctly tells us that by no known astronomical principle can all the moon's observed irregularities be explained, and from his time to the present all the able astronomers have been studiously searching for these very irregularities of apparent motion, when all the time the trouble may have been, partly, at least, not in the moon at all, but in the motions of the earth in its wobble along its orbit on the opposite side of the common center of motion to which the false astronomy of the scientific world has always assigned it. It is not surprising, but rather it is perfectly natural that there should be small errors in astronomical calculations, such as those employed in determining eclipses of the sun, missing contacts often by several seconds, when the earth, the only basis of observation, is actually about 6,000 miles out of its supposed position in the heavens, being on the opposite side of its mean orbital place from the moon, to which astronomy now assigns it. At all events it is inconceivable, while astronomers have been so diligently searching for every defect of lunar observation and calculation, that this glaring error in the position of the very base of all our observations should not have been stumbled upon.

We will conclude this paper by giving a bit of history connected with the discovery here claimed, and relate some facts which may interest the reader more than the dry argument so far demanding his attention, but indispensably necessary to prepare the way.

[TO BE CONCLUDED NEXT MONTH.]

CONFUSED IDEAS ON PHYSICAL SCIENCE.

One of the best illustrations of the confused notions of physicists, by which they still are enabled to hold to the wave-theory of sound as true science, is furnished by the eminent Prof. G. G. Stokes, F. R. S., of Cambridge University, in a paper on Sound which he read before the Royal Society of Great Britain, a copy of which he sent to Dr. Mott, and which the doctor has shown to us. It is a well-known fact that all the great investigators of acoustical phenomena, including Tyndall and Helmholtz, have acknowledged that a body moving slowly to and fro through the air, such as the hand, or a clock-pendulum, will not condense this medium in front or rarefy it behind, so as to send off a pulse or wave, but that it merely displaces the air-particles from in front, causing them to move around the edges of the body and take their place behind it to equalize

the disturbance, substantially the same as in the case of an incompressible fluid like water. Yet, notwithstanding this truthful admission, they lose sight of the philosophical consequences involved in it, which are completely fatal to the present theory of sound, as we will endeavor in a moment to show. They assume, for example, that if this same slow movement of the hand were repeated in shorter distances with sufficiently rapid alternation, and without any increase in velocity, the mere increased number of motions would condense the air and send off sound-pulses, or pulses of the same nature, having a velocity of 1120 feet in a second. A more erroneous idea was never conceived: and we believe that we cannot perform a more valuable service to the cause of physical science than to expose this fallacy here and now for all time. We have repeatedly hinted at it in these pages, but this peculiar phase of the old theory is made so prominent and glaring in the paper of Prof. Stokes, and the true principle is so completely ignored by confused discussion and want of definite idea, that we propose to elaborate the matter so fully that no excuse will remain for misapprehension. Here is the paragraph from Prof. Stokes' paper directly relating to the matter in hand:—

“Suppose a person to move his hand to and fro through a small space, the motion which is occasioned in the air is almost exactly the same as it would have been *if the air had been an incompressible fluid*. There is a mere local reciprocating motion, in which the air immediately in front is pushed forward, and that immediately behind impelled after the moving body, while in the anterior space generally the air recedes from the encroachment of the moving body, and in the posterior space generally flows in from all sides to supply the vacuum which tends to be created; so that in lateral directions the motion of the fluid is backward, a portion of the excess of fluid in the front going to supply the deficiency behind. Now conceive the periodic time of the motion to be continually diminished [that is, the rapidity of alternation increased]. Gradually the alternation of movement [no increase of velocity thought of] *becomes too rapid to permit of the full establishment of the merely local reciprocating flow*; the air is sensibly compressed and rarefied, and a sensible sound-wave (or wave of the same nature, in case the periodic time be beyond the limits suitable to hearing) is propagated to a distance,” etc.

Here we have in a nutshell the entire ground of fallacy on which the wave-theory of sound is based. It is that the increased number of motions of a body vibrating in the air is what condenses the air into sound-waves, *without the slightest reference to the velocity with which the moving body travels*. Nothing can be plainer than the fallacy of this fundamental mistake; and Prof. Stokes is, no doubt, just the man to be convinced of such a radical error, when the proper evidence is before him, and then so to present it to the Royal Society as to produce a sensation among the physicists of Europe. It shall not be our fault if he does not see it.

Let us take his own illustration and admission as quoted above, and look at it carefully. When he moves his hand to and fro (say a foot in a second at each motion) he does not condense the air, he says, because the particles have time to slip around his hand, and take

their place behind in order to restore equilibrium, the same as in an incompressible fluid. So far it is all plain and true. But suppose that he moves his hand to and fro half a foot in half a second at each motion, and that he keeps up this alternation of motion, would its contact with the air come any nearer condensing it than before? Certainly not. Since the *velocity* of contact with the air-particles is precisely the same as before, when the hand went at a single motion a foot in a second. Then suppose he should move his hand one inch to and fro, making each motion during *one-twelfth* of a second, it is plain that no more condensing effect would be produced by such motions, since the hand must move at precisely the same velocity through each of these inch-motions as it did when moving a foot without stopping. Take any one inch out of the single foot-swing in a second, and its action on the air-particles would be precisely the same as would be one of the inch-motions made in the twelfth of a second, as last supposed. To see and appreciate this self-evident law of mechanics, we have only to remember that the condensing effect of a moving body on the free air has nothing to do with the distance traveled or the number of movements made in a given time, *but it depends alone and solely upon the velocity of contact of the moving body against the air-particles*. A body moving an inch and then stopping surely cannot condense the air any more than it would if it went on a foot at the same velocity before stopping. A body moving at the rate of only a foot in a second might make *one* motion, *twelve* motions, or *twelve hundred* separate motions during the same second by dividing the foot up into sufficiently small segments of travel, and still it would produce no more condensing effect on the air in one case than in the other, *since the velocity or force of contact is exactly the same in each case*. Surely such a thinker as Prof. Stokes will comprehend this; and consequently he will see at a glance that a tuning-fork making 256 motions in a second, but so reduced in distance as to make its greatest velocity during each motion, but at the same rate of a foot in a second, cannot condense the air by any one of such short motions, since the velocity of contact is the same as in the longer motion of a foot. How would it be possible for one such short motion at only a velocity of a foot in a second to condense the air, when a longer motion at the same velocity, as in the case of the professor's hand, merely displaces the particles? And if one short motion at this velocity will not produce a condensation, would the motion at no greater velocity, repeated twice, thrice, or a thousand times in a second, improve the condensing tendency? It is positively marvelous that physicists have not made this nice but very important distinction, and thus demonstrated that sound is not the effect of atmospheric condensations and rarefactions at all, as universally supposed. Certain superficial appearances, we admit, seem to favor this supposition of condensed atmospheric pulses being the cause of sound, but these mistaken appearances we have repeatedly explained, both in our original work on this subject and in the various numbers of this magazine. We do not think that our great physicists have done their own intellects justice in continuing to assume condensed air-waves as constituting sound, with such insuperable objections against the theory as here presented in this enormously slow veloo-

ity of contact of the moving and still sounding prong. Especially is this oversight inexplicable when we know, as Capt. Carter's experiment so clearly demonstrated, that the fork sounds audibly in the open air when its swiftest velocity of travel was only at the rate of *one inch and a half in four years*. And now, when the ablest physicists have voluntarily assured us that a single slow motion fails to condense the air into a sound-wave on account of the air's mobility preventing it, what must they say in the blazing light of the fact just stated, of a body sounding when its motions are more than a million times slower than this non-condensing motion of the hand?

Thus, by the admission of Prof. Stokes, as well as of most eminent scientists before this controversy on sound came up, a single slow motion of a foot in a second cannot condense the air nor start a pulse or wave equivalent to those supposed to constitute sound. And from the plainest ratiocination the intellect must admit that if one such slow motion will not condense the air, on account of the mobility of its particles and the readiness with which they slip around behind the moving body, then two such motions equally slow, each, of course, of half the distance, can come no nearer producing a condensation. Nor could three, three hundred, or three thousand such motions of no greater velocity do any better. A truth so manifestly axiomatic as this would not seem to require an argument, yet the oversight of this very truth is the essential basis of the wave-theory of sound. Physicists have been singularly careless, not to say obtuse, in not recognizing the almost self-evident fact (the first intimation of which in any work appeared in the *Problem of Human Life*) that the condensation of the free, mobile air depends alone upon the velocity of the moving body, and not in any wise upon the distance moved, the number of movements made in a given time, or the direction taken by the moving body. If the same distance of motion (say one foot) were maintained, as the alternations of movement increased in rapidity, then as a matter of course the velocity of travel would be augmented with the number of oscillations in a second, and the tendency to condense the air would be increased accordingly. But Prof. Stokes had no such meaning as this in his mind when he spoke of the increased alternations of the moving hand. Had he thought of such a thing as maintaining the distance of the moving hand while increasing its alternations, he would certainly have intimated it, and thus have obviated the very confusion or want of perspicacity of which we complain. The prong, instead of augmenting its number of motions in a second, as is well known, keeps up the same uniform number, but decreases the distance traveled at each swing, thus constantly decreasing its velocity of contact with the air-particles, and its consequent condensing tendency. The rate of velocity, therefore, does not depend upon the number of vibrations in a second, as before insisted, except as they are taken in combination with the distance traveled at each swing. We beg the reader's indulgence for sufficient time here to elaborate this matter fully, for on it, as a beginner in natural philosophy can see, the entire present theory of acoustics depends.

If, for example, a single motion of the hand at the velocity of a foot in a second would not by its contact bend a powerfully stretched membrane, would two such motions of the

hand in the same second, but of half a foot each, and of course at the former velocity, bend it? Would five, would ten, or would 250 such motions, each so reduced in distance as not to increase its velocity, succeed in bending this membrane? To ask such a question is to answer it flatly in the negative to any unbiased mind capable of reasoning philosophically on matters of physical science. Can such a mind doubt for one moment but that a body making a single motion through the air at the rate of a foot in a second, produces twelve times as much impression on the air-particles, in the way of condensing them, as if it moved only at the rate of an inch in a second? If the principle here suggested be correct, then surely twelve separate inch-motions, all taking place in a second, would no more tend to compress the air than would a single motion of a foot at the same velocity. If this one-foot motion in a second were divided up into one thousand separate segments of motion, each a thousandth of a foot in distance, no time being allowed for stops and starts, and if each of these minute motions were at the same velocity—namely, at the rate of a foot a second—can anything in mechanics be plainer than that neither a single one, nor a thousand of such minute motions succeeding each other, could come any nearer condensing the air than would the one single motion through a foot of space at the same velocity of travel? Hence, we conclude that no matter whether the movement of a body be long or short, whether it consist of one motion or a succession of motions in one direction, or a succession of motions alternately in opposite directions, slow motion in an elastic mobile medium, as now authoritatively admitted, can only displace the particles as in an incompressible fluid. If a body should move forward through the air at the velocity of *one and a half inches in four years*, as positively demonstrated in the case of a tuning-fork's prong while still sounding, such enormously slow motion will not be claimed by any intelligent person, in the light of Prof. Stokes' admission, to be able to condense the air and drive off a pulse. To claim such a result as possible, would be to fly into the face of reason and common sense. Should such moving body stop and then start in the same direction at this slow rate of velocity, it could no more condense the air by the second movement than by the first; nor could its start in the opposite direction at no greater velocity produce any different result than by its first movement. If two such movements at this velocity could no more tend to condense the air than could one, then five, ten, ten thousand, or ten million such separate motions, each at no greater velocity, would be incapable of producing a condensation. This clearly seems to be self-evident truth. Bear constantly in mind that *velocity of motion* is all there is to consider in the premises, since the *stops* manifestly can effect nothing, being *motionless*. After a body has stopped moving without condensing the air, it makes not the slightest difference which way it goes, as to its condensing tendency, whether in the direction it was pursuing before it stopped, in the opposite direction, or in some other or lateral direction. Its effect on the air will be precisely the same alone according to its *velocity* and consequent force of contact. If its velocity be too small to condense the air at any one motion, then, as before observed, two, ten, or ten million simi-

lar motions, which add nothing to velocity, can add nothing to condensing power. Hence, the numerous stops, starts, and changes of direction in a tuning-fork's prongs constitute a factor entirely outside of this problem of the condensation of the air, since the condensing tendency of each separate movement is to be considered independently or by itself, the same as if no other movement had been or was to be made, and being vastly too slow to send off a condensation or pulse, according to Professors Stokes, Helmholtz, and Tyndall, it demonstrates the wave-theory of sound to be erroneous. In a word, if the movement or travel of the prong, either for a long or short distance, is too slow to condense the air or drive off a pulse, it is plain that the period of *rest* of the prong, or, in other words, its period of *standing still*, however short or long that period, can add nothing to its condensing force. Its *velocity while moving* is all there is in the problem. Hence, sound is not the result of air-waves or atmospheric condensations and rarefactions, since a fork moving millions of times too slow to condense the air, as confessed by the highest authorities, still sounds audibly.

But the objector asks—are you sure that a short motion at a given velocity does not condense the air even when a longer motion of the same body at the same velocity would not? And he refers us to Prof. Stokes' remark as quoted. "Gradually the alternation of movement becomes too rapid [not a word about increase of velocity] to permit of the full establishment of the merely local reciprocating flow: the air is sensibly compressed and rarefied," etc.

Now we can quash this difficulty in a very simple and mechanical way. If the prong were moved to and fro like the hand, a foot in a second, instantly changing directions at the ends of motion, Prof. Stokes would admit that no condensation of the air would take place. This is all we ask, *since the last thousandth part of this motion, before changing direction, and the first thousandth part of the next motion after changing, can be fairly and scientifically isolated and made into the very short motions we are talking about!* As no part of the long motion compresses the air, since the whole of it does not, it is plain that the last thousandth part of it does not condense it: yet if we count this last thousandth part, letting all the rest go, the prong thus moves through it, stops just as short, and starts back just as quick for the next thousandth part as if all its motions were alternately but the thousandth part of a foot each. What now becomes of the air-particles in front of the prong when, in closing its foot swing, it goes through this last thousandth of a foot and stops and turns instantly back and moves the other way another thousandth of a foot? Why, you have to say, with Prof. Stokes, that the particles get out of the way of the prong on account of their mobility without being condensed, the motion, small as it is, being too slow to condense them. The same thing must of course be true were the prong's entire motion but the thousandth part of a foot, and at the same velocity of one foot in a second. Does not the reader see how utterly confused and self-stultifying a false theory must necessarily be? It is impossible, in the nature of things, for error to cohere.

Perhaps no fallacy in physical science is better calculated to confuse and deceive the unwary than this same supposed condensation

and rarefaction of the air by the mere rapid alternations of swing in a sounding body, such as a fork or string, without the slightest reference to the *velocity of motion*. So deceiving is it that from the days of Pythagoras down to the present, the brightest scientific intellects have mistaken such rapid alternation of motion for the *swift travel* of the prong or string while in motion. The eminent Prof. Helmholtz innocently tells us that the prong, when sounding, travels "very much faster" than the pendulum of a clock, and Prof. Tyndall tells us to notice the prong of a tuning-fork "swiftly advancing," "carving the air into condensations and rarefactions," when, in reality, as it has been demonstrated, the fork sounds audibly while its prongs are moving 25,000 times slower than the outer end of the hour hand of a regulator clock. (See December MICROCOSM, 1888.) And without intending to boast, but as a simple matter of scientific history, we challenge the world to point to one sentence in any philosophical treatise or elsewhere, before the issue of the *Problem of Human Life*, which even hints at the possibility that such supposed swift motion of the prong or string was erroneous. Yet with this revolutionary discovery sent broadcast, sapping, as it does, the very foundation of a scientific theory never before called in question, certain professors of physics self-complacently pretend to ignore its author as unworthy of their consideration. We can surely stand it much easier than they can afford it.

The idea that rapid successions of slow motion (*slow*, because of reduced distance of travel at each swing) should condense the air because of the frequent alternations of movement, is a most pernicious fallacy growing out of the very subtle misapprehension of facts which we have just endeavored to explain in treating upon Prof. Stokes' paper. Physicists must grasp the thought, if they would master the intricate problems of physics, that these minute divisions of time, such as those made by the vibrating fork or string, are only *relatively* rapid—that is, rapid in relation to the small spaces passed over. A period of time is relatively long or short in exact proportion to what takes place in it. The alternations of 256 vibrations in a second, though seeming rapid to us, are relatively quite infrequent of occurrence, and would be even an hour or more separated from each other could we look at them in their true relation to the minute space traversed during each vibration—so minute as to make their travel enormously slow. The swing of a pendulum to and fro a foot in a second is relatively much more rapid alternation than the swing of a prong 256 times in a second whose entire aggregate travel is but an inch. If we were to consider intelligently the 128,000,000th of an inch as the whole distance traveled by such a prong in a second while still sounding audibly, as proved in Capt. Carter's memorable experiment, its 256 alternations would relatively be many days, if not weeks, apart. Could these incomprehensibly minute divisions and reductions of space, as the tone of the fork settles down, keep pace in our minds with the minute alternations of time in each swing which we are considering, we could readily conceive of an abundance of time between their occurrence for the air-particles to slip around behind the prong, as Prof. Stokes says, since the most superficial investigation can determine by arithmetic an actual velocity of the prong a million times slower

than that of the hand to and fro through a foot-space referred to by Prof. Stokes.

The true solution of this entire problem, which physicists have so strangely failed to apprehend, consists in recognizing the sole and simple fact that if the air-particles have *less time* in which to slip around the rapidly alternating prong, as Prof. Stokes urges, they have correspondingly *less distance* to slip. Nay, they have millions of times *less distance* to slip, considered in the light of their rate of alternation, as compared to that of the hand moving through the space of a foot once in each second; while the air-particles, in the case of the sounding prong, have the additional advantage against being condensed of *millions of times less velocity of contact to resist than in case of the moving hand*. How overwhelming must this argument be to the mind of a real scientific thinker when he reflects that *velocity of contact* is all there is to be considered in connection with the problem of condensing the free air! This single statement settles forever the question as to the fallacy of the wave-theory of sound. And if sound is not constituted of the condensed pulses of the medium, then what is it? For an answer to this question, consult the Substantial Philosophy as profusely elaborated in the four volumes of this magazine.

To the mind of a true philosopher an atom of matter so small as to be invisible under the microscope, is but a reduced world, while the millionth of a second of time is but a miniature cycle of ages. A second of time is a longer period to a midge, whose whole lifetime is but an hour, than would be several months to an elephant whose age reaches a hundred years.

The whole matter is one of *relativity*, and the physical investigator who cannot take into account the thousand-millionth of an inch as easily as a mile, or the millionth of a second as readily as a month, or a year, if needed in physical research, is not capable of inspiring young students with the proper spirit of true philosophical investigation.

We have thus taken pains to go somewhat deeply into the finer details of this investigation, not that we expect the mass of our readers to care to follow us or to enjoy the critical discussion of such a dry subject. But as we are writing for the future more than for the present generation, we shall be satisfied if our scientific readers do not lose their patience with us and with *THE MICROCOSM* on that account. At all events, we feel sure that such a scientist as Prof. Stokes, who has already gone so far into the principles of physics as to admit that the movement of his hand is too slow to condense the air into a wave or pulse, but that it merely displaces the particles, allowing them to slip around from in front and take their place behind, must be able to grasp what we have here written. We feel further sure that he will have the independence of mind, if convinced, to admit at once that a body moving millions of times slower than his hand (such as the sounding prong of a tuning-fork just previous to becoming inaudible, a fact he can easily see demonstrated in Capt. Carter's great experiment), can hardly be supposed to condense the air *by virtue alone of the very small distance traveled*.

We shall see that a marked copy of this paper as soon as published is sent to Prof. Stokes, and we beg of him to give a candid opinion

of this discussion for the benefit of the public, that we may print it in this magazine. We ask him in all frankness and sincerity to let our readers know upon what principles of mechanics or philosophy the motion of his hand through a foot of space in a second is so slow that it fails to condense the air, when a motion of a prong through a less space and traveling at a million times less velocity not only condenses the air in front, as the present theory teaches, but sends off these pulses at a velocity of 1120 feet in a second.

Should he become convinced that we have here an insuperable difficulty in the way of the present theory of acoustics, as we feel quite positive he must, he cannot serve his day and generation more effectually than by taking sides at once with the Substantial Philosophy. We need some powerful allies on the other side of the Atlantic, and we shall be only too happy to welcome Prof. Stokes into the ranks, and to learn that he has boldly ventured to inaugurate the new departure in acoustics among the physicists of Cambridge University.

DR. TEFFT'S GREAT BOOK.

Our readers are not unfamiliar with the force and style of the Rev. B. F. Tefft, D. D., LL.D., as a writer. Several articles from his trenchant pen have appeared in this magazine, in some of which he has ably defended the *Problem of Human Life* against its critics. Now it comes our turn, in more than equal terms if we had the words, to speak of a large work called *Evolution*, just issued from the press of Lee & Shepard, Boston, Mass. We have not yet read the book through, but we have been charmed, and at times enraptured, with its smooth and scholarly sentences as they flow out with a clearness and stateliness worthy of the "First scholar in New England," as the doctor is claimed, no doubt justly, to be by many of his friends. Notwithstanding the numerous volumes and treatises which have appeared against the development theories of Darwin, Haeckel, Spencer, and other materialistic evolutionists, it is now clearly evident that the argument in opposition had not come near being exhausted. It seems, almost, from glancing through this great volume that the questions involved had no more than been touched at least in many of their important aspects. In truth the new light which is made to flow in from so many directions abundantly indicates the master mind and logical pen that had taken up the task of an entirely new analysis of the subject. We can say in all candor to those of our readers who wish to go to the bottom of the development theory, pro and con, that we know of no single book so instructive and so readable as this we are now noticing. It comes, in its general character, nearer a complete library on *Evolution* as taught by its ablest advocates, as well as nearer a full exposition of the various methods of refuting it, than any work published.

It contains nearly 500 closely-printed pages, and sells by mail or express prepaid at \$1.50. We have arranged with the publishers to supply our readers at the lowest terms as above. Or we will send a copy free as a premium for five new or old subscribers for the present volume of *THE MICROCOSM*, with the money, \$5. Or to any one purchasing a set of our books & bound volumes of *MICROCOSM*, *Problem of Hu-*

man Life, and Universalism Against Itself), \$5, we will send a copy of *Evolution* free.

P. S.—Since the above was written we have received the following letter from Dr. Tefft, which speaks for itself:

BANGOR, March 23d, '85.

DR. A. WILFORD HALL:

DEAR FRIEND,—I am glad you received my book, and should feel simply proud of your approval of it.

Is it not singular that you and I, probably at about the same time, should have started out on the same line of work, against the great enemy of Christianity—Evolution? And this, without the slightest knowledge of one another's designs. It is still more singular, that with a common end in view, the one work should make no possible interference with the other—they nowhere cross each other's tracks.

You deliver to Evolution a mortal blow from the side of physics. My wish was to give it an equally fatal stab from the side of metaphysics. One work ought therefore to help the other; and so I thought, when indorsing your argument against the common foe. There is no man whose honest opinion of the force of my argument would more thoroughly satisfy me.

I greatly appreciate your editorial labor. Your controversial articles are in every case unanswerable.

Very truly yours,
B. F. TEFFT.

OUR GREAT ENCYCLOPEDIA OFFER.

Among those who have accepted our offer of a complete set (16 leather-bound volumes) of *Appleton's Encyclopedia* for purchasing \$50 worth of books, we may name the Rev. A. McA. Pittman, of Darlington, S. C. He bought fifty copies of the *Walks and Words of Jesus*, at \$1 each. We sent these books and the set of *Encyclopedia* by express, and received in return the following letter:

DARLINGTON, S. C.

MESSES. HALL & Co.,—I have just received the fifty copies of *Walks and Words of Jesus*, and the sixteen volumes of the *Encyclopedia*. I am more than satisfied with the books, and feel well paid for my labor. I would not take \$50 for the *Encyclopedia* alone. You have my thanks for your kindness.

A. MCA. PITTMAN.

NOTICE TO ADVERTISERS.

We have made an arrangement with Mr. WM. C. DUNN, of 24 and 26 Vandewater Street, this city, by which he becomes the sole manager and owner of the advertising business in this magazine, and by which he will become the publisher and proprietor at the end of the present volume, to be formally announced in the 12th number, which will be issued next September. Let all contracts or orders for advertisements, or inquiries about terms, therefore, be directed to Mr. DUNN, as above. All subscriptions, for the present volume only, and orders for books, will be sent, as heretofore, to HALL & Co., 28 Park Row.

A MAGNIFICENT ENGRAVING.

Our agent, Mr. J. D. C. McFarland, of Des Moines, Iowa, has sent us an engraving 19 by 24 inches containing the steel portraits of the

four chief originators and promoters of the Reformation now known as the "Christian Church," but more early designated "Disciples." It is the Denomination to which President Garfield belonged, popularly called "Campbellites." The four portraits are those of Alexander Campbell, the chief mover in the new theological departure; Thomas Campbell, his father; Walter Scott, and Barton W. Stone. To the older members of that denomination, who knew the subjects of these portraits, their names are almost a matter of veneration, whilst the very youngest are taught to regard them with the highest esteem for their work's sake. To all such this engraving will prove of almost sacred value and interest to hand down to their children as a memento of great historic characters and revolutionary religious events. As to the merits of the engraving itself, considered as a work of art, we cannot speak in too high praise. We have never seen its equal for elegance of workmanship and artistic finish, while the portraits as likenesses are declared by those who knew the subjects personally and well to be equally excellent. To those admiring a high order of excellence in pure art, it cannot be other than an intellectual treat to view this masterpiece of steel engraving, whether they may care for the subjects denominationally or not.

THE LECTURE FIELD.

WE have received urgent solicitations from Prof. Lowber, Prof. Cropper, and numerous others, to tear away from New York, and travel through the South and West, delivering lectures on the Substantial Philosophy. We receive the strongest possible assurances that a good hearing could be secured at numerous lecture points. Glad enough would we be to accept these kind invitations, and take a change. But THE MICROCOSM must be edited. Up to this time we have found no suitable assistant in that direction. We trust that all our friends will, therefore, consider its pages the only possible lecture-field we can cultivate for the present, and that they will try to increase the magnitude of our most interesting audience by getting as many new hearers as possible. There are dozens of interesting and profitable lectures, on the most important religio-scientific and philosophical themes, in the seven numbers of volume four already published, while there are not less than hundreds equally important in the first three volumes, bound in cloth. Do you want your neighbors to hear us and our contributors lecture on Substantialism in the most effectual way possible? If so, invest a few dollars in these works, and loan them to be read. They will do ten times more good than can an oral lecture, which will soon fade from the memory.

NOTICE TO SUBSCRIBERS.

Those whose subscriptions have expired with the first half of the volume will please remit 50 cents for the last half, as there will be somewhat modified terms for the next volume, notice of which will be given in the last number. In the meantime, let all who want the present volume from the commencement and any of our books as premiums, at the exceedingly low prices at which we are furnishing them, send on their names. (See last page of February number.)

WILFORD'S MICROCOSM.

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FUTILE OBJECTIONS TO REFORM.

BY REV. PROF. W. H. SLINGERLAND, PH. M., M. S.

There is a large measure of truth in these words of William Lloyd Garrison: "To every great reform the same objections, substantially, are urged until it triumphs. First, that it is against the Scripture. Second, that it disturbs the peace and endangers the safety of the church. Third, that it is generally discarded by the priesthood, who, being Divinely appointed, must know all about it. Fourth, that it is contrary to long-established precedent and venerated authority. Fifth, that it lacks responsibility and character; those who espouse it are generally obscure, unimportant, and none of the rulers believe in it. Sixth, it is sheer fanaticism, and its triumph would be the overthrow of all order in society, and chaos would come again. Lastly, its advocates are vulgar in speech, irreverent in spirit, personal in attack, seeking their own base ends by bad means, and presumptuously attempting to dictate to the wise, the learned and the powerful."

I am well aware of the "liberal" religious sentiments of Mr. Garrison, and the reader may read between the lines all he pleases concerning the bitter spirit that actuated their author. That Mr. Garrison was a noble leader of the anti-slavery reform, to whom in this regard too much honor cannot be given, no one hesitates to acknowledge. That he was led astray religiously, and wrote and spoke bitterly concerning various denominations of the Christian church, is also a matter of history. With those things we have at present nothing to do. The quotation above given is so full of general truths that we may apply them as well to-day as the author could fifty years ago. At that time the cause of Anti-Slavery was struggling amid difficulties similar to those which to-day surround the Substantial Philosophy.

A few noble spirits were the leaders of a gradually increasing army, which step by step advanced toward the great victories of Emancipation and the Fifteenth Amendment. Are not like victories before the leaders and army of the Substantial Reform? I, at least, have faith so to believe. Let us pass in review before our minds these objections which Mr. Garrison says, are urged against "every great reform." "until it triumphs," with a few applications to Substantialism.

1. *It is against Scripture.* The creed-makers have often put interpretations upon Scripture passages, to make them conform to preconceived ideas, that common sense or unprejudiced scholarship would never allow. If a thing is said to be "against Scripture," it becomes necessary to ask, *as interpreted by what creed?* In the minds of many, there is a growing belief that the interpretation which is nearest "natural" is the one nearest right. By "natural" I do not mean necessarily *literal*. There are many passages obviously figurative; and to find the dividing line and rightly interpret the figurative, have led to polemics innumerable. But taken in connection with kindred

passages, nearly every passage of Scripture will allow what may be called an obvious or natural interpretation. And this will usually be found "natural" in another sense; *natural* because in harmony with truth as it is in *Nature*, as ascertained by true science. This because *Nature* and the Bible are both God's books. Substantialism has been attacked by some who have claimed that it is "Against Scripture." No doubt it will antagonize some creeds, but with a correct interpretation of Scripture it is doubtful if it prove antagonistic to the Word of God. We must distinguish between creeds and that on which they are said to be based. So far from finding the objection valid, the writer has, since he began the study of Substantialism, found the Bible, when in his judgment naturally interpreted, richer in instruction than before, and inspiring stronger faith and greater hope. There is an increasing army rising up over our land to declare its belief that God's Word will never be antagonized by the Substantial Philosophy.

2. *It disturbs the peace and endangers the safety of the church.* What church? Is some denomination meant, or the church in the true sense; that is, "all who love and serve the Lord Jesus"? In the first sense, the peace and safety of some denomination might be disturbed and endangered. Denominationalism is not always built on the rock of truth. Reform, which means the righting of wrongs and the eradication of error, might undermine the foundations of a denomination based on wrong or error. But reform could never "disturb the peace and endanger the safety" of what is founded on the Rock of Truth. In the visible church, divided into sects, guided by man-made creeds more than by the Bible, misled by equivocal teaching and blinded by showy ceremonials, there may be a chance for reform; and the God of truth cannot be better served than by such plain teaching of truth that error must fold his wings and flee again into darkness. One to whom the truth of Substantialism is established, need not fear to teach it boldly. If in harmony with the Scriptures, it must be in harmony with Christ's true church, and the purpose of the church will be best secured when the "truth as it is in Jesus," and *as it is in nature*, is so clearly presented that none may mistake it. The church of Christ can never be endangered by error; its peace can never be disturbed by a chimera. If Substantialism be either erroneous or chimerical it can never affect the true church. If, on the other hand, Substantialism be true philosophy, as we believe, that which advances it will advance the cause and hasten the ultimate triumph of Christ.

3. *It is generally discarded by the priesthood.* This is in the sense of the third definition of discard, as given by Webster: "To refuse to entertain or deal with; to reject." It is an undoubted fact that a settled ministry or priesthood is generally slow to receive and adopt that which conflicts with common scholastic opinion, and especially that which antagonizes, or appears to, its denominational belief. Let us give a proper credit here. Undue haste is

worse than dilatory conservatism. To be wisely and progressively conservative is the golden mean. A reform will first carry away with it the few most advanced thinkers and a lot of easily attracted enthusiasts; later will follow those who are to the ecclesiastical body what the phalanx was to Alexander's army, and in the rear come the dilatory conservatives. Substantialism has won its few leaders of thought and a host of enthusiastic supporters. If it is a real reform the phalanx will soon appear. The writer's ambition is to bear a spear in that phalanx till there shall be no more "worlds to conquer" for Substantialism.

4. *It is contrary to long established precedent and venerated authority.* No doubt this is true of every reform. If everything was progressive, if men in society, government, science, or religion were ever ready to receive and act upon truth, whether revealed or obtained by investigation, there would be no need of reform. It is because custom and habit restrain us from taking advanced positions, and because it takes special effort and courage to bring the masses into harmony with advanced ideas, that things go on in the same routine till precedents are established and authority venerated. And however rutty the road becomes, we all walk in it because great men have traveled it before us. Only when the true reformer comes along, and carves a new road along the cliffs of human thought, or macadamizes the old till it is new again, do we ever think seriously of improvement or progress. Even then habit and regard for the precepts and example of our leading men make us slow to accept and travel the new way, however much superior it may be to the old.

Believing in the Substantial Philosophy, and in its ultimate acceptance, the writer sees in the foregoing ideas one reason why time is an essential element in its promulgation. Habits of thought cannot be broken in a day. Veneration for authority will in some degree exist after our gods are proven mere idols. The wave-theory of sound is in all the text-books of our schools. Until the corpuscular or substantial theory takes its place in those text-books, the ordinary teacher cannot be expected to violate precedent and defy authority by teaching the new, however fully convinced himself. It is of no use to dodge this truth. And the same truth will similarly apply to everything touched by the Substantial Philosophy. We must "possess our souls in patience," and press the truth home to all minds, till, like all other true reforms, Substantialism triumphs.

5. *It lacks responsibility and character.* Of course; for a reform in its initial stages is an advanced truth, or a truer course of action, advocated by a few who are clearer sighted or purer souled than the multitude. These few individuals must bear the responsibility, and the real character of the reform is unknown to the masses. As time passes and the reform advances this objection vanishes. Numbers share the responsibility; its character by becoming known becomes established, public and influential men become its advocates, the rulers of thought and state stamp it with the seal of their approval. This futile objection has had its day with the Substantial Reform. It has passed the time when its adherents were few, irresponsible and unknown, and we can easily predict the time when even the dilatory conservatives will move with the tide. May the day hasten!

6. *It is sheer fanaticism.* We have heard this objection urged too often to fear it. It was urged against the anti slavery reformers; but the reform went on. It was urged against prohibitory legislation by the liquor interest in Kansas and Iowa, but the large amendment majorities proved the power of the temperance reform. It is urged whenever irreligious people are invited to become devoted servants of God, but conversion, God's radical reform of the soul, is ardently advocated and experienced by millions to-day. Fanaticism is not, in its real essence, a good thing. But nine times out of ten the name is given to the radical advocacy of advanced ideas, without respect to their truth or falsity. While the ardent advocacy of error or falsehood is fanaticism, the name cannot rightly be applied to the advocacy of truth. If in advocating Substantialism we advocate truth, we are not fanatics. If our opponents apply the name to us, it is in no sense a stigma, unless Substantialism shall prove chimerical. After all, such calling of names is only begging the question, and shows our opponents to be hard run for valid arguments when such a quibble can be used to answer the logic of facts.

7. *Its advocates are vulgar, irreverent, personal, and are seeking their own base ends.* This is an argument exactly like the last, and if the statement were true, which it seldom is in a true reform, it would not prove or disprove the truth advocated, nor make the reform either more or less desirable. We remember to have read of a Jewish Reformer who "ate with Publicans and Sinners," and who was exceedingly "personal" in His remarks, and who was accused, and even maltreated. And in every age, from the Saviour's time till now, in order to the success of any reform the public ear must be reached and the leading adherents of the old regime must be personally dealt with. There must and will be what conservatives call irreverence for the old and established, there must be personal conflict of mind with mind, and system with system, till the right triumphs. And while the result is, at least to the masses, uncertain, there will be more or less of recrimination and impugning of motives. Naturally this argument, if such it can be called, can be used with greatest apparent force against the advocates of the new idea. Hence it has been used against Dr. Hall and his supporters. He has had his language distorted in garbled quotations, his motives impugned, his character declared ignoble, and his efforts derided and called presumptuous. Well, be it so. Such arguments may convince fools, but thinking men will not let diatribes on personal character keep them from the investigation of truth. Such futile objections to Substantialism or its founder, are as fleeting as vapor, and will have no power to prevent either from attaining a deserved immortality.

HEREDITY AND RESPONSIBILITY.

BY REV. G. H. VAN DUSEN.

There are no subjects in the whole range of theological discussion that demand more of thought, and of patient, careful, and prayerful study than those before us. Unitedly considered they have a bearing on the welfare of human beings here, and the destiny of the soul hereafter.

No human being is adequately furnished to meet fully, and discharge wisely the duties and obligations of life, growing out of his relationship to God and his fellow-men, until he has come to some just appreciation of those subtle instincts, life processes and principles which are comprehended under and included in the term *Hereditry*.

No man who is ignorant of these principles can possibly realize the true character and weight of his responsibility under the requirements and limitations of divine and human laws. No legislator can frame, or government enforce, justly and wisely the laws of the land without this most important knowledge. No minister of the gospel is prepared fully to preach and apply the truths of God's word to the varied conditions and characters of men, until he has grasped and comprehended the principles that underlie this subject.

Well has it been said that, "No man liveth to himself, and no man dieth to himself," and there is a world of thought, and of principle involved in that statement.

Responsibility, has reference to law, or government, and arises not so much out of the nature of acts performed, whether obedient or disobedient, as of the mental or spiritual state which preceded them, in connection with the reflex influence upon the individual and the effects produced upon others. The idea of responsibility grows primarily out of our conception of relationship to the Divine Being, as *creator* and *ruler*, in connection with the authoritative announcement of his will. Acts performed and words spoken are in themselves indications of certain mental and spiritual conditions or states. An act is moral or immoral, good or evil in the absolute sense only as it has reference to the just and righteous law of the Divine Being.

Hereditry has reference to that which has been inherited or transmitted to children by parents; the usual reference of it is to physical characteristics, and in some sense to the mental equipment or phenomena of the mind processes in the offspring.

There is usually no reference of this principle to what is termed the spirituality of offspring, the generally accepted theory being that the soul or spirit life and characteristics (in its initial elements at least) is the direct gift of God, and that conjoined with the human there is a divine creative act performed, coincident or consequent, by which man not only comes into existence as a sentient material being, but also as a spiritual being. Not only possessing a body and mind, but also being characterized as a living soul. Man responsible for mind and body, God for soul or spirit. Possessing thus the nature of the higher types of material things or creatures, and also the nature (in some sense) of God, standing thus midway between the lower and highest types of life, "a little lower than the angels," and yet crowned with glory and honor in being put above all merely material things, comprehending in his nature both the material and the immaterial or spiritual. No theory that has ever been advanced with regard to the production of the human species is to my mind more dishonoring to God, the source of all that is pure and holy, than this. If it were true, man of necessity could only be responsible for his part in the transaction, which would relate to mere physical tendencies and developments, while in view of the fact that the soul or spirit

nature dominates and controls the physical to the last analysis, it were to put all responsibility upon the deity, and bind him to conditions which involve a violation of the principles of his own laws and compel him to supplement by direct exercise of his power the willful, voluntary, immoral act of his creatures by which the most sacred rights of men are involved, and the rules of the divine government are disobeyed. This conclusion leads to the abandonment of that theory as untenable, and to the acceptance of the idea that the life principles in their entirety are dependent upon the human will and act alone; and that when God conferred upon the first human pair the power to produce offspring, he at the same time gave them ability to transmit an essential life-germ of their own peculiar spiritual type, in connection with the physical phenomena which has led to the maxim, "Like produces like." In the "Problem of Human Life"—than which no grander scientific work has been produced in this or any other age (on the subjects of which it treats)—page 65, we read, "The creator, in forming each original species, delegated to the parents the power of imparting to the *ovule* an incorporeal life-germ, embodying their joint specific vital and mental organism, but so condensed that it might expand to keep pace with the growth of the *embryo*, and thus form the invisible outline or structural guide for the deposition of the physical molecules from the mother's blood."

It is evident that there can be no valid objection to this theory, for it is in reality the only one that avoids the idea that God, and he alone, is responsible for human existence and its outcome, whatever that may be; and in fact involves no more of mystery than any other.

Men are not what they seem to be always; or in other words, the physical and mental development of man does not always indicate his true character; it is in the spiritual part that the true character of the individual inheres, and hence in this direction alone must we look for a correct theory as to responsibility, and with the procuring cause, whether a creative act, or in the transmitted tendency, or of personal influence, it must rest.

In the line of this investigation we are led to that sharp distinction which separates mankind from the mere animal part of creation by so broad a chasm that it is an absolute impossibility that any lost link or links will ever be found which will bridge it over; and thus the lie is given to the materialistic theories of modern times. In the line of his discussion of the principles here involved, Dr. Hall has given the death blow to the whole range of the *evolution* nonsense, as it stands related to the production of the human family; whether of that peculiar type taught by Darwin or the spontaneous generation theory of Haeckel. We now propose the question, The soul or spirit, what is it? Evidently a something or a nothing. If a nothing, it is not an entity, then it is the sheerest nonsense to talk of responsibility. If a something, then of necessity a substance, and because beyond the apprehension of the senses, we must conceive it to be an immaterial substance, and physiological investigation will lead to the conclusion that seems inevitable, that it possesses the property of form, and fills and controls the body, as God fills and controls the universe. It is also evident that up to a certain time in the life of a human there is something of mere animal instinct which

constitutes the controlling influence or power in opposition to the mental and spiritual equipment of the individual; but gradually the soul or spirit assumes the throne of dominion, and sits regnant, crowned and sceptered over the intellectual and physical nature of the child, and real responsibility is begun—not as it was in the case of the first of our race, but under widely different circumstances and conditions. Such was the original structure of the spiritual nature of our first parents that there was a strong leaning to right, or the will of God, and no desire in the direction of disobedience; but there came a change: under a subtle evil agent and influence they were led to distrust God, and a change of nature inevitably followed, or was coincidentally developed, which made possible that flagrant act of disobedience which brought upon them the curse that God had pronounced, and upon their unoffending offspring depraved mental and spiritual conditions for which they are not, and never can be, held responsible; and this exposed condition of our race led to that crowning act of divine mercy and love—the gift of the Son of God to save men from death. The theory of soul or spirit development cannot be too strongly insisted on, and it is evident that it does not depend, only in a limited sense, on the mental or physical growth of the individual; it reigns without a rival in the region of the intellect, and is the *Autocrat* of its own destiny.

The will (so called) is but the authoritative indicator of the soul's choice between good and evil.

The time when the soul comes into the full possession of its powers, depends upon certain conditions, which it is not my province to discuss; it inherits certain characteristics or tendencies which will have to do with its development and decisions forever. It can act upon its own conception of good and evil. Transmitted tendency may warp and distort the judgment, but has no power with regard to the freedom of choice.

As to personal, separate responsibility in the absolute sense, we say there is no such thing. There is a necessity in the case that demands that there be a day "in the which God shall judge the world by that man whom he hath ordained," and that there "stand before him small and great," and that "the books be opened" which contain the sum total of human history; and God alone can rightly weigh and measure those subtle influences, which beginning their flow in *Adam*, have sped on their course through the lengthened years of human life, to be checked alone by the clangor of the Archangel's trump. He alone can untangle the interlaced threads of influence, and separate, link from link, the chain that binds us together, and loose the meshes of the net that has snared us all, and thus charge home upon each his *due weight of responsibility*.

Responsibility in reality can only be predicated of the uninfluenced, unnecessitated, voluntary, deliberate choosing of the soul, which leads to the performance of good or evil deeds, and the speaking of good or evil words, which are to form the basis of the judgments of the last day. "By thy words shalt thou be justified, and by thy words thou shalt be condemned," "We shall be judged for the deeds done in the body." These deeds and words indicate the nature of the soul's choice, and are hence the true indicators of the character of the individual. The soul is omnipresent and all-powerful

in the physical structure that it inhabits or possesses; it can and ought to rule, it does and will rule until of free choice it abdicates its throne in favor of the appetites and passions of the physical nature, but it is still responsible for all the conditions and consequences of the act.

It is capable of almost infinite adaptation and development. It has inherently a principle of growth that is, so far as we know, unlimited. It has the power, and must, by the very conditions of its existence, transmit its own peculiar type of character to others. A man has offspring of his soul as well as of his body; "like produces like," is as true in a spiritual sense as it is in a physical sense. The soul, or mental type, is more likely to impress itself than even the physical.

But soul offspring is not confined to the line of natural descent; we go out to each other in transmitted soul impressions which, on the plastic, susceptible material of human mentality, leave their cast and impression, good or ill, forever. The footprints on the sands of time of which the poet speaks, are in the line of soul impressions; but they are not only imprints that shall affect while time shall last, *but while eternity endures*.

Under the law of transmitted tendency the true gauge of responsibility lies outside of any influence that in its character is of determining force in the choosing of the soul, in opposition to its own sense of right, or what it would have been, separated from that influence.

Hence, with this limitation, real responsibility inheres in the choice of the soul in the conditions in which it is placed, and under the light that it enjoys in connection with the effects which follow, whether in acts performed, words spoken, or influence exerted, immediate or consequent.

Parents conscious of this power and necessity of passing over to the offspring not only physical and mental characteristics, but also of their soul or spirit type, and that for this they are in some sense responsible, in connection with the self-evident fact that the soul has power to rise from the dust, under the restraint in some directions and the cultivation in others which are the result of its own choice, will feel that necessity is laid upon them to be at their very highest and best, that they may give to their children such a type of life as will result in their highest good, and best furnish and equip them to meet and discharge their responsibilities toward God and their fellow-men.

The wise man said, "Train up a child in the way he should go and when he is old he will not depart from it." To insure the best results there must be training and disciplining in the case of the parents before the child comes into existence. Divine grace is pledged to supplement the effort of the soul after the good and pure, and comes in to restore that perfect equipoise of nature, which was lost as the result of *Adam's* fall. All effort of the soul to rise unaided will prove futile, for the tendency of unregenerated human nature is to the dust. The influence of the divine spirit is directly antagonistic to human depravity, which is the sum total of transmitted tendency from our ancestors, and assumes the form of an evil principle in our own hearts, which has been augmented by the influence of evil persons that we have come in contact with, and most of all by our own sinful indulgence. Whittier writes:

We shape ourselves the joy or fear
Of which the coming life is made,
And fill our future atmosphere
With sunshine or with shade.

The tissues of the life to be
We weave with colors all our own,
And in the field of destiny
We reap as we have sown.

The sentiment of these lines is beautiful indeed, but life is no such isolated fact as the poet represents. These words are only true when uttered in connection with a full conception of the principle involved in *Heredity*, which has much to do with the character of human responsibility.

**IF JUDAS' CONDUCT AND DESTINY WERE
ETERNALLY FOREKNOWN, WAS HIS
RUIN AN UNAVOIDABLE NECESSITY?**

BY REV. T. WILLISTON, M. A.

Having in previous numbers of *THE MICROCOSM* argued this question somewhat extensively, and having shown that there is no quarrel between man's freedom, or power of choosing, and Divine prescience, I am not about to go over the whole ground again, or to weary *THE MICROCOSM*'s readers with a repetition of what I have said before. As it has by some been confidently affirmed that Judas could not possibly help going to hell, if God always foreknew that he would, I propose in this brief article to show the absurdity of that affirmation or plea, by a method that is somewhat unique, or out of the ordinary track.

For argument's sake we will suppose, in the first place, that John Joseph Gall was the founder of a true science, and not a mere theory, and that he and Spurzheim were right in affirming that one's character and conduct largely depended on his brain moldings and the conformation of his skull. We will next suppose that a man can be tried for two or more crimes at once, and that one of Gall and Spurzheim's disciples has by a jury been found guilty, first of grand larceny and then of murder. After the verdict is rendered he is asked, we will suppose, whether he has anything to say in extenuation of his guilt in committing the crimes he has. The criminal rises to address the court; and now, reader, let us with charitable heart, and with as deep a sympathy as we can muster, listen to the following plea of his: "May it please this honorable Court, by whom I am asked whether I did the deeds I am accused of, and if I did, why the penalty of the law should not be inflicted upon me: I do not deny, gentlemen, that the deeds ascribed to me in this trial were done by me; I did appropriate to myself the money that I am accused of stealing, and I did take the life of the man whom I am accused of murdering. But, gentlemen, it is my misfortune that I was born with bad cerebral and craniological indications. Those who have examined my head phrenologically, assure me that kleptomania, or *acquisitiveness*, and *destructiveness* are indicated by the conformation of my skull, as being my prominent and essential traits of character. Now I hope you are aware, gentlemen, that those whose misfortune it is to have been born with the two craniological protuberances indicating a strong propensity to steal and to slay, *can by no means help stealing and taking men's lives*. Why, gentlemen, if the science of Craniology had been understood in Bible times, David would not have written the 51st Psalm, Peter would not have wept bit-

terly because he had denied Christ, nor would Judas, after betraying Christ, have exclaimed, 'I have sinned.' It was their ignorance of Phrenology that caused those men to feel self-condemned for what they had done. Had they but known what we now know, namely, that no man is responsible for the cerebral organization that he is born with, or is blameworthy for deeds that are ascribable to the structure of the skull that God gave him, they would have had no stings of conscience. It is my solemn conviction, gentlemen, that Ananias and Sapphira could no more help keeping back part of the price than I could help taking the money I did, and that neither Booth nor Guiteau could help shooting Lincoln and Garfield any better than I could help killing the man that I have. I hope, therefore, to be honorably discharged by this Court, as one whose so-called crimes are chargeable not to any inexcusable wish of his to injure others, but to those peculiarities of brain and skull structure which the Creator gave him, and for which, of course, he is not answerable!"

Think you, kind reader, that this man's defense would be accepted by any judge or jury in the wide world? Is it your sober and honest conviction that one's accountableness is necessarily dependent on the *shape of his head*, or that a deed which would otherwise be criminal can be rendered blameless by the doer's chancing to have a cerebral proneness to do that act? I am sure that so far from adopting the views expressed in the speech of the supposed criminal, you at once pronounce them sophistical and absurd. Well, if God is confessedly the Former of man's body, and must know in advance what shaped skull and brain each mortal will have, and if His being the author of man's physical structure excuses no one for wrong deeds that he has a propensity for doing, can His being the author of man's mental and moral structure, and his foreknowing what that structure will lead each actor to do, rob the actor of all freedom, and compel him to do what he don't choose to do? Impossible, irrational, profoundly absurd! Will Judas, or any one of the lost, ever venture to offer so absurd a plea as that before God? Conscience will forever convict Christ's betrayer of what it convicted him at first, namely, that his betrayal of Jesus, though ordained of God, was on *his* part a perfectly voluntary act; and that wretched man will never be so bad a reasoner as to deem himself blameless for an act that he chose to perform. Of him and of all the lost it will be true, that God gave them a chance to be holy and happy, and to their abuse of the powers and opportunities He gave them will they all be constrained to ascribe their ruin. No one of their number will have it to say that, in giving them existence, the Creator had wronged them, or had displayed the least degree of cruelty or injustice. Unsearchable as to us are many of God's ways and providences, this truth should be firmly imbedded in every human heart—"Just and true are Thy ways, Thou King of saints;" unalterably and stainlessly pure will they ever remain!

ASHLAND, N. Y.

ZOOLOGY AND THE NOACHIAN DELUGE.

BY J. W. LOWBER, M. A., PH. D.

The historic and traditional evidence of the Noachian Deluge is so conclusive, that even the

greatest enemies of the Bible are compelled to acknowledge its force. The mythologies of all the ancient nations are full of remembrances of the great catastrophe. It is described in the legends of the Greeks and sung in the poetry of the Romans. It is represented in hoary hieroglyphics of Egypt and in the sculptured caves of India. It has not even been omitted in the pictured writings of Mexico. The eminent Hugh Miller says; "The traditions of the flood may properly be regarded as universal, seeing there is scarcely any considerable race of men among which, in some of its forms, it is not to be found." There is no possible way of accounting for these traditions without admitting the facts concerning the great deluge.

The Deluge was evidently a judgment sent by Jehovah upon the wicked Antediluvians. They had filled up their cup of iniquity. The imagination of the thoughts of their hearts was evil continually. Every purpose of their hearts, and every scheme gotten up by them, were of a malevolent character. In order to accomplish God's design in creating this world, it was necessary to destroy the wicked race. It must be remembered that the Deluge of Noah was for the specific purpose of destroying a wicked race, and not for the purpose of simply bathing the earth in water. God had no design in baptizing the mountains, only so far as it was necessary in order to destroy the wicked Antediluvians. As the earth must be again peopled, God selected the best of the race that He might accomplish this. He thoroughly tested Noah, and found him to be a man of unwavering faith. The one hundred and twenty years of Noah's ministry was sufficient to reach all the rest of the Antediluvians, who were worthy of salvation.

It has generally been taught that the entire earth was submerged by the great Flood, so graphically described in Genesis. The skeptical scientist objects on the ground (1) that the ark could not have accommodated a male and a female of each of all the various species now living; (2) that all the animals could not, by their natural constitutions, have lived in the same temperature for a whole year. In answer to these objections, we wish positively to state, that we can see no good reason for maintaining the universality of the Deluge, any further than the destruction of mankind. It was universal so far as this earth was peopled, and no further. Jehovah is a great economist, and does not use miraculous power unless it is absolutely necessary. The natural element alone is used in the Divine Administration when it is sufficient; but when it is necessary, God puts forth miraculous power. If we concede that the Deluge was universal so far as the race was concerned, and not in reference to the entire globe, we are saved the necessity of supposing a number of unrecorded miracles. We are safe in stating that this is now the position of some of the greatest Biblical scholars in the world.

The position we have taken is in perfect harmony with Bible phraseology. The phrase "all the earth" is frequently used, when only the land of Palestine is meant. We have the statement, "All countries came into Egypt to buy corn." It is, however, a fact, that only those countries adjacent to Egypt are intended. There is always harmony between a correct understanding of Nature, and a fair interpretation of the Scriptures.

LOUISVILLE, Ky.

SIN SELF-RETRIBUTIVE.

BY REV. T. NIELD.

What is not God is of God and subject to the operation of His law, which is the expression of His will and the condition on which its well-being depends. Inorganic matter, since inert, is subject to extraneous force, either that of gravity or of vital force. Organic matter is created on a higher plane of law. It is endowed with vital force, which has the power to override the force of gravity. And yet the vegetable cannot know, think, will. The beast is higher in the scale of being; hence it moves within a higher sphere of law. It has mind to know and think, and will to wish and act. Hence why the beast can comprehend the motions of the human mind and will as outwardly expressed upon the level of the beast's capacity to know. And since it is endowed with mind and will, it can antagonize the human mind and will. So far the beast and man are on a common ground, on which their natures meet and touch each other. But in his higher nature man is on the summit of terrestrial being, and with the finger of that nature he can touch the garment-hem of God, the Infinite. "So God created man in his own image, in the image of God created he him." It is because his nature is exalted thus to kinship with his Maker that he has such wondrous powers. Their natures meet upon a level where they touch each other. Man is material, hence is subject to the laws of matter; animal, hence subject to the laws of life; moral, hence amenable to laws on which depend the moral quality of actions; spiritual, hence within the sphere of the immaterial and eternal; hence he is able to assume an attitude in harmony or in antagonism toward the eternal infinite Spirit.

The laws of being are the conditions of well-being. Hence, a violation of the laws of being is a violation of the conditions of well-being. Matter, since inert, and vegetables, since without intelligence and will, have not the power to break the laws of their environment. The beast, having both intelligence and will, has, so far forth, the power to break those laws and so entail upon itself the consequences of its self-originated acts, which have a measure of effect upon its happiness. But, lacking power to see the quality of acts as right or wrong, it has no moral power, and hence is not amenable to moral law; nor can it be involved in moral consequences. But man has moral power—intellect to see the quality of acts, and will to choose them or refuse. He has power to comprehend the mind and will of God as they have been expressed in law, and power to render or refuse obedience to the law. And thus, since the law of being is the condition of well-being, he has power to violate the conditions of well-being. So, to use this power is sin; for "sin is the transgression of the law."

Effects are molded by their causes in the moral and spiritual world. He who breaks the laws of being breaks away from the conditions of his well-being, and the depth to which he falls is in proportion to the height from which he fell. It takes an awful power to make a dreadful wreck. It took an archangel to make Beelzebub. It takes a being little lower than the angels to make one little higher than the devils. The nearness of his nature in its approach toward the Infinite, the nearer infinite becomes the wreck of being, and the woe that

follows his antagonism to the laws of God. Here is the basis of the retribution that the Scriptures represent as *the wrath of God*. Man's nature is pregnant with the grandest possibilities, and he is arbiter of his own destiny. Let these possibilities be negated; let him break the bands of law, which are the safety-bounds of his environment; let him hurl himself against the adamant will of the Omnipotent, and he must stagger through eternity from the rebound. The wrath of God! It is the inexorableness of law, whose fiat is that causes must produce effects; by which the effect of sin involves the loss of all that a conformity to law made possible, and the entailment of an eternized condition of depravity that leaves the soul in discord with the laws of universal being—self-ostracised and self-damned; yet damned by law, as one is riven by the power of God who braves a thunder-bolt.

As set forth in a former article, God, in making man a moral being, was under the necessity of making him a free agent, capable of moral acts, hence capable of sin. Being a free agent, his acts are his own. Being his own, he is responsible for their results. Hence, he it is himself who destitutes himself, and, if he sin, consigns himself to hell and furnishes the fuel that shall burn him through eternity, and this by the inexorable operation of the law whose goodness he despised, whose power he dared to brave.

GREENSBURG, Ky.

IS LIFE MERE PHYSICAL FORCE?—No. 2.

BY REV. JOS. S. VANDYKE, A. M., D. D.

It is assumed by some that life is a physical force, either one of the ordinary physical forces, or a force no more unlike these than these are unlike one another.

It has been asserted that electricity is the efficient agency in the production of the succession of molecular changes which constitute life, whether those changes are restricted to the possible arrangements of indestructible atoms, or are extended to include new affections assumed by matter under new combinations. As electricity is capable of producing new compounds by the simple union of material molecules—a spark of the fluid passed through hydrogen and oxygen being capable of producing such changes in the arrangement of the indivisible units as result in the production of water—it is assumed that it may also cause such changes as pass under the term life. As under proper conditions it can be transformed into heat, or light, or chemical affinity, or magnetism, it may also, under certain conditions, be transmuted into life; that is, if electricity, as ordinarily known to us, is not life, it is nevertheless capable of being transmuted into life.

In refutation of this theory it is competent to affirm, electricity must be regarded, in that case, as possessing two radically antagonistic sets of affections. Directly opposite qualities must then cohere in one and the same immaterial, non-substantive "simple succession of molecular changes." It has mind, and it has no-mind. It has the phenomena of life, and it is lifeless; for science asserts that electricity is

"latent" in many substances.* It must be life, and it must be death; for if life is to be regarded as electricity because electricity circulates through the body which life pervades, then we presume it ought also to be regarded as death, because too much electricity coursing through the body causes death. If death is too much life, and life is electricity, then why is the electric cell, when dead, no longer a surcharged battery? It looks as if life were capable of employing electricity as its agent.

Others are inclined to regard life as heat. Certainly heat, within a limited range, is indispensable to the continuance of life. Too much heat, or too little heat, is alike incompatible with either actual or potential vitality. If life is to be defined as heat because heat is an invariable attendant on life, then why may I not define it as water, which is also indispensable to its existence? We have the authority of Prof. Huxley for the assertion that water is absolutely necessary to the continuance of life, the human embryo being actually ninety per cent. water; and yet no one has defined life as *pura aqua*. It is true that some of the simpler forms of vegetable life can undergo desiccation to such an extent that life is seemingly extinct, and yet on receiving moisture revivification takes place after protracted periods of such arrested vitality. But revivification can also take place after the suspension of vital functions consequent on the loss of heat.

If life is heat, then ought we not to expect that the enemies of Christianity would offer no objection to such an interpretation of "Acts" as makes the "venomous reptile," which fastened itself on Paul's hand, come *de novo* from the flames, and not from the wood, being driven out by the heat? This miracle, if it be a miracle, requires no small measure of credulity.

Without examining each theory possible under the comprehensive statement, "Life is some one of the ordinary physical forces," we content ourselves with an attempted refutation of the theory as a whole. Strauss asks, "If, under certain conditions, motion is transformed into heat, why may it not, under other conditions, be transformed into sensation?" Instead of undertaking to prove that motion cannot be transformed into sensation, we ask him to prove that it can. Until he thinks he has proved that it can be so transmuted, we certainly need not undertake to prove that it cannot be. Again he asserts, "A part of the sum total of matter emerges from time to time out of the usual course of its motions into special chemico-organic combinations." Judging from the calm confidence with which this assertion is made, one would suppose that its author had frequently seen matter forsaking its "usual course of motions" to enter "special chemico-organic combinations," or at least had one or more experiments upon which the affirmation rested—a few metaphysical arguments at least. No: his statement is an unsupported hypothesis. There is absolutely no proof whatsoever that "matter from time to time emerges out of the usual course of its motions."

* Modern science has given us "latent heat," "invisible light," "hypothetical ether," and "theoretical mind stuff," as well as "latent electricity;" and this it has done while inveighing against subtle influences. Are we not justified in expressing the hope that it may yet come to accept the theory of "vital force?"—that it may yet proclaim itself the staunch defender of the doctrine of an invisible, Spiritual Personality?

We are not disposed to defend any conception of life which interferes with the assumption that it may and does employ physical forces as its agents. There are physical forces at work in every living organism. There are chemical affinities. There are electrical currents in organized beings. The question is: Are we justified in affirming that there is nothing in organisms except matter and the ordinary physical forces? To this question we answer, there is something more in living organisms than matter and its inherent forces—there are vital forces. This assumption, if it is to be regarded as an assumption, is seemingly indispensably necessary to account for the phenomena of life. Do I conclude that because the locomotive has driving wheels, and steel axles, and iron rails under it, and a boiler, and an ample supply of coal, and a sufficiency of water, and nicely fitting pistons, and handsomely constructed cars attached to it, therefore, to-morrow, at precisely twelve o'clock, having turned itself around, reversed the seats in the cars, and kindled a fire in the furnace, it will start without an engineer from Philadelphia for Cincinnati, stopping on its way at such cities as have connections with other railroads, halting for a fresh supply of coal and water where these may be had, running at a particular rate of speed to Pittsburgh and with accelerated speed beyond, emitting a shrill whistle at every road-crossing, putting on brakes when running down inclined planes, increasing the amount of steam when ascending the mountainous regions of Pennsylvania, pausing just twenty minutes three times a day, at meal hours, to afford passengers an opportunity of eating, making these stops where victuals are in readiness, etc.? Such a conclusion would be fitting evidence that I was entitled to a room in the lunatic asylum. And if any one in the wide universe expects me to believe that the ordinary forces of nature, without direction from a superintending intelligence, can produce the phenomena of life, he must do more than assure me that some scientists accept this theory, that they present labored arguments in its favor, that they confidently expect to present unanswerable proof by and by; that they boastfully prophesy that in the next generation every one will believe it; that, in fact, nearly every intelligent person does now, except "the illiberal," "the bigoted," "the prejudiced," "the narrow-minded," and "the despicable orthodox dupes." He must present incontrovertible evidence now that there is no intelligent agent which employs physical forces. He must prove that physical forces are equal to the production of such effects. He need not cudgel his antagonists with the prophetic science that is still in the clinched fist of the future. The next generation will no doubt be able to do its own thinking, and what it cannot refute it will no doubt have sense enough to respect, if it cannot accept it as proved. Neither God, nor the equity which is the child of evolution, calls upon this age to fight enemies as yet unborn. Consequently, until the unanswerable arguments are presented—and no one pretends that they have been presented—reason will continue to constrain the belief that physical forces, though sufficiently potent, if directed by an intelligent will, to convey Mt. Blanc to the distant Alcione, are nevertheless powerless in themselves to produce intelligent results.

CLANBURY, N. J.

SUMMARY AND CONCLUSION OF THE ARTICLES ON EVOLUTION, OR NATURE'S SYSTEM OF PROGRESSIVE CHANGES.

BY ISAAC HOFFER, ESQ.

First. We have seen that Nature's System of Progressive Changes is distinctly marked off into three great periods, and that in the commencement of the First period there appear to have been only two forces in action—repulsion and attraction; and that these two forces were the prevailing and conditioning forces during this period; and that chemical force came into action when matter was passing from a state of disintegration into a state of aggregation and consolidation, and was dependent for its action upon these two conditioning forces.

During the Second period these same two forces remained the conditioning agencies and brought about the proper conditions for the operation of vital forces, and the development of the grand system of life. In the Third period the same forces are still the conditioning power, and the fundamental forces upon whose action all the operations in nature are dependent. Being the most enduring and unchanging forces they are yet the agencies upon whose action the greater changes in nature depend.

Second. That chemical force has disintegrating, combining, and formative powers; and vital forces have, in addition to this, organizing, vitalizing, and characterizing powers; and that the formative and developing action, both of chemical and vital forces, require and produce conditions in which the atoms of matter are disunited and brought into a state of perfect sameness. This state of disintegration and sameness in matter is the *basis and source* of progressive changes. It is here that division and differentiation start. A nucleus of living matter is first formed and then expanded into a cell—a vitalized product. This is the beginning of all vital action in vegetable and animal life, and is the process through which all plants and animals are developed. Matter must be infused with life and become *living matter without any distinguishing characteristics as to the kind of matter*, before it can become part of a living body, whether developed from the seed or by nutrition; and the kind of plant or animal is wholly determined by the agency—the vital force—that transforms the dead material into living matter.

Third. That all the forces which appear to have been employed in this whole system of progressive changes were mere agencies, dependent upon a superior power—a power superior to all conditions and dependencies, self-sufficient and capable of originating this system; and of energizing, directing and controlling all the operations and results involved in its successful accomplishment. And that this superior power has its source in intellectual energy, and that from this source proceed all the activities in nature and in man.

Fourth. In man, intellectual energy, physical and vital forces, and matter, are all represented and embodied in one interacting personality, and in one form of energy, and that in this personality the intellectual part is the elementary source—the originating, designing, exerting, impelling, directing and controlling power in all man's actions and doings. In him the cycle of physical development is completed, and a self-sufficient and self-exerting energy

perfected, and the era of intellectual progress commenced. This intellectual part is the only self-developing energy, and the sole progressive power, and to it is committed and intrusted the sole agency for continuing the great system of progress in the spheres of thought and intellectual operations now and in the future. Every individual man is a perfected product, and complete representative of all the progressive powers and agencies manifested and employed in nature's past system of progressive changes; and is also a complete, but limited and finite, representative of that superior power which sustains, directs, and controls nature in all her operations.

Fifth. From the foregoing summary we are led to conclude: 1. *That all the forces of nature and all the elements of matter have one and the same source.*

We cannot approach this source to examine it, and see what it is, and how force and matter emanate and proceed from it; and through what changes they pass in their receding from this source. But it is a self-evident fact that *something cannot emanate and proceed from a source that is not contained in it, and that which emanates and proceeds is a part of, and so far represents in some form, what was contained in the source.*

And it is also a self-evident fact that *if something emanates and proceeds from its source it must make its appearance somewhere else; and that in the order in which it proceeds subject only to the changes involved in the proceeding and extension.* From these facts it is clearly evident that the forces and matter of this earth, and the operations and results of their interactions, are representative, in some form, and to some degree, of what exists and takes place in the source where they come from. And that they come from some source, and have their Efficient Cause there, must either be true, or else they must come from nowhere, and must have been produced or created out of nothing, and without any causation.

2. That forces in their fundamental energies and direct actions, and elementary substances in their essence, *are unchangeable and therefore without beginning or end.*

We cannot in our researches go beyond time and existence, and conceive of the origin of a First Cause, nor can we comprehend clearly how anything can exist without an origin and a cause: for everything tangible in the organic and unorganic world shows unmistakable evidence of a changed condition, and every change must have its cause and its origin; and yet the very fact that every change must have its cause and its origin imperatively necessitates an ultimate cause and source, which is unchangeable, uncaused, and without origin. There can be no causation and origination by nothing and in nothing, and yet there can be no dependent things without something to depend on; and without something to be changed and the power to change it, there can be no change. But this is a world of changes and transformations, and it is only these and the laws governing them that we can examine, and from what is represented in them learn something of their cause and source.

Forces in their fundamental actions do not change, but their effects and results may change with the varying conditions and characteristics of the substances in which they operate. Repulsion and attraction, chemical and vital forces, and mental energy have

each fixed and immutable laws of action from which no variation has ever been discovered by man. Neither can material substances be changed in their essence, but in their state, combination and relation they are the passive elements of all change. The iron in the blood, in the ore, or in a bar of steel, while the same in essence, is in each case so completely transformed, that it has no apparent identical characteristics in either. These facts demonstrate that there is an *ultimate state of substantiality, and an unchanging source from which proceed all the powers and elements of change.*

Paradoxical as this may seem, it is nevertheless a fact that all the tests of chemistry and of science go to prove that elementary substances cannot be changed in their essence; and a thing that is unchangeable cannot have been brought into existence by any cause, nor can it have had an origin, for causing a thing to be, or originating a thing is an operation of change; hence *forces that are fundamentally unchangeable and elementary substances that in their essence cannot be varied, exist independent of causation, and without a beginning, and being unchangeable, must continue in endless duration the same in energy and action and in essence.*

LEBANON, Pa.

PUNISHMENT, RETRIBUTION, EXPIATION.

BY JUDGE G. C. LANPHERE.

There is much of evil and injustice in the world, and hence the necessity of punishment. It is as necessary to our physical well-being as to our moral nature. In the state, as in the family, the certainty of punishment for wrongdoing is one of the most effective means for the preservation of society. Indeed, the civilization of a people is justly measured by the certainty, or uncertainty of the punishment of crime. When the state can truthfully say to the criminal, "Know that for all this thou shalt be brought into judgment," a high order of civilization prevails. And the sooner punishment follows crime, the better for the state, and the better for the wrongdoer. Not only is punishment, when justly administered, a preserver of society: it saves the individual from greater evils, and hence greater ultimate suffering. Viewed in true light, and divested of the sophistries of sense, punishment for wrongdoing is a great blessing. "Before I was afflicted I went astray; but now have I kept thy word."

Whether there be a Supreme Ruler of the Universe or not, in the moral realm punishment, suffering of some kind, *inevitably* follows wrongdoing. They are so tied together that neither God nor man can, or does separate them. Repentance only affects the future. It cannot condone or obliterate the past. It cannot interpose between the wrong and its punishment and stop the blow. And it is well for the world that it is so. That system of morals, or of theology, which teaches that men can escape punishment for wrongdoing, is in the highest degree pernicious, and if believed, cannot but work great injury to society. It is the false and deceptive cry of "peace, peace," when there is, and can be no peace, until Justice has overtaken the guilty.

Punishment may be regarded as of two kinds: external, such as is inflicted by a parent upon a child, and by the state upon a criminal; and

internal, following the violation of the moral law, consisting of remorse, shame, fear, humiliation, the writhing of a guilty conscience, loss of human sympathy, and deadness to all that is noble in the human character. The latter kind of punishment is properly termed retributive, or expiatory. The former kind of punishment may be condoned, omitted, or escaped; the latter can never be. The experience of mankind demonstrates the profound wisdom of the Great Teacher, when He said, "Agree with thine adversary." Justice, temperance, purity, human sympathy, "quickly whilst thou art in the way with him, lest at any time the adversary deliver thee to the Judge, and the Judge deliver thee to the officer, and thou be cast into prison. Verily, I say unto thee, thou shalt by no means come out thence, till thou hast paid the *utmost farthing*."

God does not punish any one, except through the operation of his laws; no more in the future life, than in the present. We can understand how He punishes the violation of physical laws. It is in and through their operation, and the laws of our own being. If we put our hands in the fire, we shall suffer pain. Why should He punish in a different manner the violation of moral laws? The physical law is vindicated by the pain and the other effects of its violation. In like manner, so far as we can see and know, are moral laws vindicated. And if this mode of vindicating physical laws is consistent with Infinite benevolence in the Divine Being—and who will say it is not?—the like mode of vindicating moral law must be consistent with that Benevolence. This view precludes the idea of malevolence or revenge on the part of God toward the persons of the guilty. God is "no respecter of persons." He does not love one, and hate another. *He loves all, and does, and ever will do, all He can to make all—devils as well as saints—happy.* This idea may not be "orthodox," but I am not writing in the interest of, or to please any sect or party, but in behalf of truth, as I see it.

Moral laws, which are laws of God's being as well as of ours, *execute themselves* upon the offender. Human laws require an executive to enforce them; not so Divine laws. I have spoken of moral or Divine laws enforcing themselves. This does not preclude the idea of the enforcement, in the future life of human, or, if you please, demoniac laws, and regulations for the protection of Society. Order of some kind must reign even in hell. In God's government punishment may be delayed; but sooner or later, every individual will "reap the reward of his own doings." "With what measure ye mete, it shall be measured to you again." This was said in no vindictive spirit, but as prophecy. It is a declaration of the relation between cause and effect; between good or bad action, and the inevitable consequences of such action. Who can question the justice of such laws? In the operation of Divine laws, and in a spiritual sense, it is indeed true, "An eye for an eye, and a tooth for a tooth." Punishment, expiation, grows out of the offense, flows from it. On the other hand, Divine rewards and benediction follow every unselfish, kindly act, and even thought. Divine laws are Divinely Just in rendering to every man his due.

If we cease to love evil, and come to love and practice good, though the effects of the evils we have done cannot be obliterated, yet the punishment or unhappiness resulting therefrom will be mitigated, lessened, and we shall

enjoy the happiness, modified by the recollections of past evils, flowing from the love and practice of that which is good. If we shall suffer endlessly, it will be because we shall love and practice evil endlessly; because we have made hell our heaven. In all this there is nothing to impeach the benevolence of the Almighty. There are powerful influences for evil, and equally powerful for good. We are in this way held in equilibrium, in freedom of choice, and can turn to the right, or the left, as we choose. Man to be man, and not simply a beast, was necessarily endowed with these powers.

GALESBURG, Ill.

P.S.—I am unwilling to have the benefit of your valuable publication without paying something more for it, and you will find one dollar inclosed.

G. C. L.

CAMPING TOUR TO YO-SEMITE VALLEY AND CALEVERAS BIG TREES.—No. 6.

BY PROF. I. L. KEPHART, D. D.

Morning dawned crisp and chilly. Very distinctly did the air indicate to us that we were in the vicinity of snow. As early as usual we were up and around, and in due time we were all "ready to move." Only twenty miles lay between us and the world-renowned valley! This, then, was to be to us the most memorable day of all our tour thus far, for with reasonable luck, we would surely reach the valley before sundown. So, with cheerful spirits and bright hopes, we betook ourselves to our journey. But, oh! what a road! Up, up, up we went! One almost continuous ascent (sometimes very steep) for about fifteen miles. One hour after we had left Crocker's, and when the professor and his wife and Lizzie were walking some distance in advance of the wagon, he having the gun, Mrs. Kephart, looking up on the side of the mountain, not more than 40 yards distant, espied a deer, and pointed it out to me, when it soon disappeared in the underbrush. Half an hour after Mrs. Klinefelter espied another, and, pointing toward it, she exclaimed (woman-like), at the top of her voice, "*Oh, look at the deer!*" This sent it skipping through the thicket of immense pines and brush, at a rate so swift that the professor had no chance to shoot at it.

Slowly we continue our journey, climbing the immense hills, through the grandest forests of sugar pines, yellow pines, firs, and cedars. The surroundings were awe-inspiring. A tremendous growth of timber covers the mountains for miles and miles, their dense branches in many places quite obscuring the sun, impressing the mind with an almost superstitious sense of the special presence of the sylvan deity. For size and height these sugar pines are tremendous. I was born and reared among the "tall pines" of Clearfield County, Pa., but they could not compare with these. Hundreds of them are each eight feet in diameter and two hundred feet high, and many of the cedars are six feet in diameter, and as tall as the sugar pines. Horace Greeley, speaking of the timber forests of the Sierra Nevada, once said: "Look down from almost any of their peaks, and your range of vision is filled, bounded, satisfied by what might be termed a tempest-tossed sea of evergreens, filling every upland valley, covering every hill-side, crowning every peak but

the highest, with their unfading luxuriance." Well may we exclaim:

Here, side by side, the forest kings
Lift up their heads and flap their wings;
For centuries they've braved the storm,
And still, through seasons cold and warm,
In serried ranks they grandly stand
As planted by the Almighty's hand.

But we move along, making our necks to ache by looking up at the tops of these grand trees, and having for the time quite forgotten that we are this day to pass through the Tuolumne grove of "Big Trees," we are all of a sudden surprised to find ourselves right alongside of one of the mighty "mastodons" of the forests of California—the *sequoias giganti*. This grove of "Big Trees" contains thirty-five of these wonderful vegetable productions. Of course they are not all standing together, but are interspersed with many pines, cedars and firs. But they are monsters. Two of them growing from the same root separate about 15 feet from the ground, and measure 114 feet in circumference, or 88 feet in diameter. They are called the "Siamese Twins." The bark is 20 inches thick, and is of a very soft, spongy texture. About 50 yards from the main road stands one of the trees that has been tunneled through, and on our return from the valley we went around that way and drove our horses and wagons right through the tunnel. But large as these trees are, they do not seem so large to the visitor, owing to the fact that for several miles before arriving at the grove you have been constantly looking at the immense sugar pines. Having become familiar with trees 8 feet in diameter and 200 feet high, trees that are 25 feet in diameter and 300 feet high do not seem so large as you would suppose. Hence, if you simply sit in your wagon and look at them, your astonishment will not be as great as you had anticipated. But stop your team, get out of your wagon, and go to and walk around the monster, and then will your feelings of wonder be wrought up to a white heat.

From this grove we continued to climb the forest-covered mountain until ten A. M., when, the women being in the wagon, and driving, and the Professor and I walking some distance ahead, we were suddenly startled by them exclaiming, "O, snow! snow! look at the snow!" (We had, in the morning, raised the question as to who would be the first to see snow, and we men had stated very positively that we were sure that the women would not.) Looking in the direction in which they were pointing, sure enough, down in a ravine 100 yards from the road, there lay a large bed of snow. We both ran down to it, and brought up some, and snow-balled the women on the 5th of July!

About 11.30 A. M. we arrived at an open park, where a crystal stream ran across the road, and huge granite boulders lay all around. Here we halted for dinner, built a fire, fed our horses, cooked a "square meal," and took a good rest. In the afternoon we proceeded, still upward, and passed *Crane's Flat* and *Tamrac Flat*. A little beyond the former we crossed the watershed that divides the waters of the Tuolumne from those of the Merced River: and at the latter we crossed the rapid, foaming, clear *Cascade Creek*. This creek winds its way down the mountain in a succession of falls, cascades and whirlpools, making a descent of more than three thousand feet in less than five miles, and empties into the Merced River a few miles be-

low the Yo-Semite Valley. Not far beyond *Cascade Creek* we begin the wonderful descent into the most wonderful valley of the world. Up to within a few years this part of the journey had to be made on foot or on horseback, there being no wagon road, but now a very steep, but well-graded, safe wagon road traverses the mountain side and leads you safe into the valley. Down this wonderful road into this more wonderful valley we go, now winding, now zigzagging back and forth on the almost perpendicular mountain side, in many places the road so narrow and the mountain sides so steep that a misdrive of six inches would dash wagon, team and all down hundreds of feet, among the glaring granite rocks. But O, what a yawning chasm lays beneath us. Down, down, thousands of feet, apparently almost under us, we catch glimpses of the Merced River. As we were descending, the exclamations were about as follows: *Prof. Klinefelter*—"Oh, isn't that fine! Oh, isn't that grand!"

Mrs. Klinefelter—"Oh, did you ever see anything so perfectly grand! Isn't that terrible! It makes me dizzy to look at it."

Mrs. Kephart—"Oh, isn't that beautiful! Oh, but I do enjoy this! I am perfectly delighted!"

Lizzie—"Oh, papa, hold on to those horses; what if we'd go over here!"

About 4.30 P. M. we rounded a point, and the Professor exclaimed: "There!—there are the Bridal Veil Falls!" And, sure enough, across on the opposite side of the valley, distant, in a straight line, about five miles, there we saw a long, white veil streaming down the perpendicular ledge, apparently about 50 feet long and two feet wide, but, in reality, a perpendicular fall of 920 feet. On we went, and about 5 P. M. we were really down in the valley, within a hundred yards of the base of the far-famed and tremendous El Capitan. Being strangers in the valley, having no guide, knowing nothing of the privileges granted to campers, and it being Saturday evening, we would, for the present, spend no time in sight-seeing, but drove on to the head of the valley, a distance of six miles, where, having found a "campers' retreat," and the place where hay could be procured, we went into camp on the banks of the North Branch of the Merced River, right under the shadow of North Dome, South Dome, Glacier Point and Royal Arches, the top of each capped with snow, and apparently distant only a gun-shot, but in reality distant from a mile and a half to two miles. Supper over, the horses well seen to, we arranged our beds, and retired for the night amid the musical tones of the constant sigh, and whirl, and roar and ripple of the distant falls, and the near-by, rapidly flowing Merced. In my next I will attempt a description of the valley and its magnificent scenery.

WOODBIDGE, Cal.

NERVOUS FUNCTIONS.

BY PROF. W. H. H. MUSICK.

Physiologists tell us that the cerebral convolutions constitute the organ of conscious mentality, and they describe those muscular actions supposed to emanate from the reactions of this nerve-center as voluntary movements, while the muscular contractions that are controlled by the nervous influence of other portions of

the cerebro-spinal axis are called "reflex actions," and said to be automatic in character. There is no logical basis for such a distinction.

The gray, nervous substance is continuous throughout the cerebro-spinal axis, and has the same structure and composition in all parts of the system. The results obtained by experiment on animals, and by pathological observations of the human subject, in both normal and abnormal conditions of the nervous system, all go to show that in all parts of the system, nervous action is essentially the same.

I will undertake to say, the original *conscious* perception of the visual impression takes place in the RETINA. The optic nerve is, admittedly, insensible to light, and its reactions to mechanical or galvanic irritation are the same as those of the nerves of general sensibility. The retina is provided with a collection of gray nervous matter—a layer of multipolar nerve-cells precisely like those of the brain.

The *conscious* perception of tactile impressions takes place in the papillæ of the integument where, I infer, both gray and white nervous matter are concerned in the function of sensation. The tactile corpuscles are, evidently, to be regarded as nerve-cells, but those corpuscles are *not* found in each papilla. There is much reason to believe that the white substance of the nervous system performs a higher function than the simple diffusion and propagation of impressions and volitions. The greater number of experimenters have failed to discover any indications of sensibility in the gray matter of the nervous system. The "most exact experiments" in regard to sensibility, are said to have been those of VEYSSIERE (*Dr. Dalton's Physiology*, pages 485-95), and he found that the gray substance of the cerebral convolutions, as well as that of the cerebral ganglia, might be extensively injured without causing loss of sensibility, but this effect was produced in proportion to the extension of the injury to the internal capsule.

VANDALIA, Mo.

AN OPEN LETTER—No. 2.

BY REV. J. I. SWANDER, A. M.

Fremont, Ohio, May, 1st, 1885.

PROF. JOHN TYNDALL, London, England,
 PROF. H. L. F. HELMHOLTZ, Berlin, Germany,
 and

PROF. A. M. MAYER, Hoboken, N. J., U. S. A.

GENTLEMEN.—This is the second time that I take to myself the honor of addressing you upon a subject of absorbing interest to all who love the truth for the sake of its intrinsic excellency. You doubtless have a distinct recollection of the matter set forth in the former epistle for your careful and candid consideration. I have reference to a communication which appeared before the learned public in *THE MICROCOSM* of February, 1883, bearing upon a new theory in the science of Acoustics. Previous to that date already, one A. WILFORD HALL, of 23 Park Row, New York City, had shown serious signs of skepticism concerning a certain (or rather uncertain) theory of sound, of which theory you are suspected of knowing more than you are willing to tell. I then wrote to you hoping that by our combined efforts we might be able to crush out this supposed insipient heresy in science, and place the old doctrine beyond the reach of such dangerous assailants. You will also call to

mind that, in the said communication, I made some very valuable suggestions upon the subject of our correspondence. In the meantime I have written a number of earnest letters to the said HALL suggesting to him the expediency of his early return to the advocacy of the old theory, that sepulchral harmony might again prevail within the materialistic fold. Do you think that he would listen to my proposed terms of peace? On the contrary, he renewed hostilities with more determination than ever. I then asked for further reasons of the scientific hope within him, to which he replied with an exuberance of enthusiasm and an array of facts which have placed him almost beyond my control. In fact I have become an almost confirmed convert to the new faith; and yet I linger upon the ragged edge of respectability in science in the hope that you may yet be induced to come to my assistance.

Perhaps you are not aware that in learned circles you are looked upon as the exponents of the old doctrine known as the wave theory of Sound. The world has therefore a right to seek counsel at your sanhedrim. As your position is one of honor, let me remind you that it is also one of responsibility. Thousands of anxious eyes are turned toward you with a reasonable expectation that you will soon cease your contemptible contemptuousness of cowardly silence and speak some great word of scientific salvation before it is too late for the boy to leap in safety from the burning deck. One honest toot from your undulatory bugle might even yet rally the demoralized fugitives for a desperate stand in behalf of the weak and venerable theory which you have the questionable honor to represent. Should you continue to persist in your mysterious reticence when questioned concerning the legitimacy of your own scientific progeny, the sentiment of a virtuous public may become suspicious and fill the air with scandal. For my part, I hereby state to you in all frankness that after addressing you this second communication upon the subject I shall respectfully ask to be relieved from any further responsibility in the matter. Why not? That the alleged heresy is spreading is evident to all who read the papers. Remember the character of the men whom you are called upon to convert from the supposed error of their ways. They are not found among the screech-owls of science; neither are they numbered with those who are disposed to catch the itch for the mere pleasure of scratching. Sincere in the advocacy of the new doctrine, they claim to base their belief upon incontrovertible facts. Nobody but the leading apostles of the old faith can hope to convince them that they are wrong. The case calls for immediate action on your part. Otherwise there is ground for grave fears that the Editor of this journal will continue to advocate his theory of Corpuscular Emissions until he accomplishes the seduction of the planet on which we live.

I say that your *immediate* attention is called to the matter herein presented. A continued silence, and all may be lost. Just think of the hallowed associations which for centuries have clustered around the theory in which your own names are now embalmed. Consider the critical condition of your fame as among the leading acousticians of the world. Think of your printed lectures and published text-books in an attempted elucidation of a theory whose soundness has been called in question. Think, too, of the thousands of honest men who are follow-

ing the leadership of one who seems as stubborn and uncompromising as the truth which he feels himself called upon to advocate. These men ask you to step forward and answer the charges preferred against the theory which seems to be immortalized in waves of air. It is further worthy of your attention, that a new text-book on sound is now in the speedy course of preparation. This book will soon find its way into all the schools and colleges of our land. A few copies will be sent as missionaries to the scientific heathen of your own country. The war is to be carried into Africa. You must either get back into the Soudan, stand the brunt of battle, or surrender at discretion. Discretion suggests that you surrender immediately.

Perhaps you are not aware of the real question at issue. If so, you will certainly allow me the pleasure of supplying you with a little valuable information upon the subject. First of all permit me to state that this newly announced principle of science is broader than the widest range that can possibly be taken in the present discussion of the sound question. Substantialism maintains that the universe in its very constitution incorporates certain immaterial elements of force which are as real as the material objects in nature and no less possessed of actual being than the rocks of the Earth or the stars of Heaven. This new philosophy is called Substantialism in contradistinction from Materialism because it lays the primary emphasis upon the immaterial or force entities in God's great handiwork. This emphasis is thus placed because the immaterially substantial in the Universe is held to be the motive power that drives the wheels of its more material machinery. Hence the reversal of some moss-covered theories in science. Matter cannot produce motion, neither can molecular motion produce an entity of any kind. Light, heat or electricity may produce motion, but cannot be the product thereof. The brain is not the originator but the organ of the mind. Sound is an immaterial substance, and, like every other force-element in nature, asserts itself according to its own law of manifestation. The invisible things of God are clearly seen in the things which do appear. Air-waves can produce sound no more than the lengthening of the shadow of the Washington Monument can cause the setting of the sun, and just as little as the crowing of the cock can produce the twilight of the morning.

The brief outline attempted in the foregoing paragraph may afford you some idea as to the teachings of the Substantial Philosophy, of which the corpuscular theory of sound is only a branch. Will you not arise in the might and majesty of your precarious reputations and crush this seditious movement from the Earth? Should you conclude to undertake the task, be careful that you do not get crushed by the accumulating power of this formidable rebellion in science. There is fun in hunting the tiger, but the amusement is not quite so relishable when the tiger begins to hunt the sportsmen. Let me give you a few points concerning the enemy with which you will have to deal. The Substantial Philosophy has but one tower of strength; and after you succeed in capturing that stronghold the citadel will open of its own accord to receive you. That tower of strength is truth. Dr. Hall and his coadjutors seem to act as though truth were everything in a scientific conflict. I verily believe that they would not

hesitate to assert that truth is of more importance than age and respectability combined. No wonder that the regulars pronounce them a set of cranks. Do they not know that although honesty requires them to advocate the superlative majesty of truth, it sometimes becomes necessary to adopt and follow a very different principle in ethics in order to reach the temple of ephemeral fame and feast upon the adulations of admiring fools? Dr. Hall is not only a great stickler for truth, but he also makes assertions that seem to fly directly into the face of established opinions. Indeed, I would not be surprised to hear him announce that roller-skating is not a divinely appointed means of grace.

Now, gentlemen, from what I know of your reputations for expertness in matters of jugglery, I have reason to believe that you are the very men to undertake the work of silencing the annoying batteries of the Substantial Philosophy. Quite a number of college professors in this country have attempted the perilous task, but failed most signally. Why? Their failure is attributable to the fact that they began the siege without any concert of action, and therefore did more damage to each other than to the common enemy. Besides, a few of them by fits of accidental honesty made certain concessions which came pretty near giving your whole cause away. In fact, they have brought merited ridicule upon themselves by their medley of contradictory assertions, which, taken altogether, made their side of the discussion about as intelligible and laughable as a forest full of screeching and chattering monkeys. You must not only concert your war measures, but also adopt a different line of tactics. If you had truth upon your side, it would be quite another matter. Truth never contradicts itself though handled by ten thousand advocates of a common cause. Unfortunately that article is now in possession of the tranquil hero who holds the fort at 23 Park Row, New York City. In order to succeed in your hazardous undertaking, you must attract his attention from this Gibraltar of his position, and entice him to give battle at some other point. Send out some Delilah to shear off these locks of his strength, and then it will be an easy matter to chain him to your chariot wheels, and drag him to the seductive portals of your dismal sophistry.

Affectionately yours,
J. I. SWANDER.

EXAMINATION OF THE PRESENT THEORY OF FORCE AND ENERGY.—No. 2.

BY HENRY A. MOTT, PH. D., F. C. S.

With a clear understanding of the nature of the *supposed* Ether medium as expounded by the highest authorities, and set forth in my first paper, we can proceed to the consideration of the present theory of Light,* Electricity, Magnetism, etc.

"The sensation of Light," says Lommel can only be excited in our minds by a stimulus of one kind or another acting upon the retina, which is the delicate expansion of the optic nerve lining the posterior part of the eyeball. The stimulus exciting the sensation may be either mechanical, as by a blow, or by pressure

* Nature of Light, pp. 1 and 2.

made upon the eye; or electrical, as by the passing of a current of electricity; or it may even be produced by the motion of the blood in the vessels of the retina itself.

"External objects can therefore only be perceived by our eyes, or be *seen* by us as the result of something proceeding from them, which reaches our retina and stimulates it to activity. This something we call light."

The undulatory theory regards light as a mode of motion generated by molecular vibrations in the luminous source, and propagated by undulations in the *supposed* Ether. The undulations of the Ether acting upon the eye produce the sensation of Light.

Langley claims that we are not acquainted with any ether-waves except those whose frequencies lie between the limits of about 107,000,000,000,000 and about 40,000,000,000,000 oscillations per second, "a range," says Daniel,* "to use a musical analogy, of about eight and a half octaves." "Our eyes are sensitive to scarcely one octave—to those, namely, which range between about 392,000,000,000,000 per second (extreme red of the spectrum) and about 757,000,000,000,000 per second (extreme violet.)"

These waves all travel through the ether of space at the same rate, about 186,680 miles per second. The length of the waves of Light or those which affect the eye, ranges between $\frac{1}{13425}$ cm. and $\frac{1}{25185}$ cm.

When waves of light having all possible lengths act on the eye simultaneously, the sensation of white light is produced. Waves of all periods must be continuously present, or, if absent for a time, absent in such feeble proportions, or for such short intervals, that they are not appreciably missed by the eye. Daniel says, "White light of this kind is comparable to an utterly discordant chaos of sound of every audible pitch; such a noise would produce no distinct impression of pitch of any kind; and so white light is uncolored." The sensation of color arises when a single set of waves act on the eye. When these waves have

a length of about $\frac{1}{8444}$ of an inch, they produce the sensation which we call red—we see red light; if they are shortened to $\frac{1}{41000}$ of an inch, their action on us changes; they call up in us a different sensation—we say the light is colored orange; and as the lengths of the waves are continually shortened the sensation passes into yellow, green, blue and violet. "From this," says Rood,† "it is evident that color is something which has no existence outside and apart from ourselves; outside of ourselves there are merely mechanical movements, and we can easily imagine beings so constructed that the waves of light would never produce in them the sensation of color at all, but that of heat."

Light proceeding from a luminous body whilst traversing a homogeneous medium is propagated in every direction in straight lines which are called rays of light.‡

"Heat-waves and light-waves in ether," says Daniel,§ "are not waves of compression and rarefaction, like those of sound in air. The propagation of an ether-wave is effected after a different fashion, somewhat difficult to real-

ize. The analogy of a *transverse* vibration running along a cord, or of a wave of up-and-down oscillation running over the surface of water or over a thin membrane, must be extended to the ether, with its three dimensions in space. At any point where the movement of the *ether* is examined, it is found to be an oscillation at right angles to the direction in which the wave is being propagated, and therefore parallel to the wave front."

To explain phenomena of reflection and refraction, the exponents of the undulatory theory find that it is necessary to assume that the ether has a different density or elasticity in the intervals between molecules than in free space.*

The undulatory theory in the form which treats the phenomena of light as the motion of an elastic solid according to Stokes† is still encumbered with several difficulties.

The first and most important of these is that the theory indicates the possibility of undulations consisting of vibrations normal to the surface of the wave. The only way of accounting for the fact that the optical phenomena which would arise from these waves do not take place, is to assume that the ether is incompressible. The next is that, whereas the phenomena of reflection are best explained on the hypothesis that the vibrations are perpendicular to the plane of polarization, those of double refraction require the assumption that the vibrations are in that plane.

The third is that, in order to account for the fact that in a doubly refracting crystal the velocity of rays in any principal plane and polarized in that plane is the same, in this case certain highly artificial relations among the coefficients of elasticity must be assumed. For these, and other reasons, Clerk Maxwell has advanced a new theory which is called the *Electro-magnetic Theory of Light*, which may be explained as follows:

According to Maxwell, the ether is a homogeneous body, a non-conductor of electricity; periodic electric stresses applied to this produce waves which travel at the rate of about 800,000,000 meters per second; these waves are waves of transverse vibration, and there is no vibration longitudinal or normal to the wave-front. These waves, due to electrical displacement, he holds, are quite competent to explain the ordinary phenomena of light, and that this theory explains, on mathematical grounds, that absence of the normal or compressional vibration which is a source of great perplexity in all the mechanical theories of light.

According to this view, each particle of a body through which light is shining is in rapid succession exposed to alternately opposite electric stresses: at each half-vibration it becomes oppositely electrified; but the ordinary effects of electricity are not generally observed when light shines through or on a body, for the electrification produced by any one half-vibration simply reverses the effect of that produced by the previous half-vibration.‡

According to K. van der Zande, the electro-magnetic theory of light satisfies all the requirements in the three difficulties mentioned attending the other theory, by the single hy-

* Princ. of Phys., p. 433.

† Modern Chromatics, p. 17.

‡ See Nature of Light, p. 14—Lommel.

§ Loc. cit., p. 432.

* See F. A. P. Barnard—Johnson Cyc. Article, Light.

† See Report on "Double Refraction," British Ass. Reports 1862, p. 253.

‡ See Dantel, Prin. Phys., p. 460

pothesis that the electric displacement is perpendicular to the plane of polarization.*

It must not be assumed that Radiant Heat and Light are identical because propagated in the same way. The waves which affect the sense of touch as heat are much longer than those which affect the eye as light. Many substances, glass, for example, are quite transparent to light, but opaque to radiant heat; while others, such as iodine in solution, are absolutely opaque to light, but permit radiant heat to pass with the greatest ease.

We may now pass on to the consideration of another form of Energy, and set forth, as briefly as possible, such salient points as will be found necessary to bear in mind when we submit the present theories to the crucial tests of Substantialism.

According to the advanced theory, Electricity and Magnetism are not forms of Energy; neither are they forms of Matter.

"They may, perhaps," says Daniel,† "be provisionally defined as properties or conditions of matter; but whether this matter be the ordinary matter, or whether it be, on the other hand, that all-pervading ether by which ordinary matter is everywhere surrounded, is a question which has been under discussion, and which may now be fairly held to be settled in favor of the latter view."

Nichols‡ says, "Electricity in itself considered, and much of its attendant phenomena, belongs to the realm of the unknown. We call it force, but after bestowing upon it a name, it still remains a mystery."

"Considered as a *thing* we know as much of spirit as we do of electricity."

Prof. John Trowbridge§ says: "I must express my conviction that we shall never know what electricity is, any more than we shall know what energy is."

Fleming Jenkin|| has pointed out that "a sense enabling us to perceive electricity would frequently disclose a scene as varied as a gorgeous sunset. * * * Every movement of our body, each touch of our hand, and the very friction of our clothes would cause a play of effects analogous to those of light and shadow on the eye. * * * Without eyes we might never have discovered the existence of light. By direct perception we have become aware of the vast importance of light, and it is probably owing to the absence of direct perception that we do not yet know the part which electricity plays in the economy of nature."

Electrical energy may be developed in various ways—in every case of friction, and probably of contact of two different bodies, it may be broadly stated, there is a development of electricity. This is sometimes expressed in another way; it is said that "different bodies are at different potentials with regard to electricity;" the word "potential," in an electric sense, being used merely to express the degree in which a body is electrified. A violent blow, and even a steady pressure, produces opposite electrical states on two opposing surfaces—the tearing of paper or linen, the crushing of

sugar, the cleaving of a sheet of mica—all produce it. Many bodies passing from the liquid to the solid state become electrical, the phenomena of combustion and evaporation are attended by it, and in the evaporation of water over the surface of the oceans is seen one source of atmospheric electricity. Certain crystals (e. g., tourmaline) when heated are found to develop opposite electrical charges at opposite poles. Many animals (notably the electric eel) and some plants, produce electrification; and Volta showed that the mere contact of certain metals caused them to assume electrical states—so long, however, as there is no difference in temperature between various parts of their junction there is no discharge or movement of electricity—no current is produced. If, however, heat be applied to the point of contact of two dissimilar metals and their free ends be united by a wire, a current of electricity will be found to flow through the wire and through the point of junction, in a direction varying with the pair of metals employed. This phenomena is known as thermo-electricity. Batteries of this kind have been constructed powerful enough to produce the electric light and other familiar effects of strong currents. Static Electricity is electricity at rest as putting bodies in opposite electrical states. Electricity in motion is current electricity. When a current, of electricity circulates or flows in a wire, the wire does not weigh any more while in that state, but it possesses many curious properties—chemical, magnetic and physiological.

"We do not know," says Carpenter* "that anything actually flows along the wire, although there are some reasons for believing that these observed effects are due to a peculiar condition of vibration, or motion, set up in the wire, different from those accompanying the manifestations of heat-energy."

Jenkin, after describing how a piece of resin when rubbed repels another similarly treated piece, and how the rubbed resin attracts any light body, says:†

"Electricity is the name given to the supposed agent producing the described condition of bodies. It seems to have been natural to regard this agent as a kind of very subtle fluid, and the nomenclature adopted in treating of electricity is based on this idea. There has been much wrangling as to the hypothesis of one and of two fluids. It is quite unnecessary to assume that the phenomena are due to one fluid, two fluids, or any fluid whatever; but in this treatise the names employed will be chiefly those which have been suggested to men of science by thinking of electrical phenomena as due to the presence or absence of a single fluid."

The one-electric-fluid theory assumes that all bodies in their natural state have always a certain amount of electric fluid, the repulsive effect of which is equal to the attraction exercised by the body upon it. This was deduced from the fact that when glass is rubbed it becomes vitreously (+) electrified, and the material with which it is rubbed becomes resinously (−) electrified, and the quantity on the glass is precisely equal and opposite to that upon the rubber.

Symmer's theory,‡ which until quite recently

* Over de theorie der terugkaatsingen breking van bret licht. Academisch Proefschrift door H. A. Lorenz. Annhem: K. van der Zande, 1875

† Prin. of Phys., p. 518.

‡ Whence, What, Where, p. 69.

§ Pop. Sci. Mont., Nov. 1884, p. 77.

|| S. P. C. K. Manual of El. Sci. Electricity, pp. 51-53.

* Energy in Nature, p. 102.

† Electricity and Magnetism, p. 1.

‡ See Ganot's Phys., p. 611.

has been generally accepted as a correct Hypothesis, assumes that every body contains an indefinite quantity of a subtle imponderable matter, which is called the electrical fluid. This fluid is formed by the union of two fluids—the *positive* and the *negative*. When they combine they neutralize one another, and the body is then in the natural or neutral state. By friction and by several other means the two fluids may be separated, but one of them cannot be excited without a simultaneous production of the other. There may be, however, a greater or less excess of the one or the other in any body, and it is then said to be electrified *positively* or *negatively*. Ganot says: "This theory is quite hypothetical; but its general adoption is justified by the convenient explanation which it gives of electrical phenomena." Experiment has shown that the phenomena of a steady electric current are not confined to the conducting wire bearing the current, for the space surrounding the wire is found in a peculiar condition—"a condition," says Daniel,* "which can be explained as due to displacement of the ether or other dielectric or medium filling that space, and one which it seems impossible physically to account for on any other satisfactory basis."

"Electrical† attraction and repulsion are explained in far the most satisfactory way by considering them due to local stresses in such a medium," and "current electricity seems due to a throb or series of throbs in such a medium when released from stress." Light and heat waves are constantly throbbing in the medium, which is constantly being set in local strains and released from them, and being whirled in local vortices, thus producing, as is claimed by the advanced school, the various phenomena of Electricity and Magnetism.

Magnetic phenomena are supposed to be due to local whirlpools set up in such a medium as referred to.

In regard to magnetism, Carpenter says‡ it is "perhaps scarcely necessary to say that even at the present day we are as ignorant of the nature of magnetism as we are of electricity—none of these forms of energy are recognizable apart from matter." * * * "There are strong reasons for believing that the phenomena of magnetism are in some way connected with the motion of the particles of those bodies which, like iron, become magnetic; that, in fact, it is another form of molecular motion."

This theory has received support from the fact that the magnetism of iron and steel is always materially lessened, and sometimes entirely destroyed, by changing the molecular (?) condition of the iron, which may be done by subjecting a magnetic rod to a mechanical twist, or strain of any kind: or by heating it, all magnetism disappearing at a cherry heat. Ampère's theory as to the nature of magnetism is that every molecule of a magnetic substance is the seat of a separate current, circulating round it in a plane at right angles to the magnetic axis. This theory was deduced from the fact that a wire conveying electricity acts like a magnet. If a long hollow spiral coil of insulated wire (solenoid) be suspended so that it is free to move when a current is sent along it, it will behave like a

magnetic needle and take up a N. and S. position.

The old hypothesis adopted to explain the phenomena of magnetism assumed the existence of two hypothetical *magnetic fluids*, each of which had the property of acting repulsively on itself but the power to attract the other fluid. The fluid predominating at the north pole of the magnet was called the *north fluid* and that at south pole the *south fluid*. The fluid was pictured to the mind as representing an invisible, elastic, gaseous atmosphere or shell surrounding the particles of all magnetic substances. It was assumed that, before magnetization, these fluids are combined round each *supposed* molecule and mutually neutralize each other; it was also assumed that they can be separated by the influence of a force greater than that of their mutual attraction, and can arrange themselves round the *supposed* molecules to which they are attached, but cannot be removed from them.

Ganot says* "the hypothesis of the two fluids is very convenient in explaining magnetic phenomena. * * * But it must not be regarded as anything more than an hypothesis: [as] magnetic phenomena appear to result from electrical currents, circulating in magnetic bodies, a mode of view which connects the theory of magnetism with that of electricity."

THE PROBLEM OF PENDULOSITY.

BY REUBEN HAWKINS, ESQ.

Previous to the receipt of THE MICROCOSM for February, I had concluded that the discussion of the *Sound* question was about exhausted; but the editorial article therein, in answer to Prof. Reppert's *Standard* article (also published in February MICROCOSM), is not only very interesting reading, but it certainly leaves the Professor no ground on which to stand to strike back, without a change of base, if his meaning is properly interpreted by the Editor.

It is not my purpose, however, to intrude myself into the controversy, and I am not positively certain that I understand the Professor's meaning when he speaks of stops and starts in the vibrations of a string; hence, what I may say in this article must be considered as having no intentional reference to his positions, but rather as an effort to reach and prove, if possible, a general law of physics.

Does a vibrating string, fork or pendulum stop at all between vibrations? Does it not change direction without any intermediate period of rest? I shall try to maintain that it changes direction without stopping—but by way of digression I would ask (without presuming to answer the question myself), would any sound at all be produced by a string if it reached the condition of rest, no matter how short the period, between each vibration? In other words, is not the production of sound dependent on change of direction by the sounding body without reaching a state of rest? But to the main question—Does it stop?

This involves another question: Does it require any period of time, however short, for force to overcome the inertia of matter sufficiently to cause some motion (of mass) when no obstructions interfere?

I think not. What I mean is that a whole mass responds instantly, without any duration

* Prin. Phys., p. 598

† Prin. Phys., p. 208.

‡ Energy in Nature, p. 128.

* Ganot's Phys., p. 579.

of time whatever, when the force acts simultaneously on all the particles composing the mass, as in gravity. A force acting on the surface of a mass (especially an elastic body), as in case of one ivory ball striking against another, is not analogous.

The common pendulum certainly fills the required conditions, and I can see no reason why the analogy is not complete between the pendulum, vibrating string and tuning-fork in this respect.

Velocity of motion is directly proportionate to the intensity of the moving force and the duration of its application (taken together and involving the proper ratio of acceleration), and inversely in proportion to the mass of the body moved.

This proposition will bear careful consideration, for on its truth or falsity hangs the answer to the main question. I do not think its truth will be disputed. To my mind it rests on the same kind of evidence I have of the truth of the proposition that $1+1=2$. Ratio of acceleration is dependent on the varying conditions of each individual problem and has no bearing on the question under consideration.

Now, if the foregoing proposition be true, we might subdivide the time of the application of a force to infinity (were that possible to finite beings), and still there would be *some* motion produced, and a state of rest could prevail *only when no force was acting*.

In the case of the pendulum, two forces alternately gain the mastery—gravity, which is persistent, and momentum, which is borrowed and temporary. When the ball reaches the end of its swing—gives up all its momentum or borrowed force—gravity is already on the throne. Why should it abdicate to give the ball a rest? Could it rest with gravity pulling at it and nothing else interfering with its motion?

The inertia of matter does not cause resistance to motion in any absolute sense; but it does cause matter to resist by reaction, and prevents, absolutely, any kind of motion which is not in exact conformity to law. In other words, mathematical consistency and necessity must be maintained.

There is no doubt in my mind that the rotating pendulum, as taught by Prof. Mayer, in its relative motions, when viewed horizontally, perfectly illustrates the actual motions of the common pendulum, vibrating string and tuning-fork; and it will not be claimed by any sane mind that there is any position of relative rest from any standpoint in the rotating ball—could not be, unless it moved *some* part of the time on a tangent.

I do not mean, however, to positively assert that the relative motions of the conical pendulum are exactly analogous to the motions of the common pendulum. I introduce it here as a perfect illustration of the *idea* of a reversal of the direction of motion without rest.

CHILLICOTHE, Mo.

THE SUBSTANTIAL PHILOSOPHY.

BY REV. C. T. CARROLL.

DEAR DR. HALL.—At any standpoint from which we may view natural phenomena, we see your beautiful philosophy confirmed, and whole floods of light thrown upon the otherwise impenetrable darkness of nature and crea-

tion. In the light of this almost *Divine philosophy* (for it is perfectly in harmony with the fundamental doctrines of God's word), all nature stands out before us as the creative work of an infinitely powerful, invisible, intangible, but *Substantial* God. It is, indeed, singularly incomprehensible that the nice distinction between matter and substance, which you so clearly develop from the unquestionable evidences of nature itself, had not been seen by at least some of the materialistic scientists of the world. They seem not to have caught a glimmer of anything except the tangible, material universe, while the fact is, that these material things are but *incidental* to the *invisible incorporeal* universe, which is "*unchangeable and fadeth not away*"—but the outward expression, the visible manifestation to sentient creatures, of that which lies hidden beneath their temporary and evanescent forms. That there is a vital and mental substance in all animal organisms, which is not subject to the changes of the material body, is now to my mind beyond all question. Also, there must be the vital substantial force in all vegetable organisms, which remains the same throughout all generations, as nature would appear inexplicable and even contradictory at every step we take without it. The *inherited characteristics* of animals through hundreds and even thousands of generations, can be explained in no other way. Birds which *migrated* hundreds of generations past are doing the same semi-annually to-day. Any one may see that these inherited characteristics do not and cannot descend through the corporeal blood. All of that would run out in a few generations. The corporeal body is constantly undergoing too many and too great changes for a solution of inheritance along that line. But this inheritance is one of the plainest facts of nature, and any scientific hypothesis which fails here, if it should fail at no other points, is demonstrated to be false.

The hypothesis of materialism certainly fails just at this point. *Therefore it is untrue*. But the Substantial philosophy comes to our aid just where it is needed—just where we must have something or grope our way in eternal darkness, and hypothecates an inner *substantial, vital and mental organism* which is the same forever, and through which the identical selfhood of man and the lower animals descends from the very origin of their species, transmitting at the same time their peculiar characteristics throughout all generations. This vital and mental organism is what St. Paul terms the "*inner man*," and which is capable of being "*absent from the body and being present with the Lord, or being at home in the body and being absent from the Lord*."

Seeing, also, that it must be essentially the same throughout all generations, we must conclude that it will *remain unchangeable*, and if unchangeable, it must be *indestructible*, and is therefore immortal. It is our conscious selfhood which we know to be above and out of the reach of the laws of the material, visible, and tangible substances—that for which Jesus died on the cross, and which is capable of *inheriting* "*a better and ever-enduring substance*," "*which is incorruptible, undefiled, and that fadeth not away*," neither doth "*moth nor rust corrupt, or thieves break through and steal*." Oh, immortal soul, yonder is your *substantial* inheritance!

MORRISTOWN, Tenn.

LIFE NOT MATERIAL.

Scientists speak of living matter, calling material substances so while they form part of the body of a living plant or creature. As new substances from food, drink, the earth and atmosphere enter the body of a living creature or plant, they are said to become living, while such as are expelled from the same are in like manner said to be dead; and at death, when the life departs from the whole body, these living substances are at once all made lifeless.

George Whewell, F. I. C., F. C. S., says: "In nature we recognize four forces which we venture to call atomic viva, organic viva, animal viva and mensic viva (mind). We assume that the elements contain these four forces in a state of activity or otherwise, according to circumstances." It is here assumed that all the elements contain these four forces, but the fact that none of them give evidence of possessing vitality except when organized into the body of plant and animal life, seems to be in direct opposition to this idea. Because a vessel is capable of holding water, does it therefore always contain water, actually or "otherwise?" Is glass light, "in activity or otherwise," according as it is placed in light or darkness, because it is capable of being permeated by light? Is the ear hearing and the eye sight, because through the one we hear and through the other see, "in activity" when among noise or in light, "or otherwise" where it is noiseless or dark?

Are we not all forced to admit that there is no life in any matter when unconnected with the vital parts of a living plant or creature? That life does not instantly depart from a piece of a plant, or of some reptiles, on its being separated, so that even new plants, and in some reptiles, new creatures, are propagated from such pieces, only shows that in such instances the seat of vitality is not limited to any one part of the body, as is the case in man and the most active living creatures. If the matter which composes the body of a living plant or creature were living, there would be no need of constantly displacing it by new dead matter.

There is no spontaneous origination of life from matter—how, then, can it be claimed that life is a property of matter, or dependent upon it, or that matter can develop life? When a man works with a tool, doing even that which he could not do without it, no person thinks of ascribing vitality to the tool while it is being so used; is it any more reasonable to ascribe life to an atom of matter while it is held within the body of a living creature? All evidences of life in nature distinctly show that the physical or material body of animal or plant is not actually living. Life develops the body from dead matter, and uses it while it abides therein.

In the mind life acts even independently of the other members of the body, and there all work must be first completed before it can be physically accomplished. Mental operations are immaterial or spiritual; hence, all things are spiritually done before they can be exhibited in nature; consequently, spirit is the cause of all material existence, as we are taught in the Scriptures. "God [the Creator] is a spirit."

Life is not tangible to the physical senses, because these act by means of matter, they can only recognize material things. But who would say that life is not real? Life alone recognizes existence, and can any person sup-

pose that it does not itself exist as a real entity and substance? Matter, which in itself is dead, cannot manipulate life or even itself. It is life that handles matter, and thus makes its actions known to and through the physical senses; even forming the physical body with all its parts and organs, whereby it acts in nature.

Matter is, therefore, not the substance, nor is time the stuff, as Poor Richard says, of which life is made. In itself matter is dead under all circumstances.

Matter is governed by what are called laws or forces. That there can be no dead forces is self-evident, hence all the forces in nature belong to life. Life is, therefore, the only real entity, and matter is but representative or phenomenal. When life departs from a material organization it is no more recognizable by the physical senses, which can only deal with matter; but does it therefore cease to exist? If even dead matter, which exists from life, is indestructible, surely life itself cannot be destroyed.

Jesus Christ said, "I am the Life." If He is the Life, there can be no other life. He was physically developed in the natural world in the form and with the attributes of a man; therefore the form of life as it is in its fullness, must be the human form. In this world are many forms of life, but all have some relation to the human form as well as character. And because it is said to man that he shall have dominion over all creatures, and shall subdue even the earth, it is evident that all things are to be within the human sphere.

Because life is in the human form, and its attributes are those of a man, human existence cannot cease while life lasts; and a being that has the human degree of life, or in whom life is fully formed, cannot cease from existence. Man is therefore, as it were, a complete atom of life, while in animals is but a partial manifestation of a complete atom; in some far more than in others. And even in plants the earthly substances, and all the elements in nature, is some manifestation of this life.

As all material substances in the whole universe are inseparably connected, so can no degree or form of life be separated from Him who is the Life; and, as already shown, not an iota even of matter can exist independent of life. God, the Life, is therefore the only I AM; and creation is an extension from Him, an effect of His constant activity, as light and heat in nature are an extension from the sun. Nature is not God, but it is inseparable from Him. In His Being He is so purely life, so infinitely superior to nature, that it is said of Him, "The Lord thy God is a consuming fire." God can no more be personally present in any or in all His works, than a man can personally enter into the things he makes and does; but as a man is said to be seen and to live in his works, as far as they show forth his character, so is God seen in nature, and so does He live in man.

Matter is the outer or extreme limit of the extension of the life or sphere of God; and life can be readily traced from matter upward through the wonderful rising scale of the vegetable and animal kingdoms, till in man is found the link that connects the material with the immaterial, or the natural with the purely spiritual. But since all natural existence, and matter itself, is from God, who is a spirit, all life is nature and the laws that govern matter are spiritual or immaterial, and therefore

intangible to our physical senses. Life cannot be unproductive; consequently it must act so as to develop something; and to this activity, death is the spiritual limit, and matter the natural. God does therefore also control death. "I am alive forevermore, Amen; and have the keys of hell and of death"—Revelation, i. 18.

J. R. HOFFER, Esq.

MICROCOSMIC DEBRIS.

Canned salmon from Oregon and tomatoes from New York are now shipped to the Congo.

Pedro I. of Brazil is the Doyen among crowned heads, having had 44 years of sovereignty.

There are now twenty-three cities in Massachusetts. The most recently incorporated is Waltham.

In Virginia peanuts are now ground into what proves a very fair flour for making pie-crust and other light pastries.

The California Legislature has passed a bill appropriating \$40,000 to build a hotel for travelers in the Yosemite Valley.

It is said to have been a rule with Ninon de l'Enclos, whose skin was the admiration of beholders, to use rain water exclusively.

Children grow taller, it is said, during an acute sickness, such as fever, the growth of the bones being stimulated by the febrile condition.

A farmer near Sacramento says his crop of asparagus this season will bring him \$12,000, of which \$9,000 will be profit. He has twelve acres of it.

Jenny Lind is coming out of her retirement, for the first time in twenty-two years, next summer, to sing in aid of the Children's Infirmary in Norwich, England.

On the authority of an English paper it is stated that Mr. Parnell will shortly marry a young and wealthy American lady, an intimate friend of the Irish leader's mother.

It is proposed to hold a meeting in Portland, Me., on Longfellow's birthday, Feb. 7, to unveil the bust of the poet, which is coming from England to the Maine Historical Society.

According to the official returns of the Health Department of New York there were reported in the ten years ended with 1893 84,697 cases of diphtheria, of which 15,697 proved fatal.

"Gold," says a Georgia editor, "is found in thirty-six counties in this State, silver in three, diamonds in twenty-six, and whisky in all of them, and the last gets away with all the rest."

There are twenty persons whose gifts to colleges in this country aggregate over \$28,000,000. Three of these rich men—Stephen Girard, Johns Hopkins, and Asa Packer—gave over \$14,000,000.

Protracted drought and extensive irrigation in the neighborhood have reduced Tulare Lake in California from a length of 42 miles and breadth of 22 miles to a length of 22 miles and a width of 14 miles.

The canal across the Isthmus of Corinth, which baffled several of the Roman Emperors, and was a favorite scheme of Julius Cæsar's, is approaching within a measurable distance of completion.

An offer of \$700 has been refused by a citizen

of Thomas county, Ga., for a madstone which he found in Montgomery county while on a visit there recently. It is egg-shaped, and about half the size of a hen's egg.

Kansas editors excel in the selection of eccentric names for their papers. The *Prairie Dog*, the *Astonisher*, and the *Paralyzer* are already in existence, and now a paper is to be started in Thomas county which will be called the *Thomas Cat*.

The man who discovered one of the richest silver mines in Leadville received \$40,000 for his find, and the two purchasers made a million dollars each within a year. The discoverer applied recently for a night's lodging in a Leadville station house.

It is stated that small candles, remarkable for the purity and brilliancy of the light they give, are imported into Europe from China, where they are made from wax supplied by minute insects bred for that purpose by the poorer class of Chinese.

Seventy-five years ago the first tomatoes grown in this country were cultivated as a strange and showy horticultural curiosity in a garden in Salem, Mass. Forty-five years ago, or a little more, they began to be used as a vegetable in the season.

Traveling mesmerists are said to be accompanied by "subjects" who have been trained to resist the ordinary tests of burning and pricking, and can thus simulate the hypnotic sleep. They are known to the professional mesmerist as "horses."

A novel mode of aging whisky and other liquors is to place a Maxim or Edison light inside of the barrel. Exposure of the liquid to the electric light for a hundred hours, it is said, changes the flavor and converts a new liquor into one that resembles a ten-year-old brand.

The fire engines in Italian cities are still the same little hand pumps used in the beginning of this century; not a single steam fire engine exists on the peninsula, owing to the rarity of fires, but a movement is now on foot to introduce steam engines according to the American style.

A French mineral water firm has begun to supply Paris dinner tables with distilled water charged with oxygen. The beverage is mildly exhilarating and is likely to be popular. Dr. Beaumetz stated in a recent address to the Societe Therapeutique that he had found it very serviceable in cases of loss of appetite and certain disorders of digestion.

Soap trees similar to those growing in China and Japan are said to flourish in Florida. They are prolific bearers of a berry about the size of a marble, which may be used as a substitute for soap just as they are taken from the trees. In Florida, however, they are usually boiled down and cast into bars. It is thought they may be made to grow on Northern farms after a little acclimatization.

An immense ledge of white metal has been discovered in Antelope Valley, Mono county, Cal., the nature of which puzzles all mining experts to whom specimens have been submitted. The metal is fusible at first, but after the first time it yields to nothing except a mixture of acids. A pound of rock yields half a pound of the metal, and there are millions of tons in the plant. It contains platinum.

WILFORD'S MICROCOSM.

23 Park Row, New York, April, 1885.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

SUBSTANTIALISM ON TRIAL.

PA. MIL. ACAD., CHESTER, {
 April 1, 1885. }

DEAR DOCTOR HALL.—This day reminds me that all fools are not dead yet, else there would not be so much blind opposition to new truth. A question has occurred to me, which I send for your consideration. Every boy who has been in swimming knows that, if he put his head under water while a companion claps two stones together under the water also, the sound is very much more intense than when heard in the air. Query. Why is this?

On the basis of the wave-theory, how can it be explained? Is the sound more intense because water is a better conductor than air? But what is meant by a "better conductor"? Does it conduct more volume of sound? If so, why? And what becomes of the extra sound which is not conducted by the air? Certainly this would be an exceedingly lame explanation. Of course no wave-theorist would dream of suggesting the suicidal thought that more waves reach the ear in a second; so I will suggest the explanation myself. Now, just here comes in a vital point. We have the fact that sound travels four times faster in water than in air.

Suppose my ear to be situated 16 feet from a sounding-bell, whose tone is C, 256v. The wave-length in air being about 4 feet, it will be about 16 feet in water. If the sounding body be partly in the air and partly in the water, and one of my ears be in the air and the other in the water, I will receive through the air a wave with the length of 4 feet, and through the water a wave with the length of 16 feet. "Ah!" says the wave-theorist, "here is the explanation desired. Of course the 16-foot wave makes a stronger impression upon the ear than a 4-foot wave. A greater disturbance produces a greater effect." Not so fast. Please explain to me how it happens that a *greater effect can come without a greater cause*. All the circumstances are against such a possibility. The producing cause is the same—a bell sounding C, 256v. The medium, "disturbed" by the bell into 4-foot waves, is *air*. The medium, "disturbed" by the same bell into 16-foot waves, is *water*. The latter weighs about 1300 times as much as air, and therefore requires 1300 times as much mechanical "disturbance," to produce the same effect. But, in this case, the water "disturbance" extends its influence four times further than in the air, hence it requires 5200 times as much original force to produce the effect. The original cause, however, is exactly the same in both cases. Hence we have widely different mechanical effects (different in strength or intensity) resulting from the immediate application of the same mechanical force, which is an impossibility. If you could show that the wave of sound will travel only one 5200th as far in water as in air, you might make out a case, for in such an event there would be an arithmetical balance; but the fact is that the sound will go much farther through water than through air. The famous Lake Geneva experiment proved this abundantly. The bell under water was easily heard at a distance of *nine miles*. It would be a rare day when the same bell could be heard half that distance in the air.

The wave-theorist may suggest that the particles of water being almost incompressible, and as perfectly elastic as air, hand over the impulse communicated to them more quickly.

and hence the greater velocity; and that the particles, striking the ear with greater force, give greater intensity. But such an explanation necessarily admits the whole mechanical disturbance difficulty just presented. And how about the particles of pine wood? They are certainly more compressible than water, yet they manage to "hand over the impulse" nearly three times quicker than water, in the direction of the fiber; and just as quickly across the grain. If any wave-theorist has any other solution to offer, let him present it.

But now the question for Dr. Hall is, how can Substantialism explain the difficulty? It will not do to say that, because the conducting power of water is superior to that of air (for reasons unknown to science, just as copper conducts electricity better than iron), therefore more substantial sound reaches the ear in a second through the water than through the air, because this point was made by Dr. Hall in explaining the rising pitch of an approaching locomotive whistle. It would follow in this line of argument that the sound through the water must be decidedly higher in pitch than through the air. I like to give difficulties to my friends once in a while as a spur to their faculties, and therefore respectfully present the above for the consideration of THE MICROCOSM.

Very respectfully,

R. KELSO CARTER.

ANSWER TO THE FOREGOING—THE SUBSTANTIAL PHILOSOPHY VARIOUSLY APPLIED.

We are very much gratified to print the above critical and very suggestive paper of Capt. Carter, and we are also glad to have the privilege of commenting upon the matter he submits to THE MICROCOSM, since no philosophy, claiming to be true, should object to the severest scrutiny. If Substantialism will not endure the test of answering such simple questions as that propounded by Capt. Carter, let it be weighed in the balance and found wanting. The captain has clearly shown that no explanation is possible for the greater intensity of sound through water than through air, based on the supposition that sound consists merely of the mechanical motion of the medium caused by the force expended in striking the two stones together within it. To re-enforce this position, it is plain, if the water were entirely incompressible, as it is nearly so, that no pulse whatever could pass through it, by any concussive shock that could be produced, *since no elasticity could exist*. And right here we present an argument which on its face is not only new, but overwhelming against the wave-theory. Water is called by the best authorities one of the "*inelastic fluids*" (see "Silliman's Chemistry," page 21, § 15). Yet, as they afterward explain, it is not entirely "inelastic," since it is very slightly compressible, that is, it contracts under pressure one 22,000th of its bulk for each 15 pounds to the square inch. The same authorities who teach this, also admit

that such fluids are only elastic in exact proportion as they are compressible (see Silliman, as above). A movement, therefore, made in an incompressible fluid, whose particles are mobile as in water, would merely displace them adjacent to the disturbing body in front, causing them to take their place behind, as quoted from the learned Prof. Stokes of Cambridge University last month. The only possible way to convey motion through an incompressible medium to any distance, is to move and thus displace bodily the entire mass, as Prof. Mayer clearly admits in his article on Sound in "Appleton's Encyclopedia," since where no compression can be made no elasticity exists, and no pulse can be transmitted. This being self-evident truth, we then reach the general and crushing law, *that the nearer to incompressibility a body may become the less degree of pulse can be transmitted through it with a given force*. Hence, as water is more than ten thousand times less compressible than air, with correspondingly less elasticity, it ought to take more than ten thousand times as much force to send a pulse of a given intensity to the same distance through water as through air. Surely this must accord with all true ideas of physical and mechanical philosophy. And therefore as the intensity of a mechanical pulse in a given medium depends upon its compressibility and consequent elasticity, and since the force producing it must correspond to the ease with which the body can be compressed and thus set in motion, in order to produce and transmit a given condensed and rarefied pulse at a distance, it follows that the force of the blow in the easily compressed air ought to produce ten thousand times more elastic motion at a distance than in water, even leaving out of view the 1300 times greater inertia of the water which has to be overcome by the blow. Thus the logical conclusion is, that as sound travels a greater distance with greater intensity and at greater velocity in water than in air, it must consist of something besides pulses or mechanical movements of the medium.

An additional and even stronger proof of the position we are taking is the fact that quicksilver is 20 times less compressible than water (see Silliman, *ibid*), while it is more than 18 times denser than water, and about 17,000 times denser than air, with correspondingly less compressibility, elasticity, and consequent conductivity of sound, according to the wave-theory, since sound can only be conducted as elastic pulses through any medium. Hence as air is more than 10,000 times as compressible and elastic as water, and more than 200,000 times as compressible and elastic as quicksilver, a pulse through water, therefore, by a given

concussive blow, ought to produce but one 10,000th as much sound-motion, and in quicksilver but one 200,000th as much sound-motion as in air. Yet, as Capt. Carter has shown, the result is exactly the reverse, the intensity of sound, as well as its distance and velocity, augmenting as the elasticity and compressibility diminish.

To clinch this nail in the coffin of the current theory of sound, we have only to state here the formula by which to calculate theoretically the velocity of sound in any medium, as laid down in the text-books—it being *great* in proportion to *elasticity* and *small* in proportion to *density* of medium. By this rule it is claimed that hydrogen gas of the same elasticity as air, and of only one-sixteenth its density, must necessarily conduct sound with greater velocity than will air. It so happens to do, not by virtue of the correctness of the formula, by any means, but from other conditions and correlations of the immaterial forces which, according to the Substantial Philosophy, as will soon be shown, determine the conductivity of any force through any given material substance.

If there were any scientific truth in this formula, why does mercury conduct sound about ten times swifter than air, when it possesses 17,000 times its density, and but one 200,000th part as much elasticity, as just shown? Why does tempered spring-steel, with many times the elasticity of soft iron (using elasticity in its common meaning), but of the same density, conduct sound at exactly the same velocity? And why does soft iron, thousands of times denser, and tens of thousands of times less elastic than air, conduct sound seventeen times swifter, and at the same time with correspondingly greater intensity and to a greater distance? These are facts and stubborn arguments which no advocate of the wave-theory can answer or dares to attack. Yet these investigators of physical science pretend to ignore the new philosophy as unworthy of serious attention.

Thus the whole formula of the present theory of acoustics falls into a heap of rubbish at the feet of wave-theorists, and ought thus to have fallen at the feet of Newton when he so signally failed to prove its correctness in calculating what ought to be the velocity of sound in air, according to this theoretical ratio of density and elasticity, missing it, however, by 174 feet in a second, as he himself acknowledged. Why is it, in the light of Newton's failure, and in view of the overwhelming facts here massed, that physicists will still continue their futile efforts to maintain the wave-theory of sound?

So much by way of re-enforcement of the captain's able argument. We now come to

the important problem which he propounds for the consideration of **THE MICROCOSM**: How can the Substantial Philosophy explain the fact that a given sound, produced by a given force, in water, reaches the submerged ear at a given distance with greater intensity than when produced and conveyed in air? This question is but one out of many scores, of similar importance and difficulty of solution, to not one of which can the slightest explanation be given, except in the light of the Substantial Philosophy. Does that philosophy solve such problems? We first lay down the broad principle in physics that *matter*, of whatever nature or character, can only be recognized by our senses through the aid of immaterial force of one form or another. Nay, we go even further than this. Without an active, ever-present, and all-pervading substantial force, no material could *exist* in a tangible or ponderable form, or ever come within the range of our sensuous observation. This broad truth will admit of no controversy. But for the substantial *force of cohesion*, for example, the solid rock would first change to impalpable powder and then dissipate into the intangible gaseous elements from which its structure as rock had been originally condensed; and finally this same cohesive force-substance ceasing to act on the gaseous particles, they would of necessity cease to exist as oxygen, hydrogen, nitrogen, carbon, etc., and would disintegrate and dissolve into still finer and rarer elements, out of which these gases came, till, but for this marvellous force of cohesion, they would be changed back into the elemental fountain of incorporeal substance beyond the reach of human recognition, and out of which, by the intelligent creative power of the universe, all forms of matter originally came into existence. Thus, let the active, substantial force of cohesion be instantly and everywhere annulled, and no material body, including our own bodies, would exist. The material universe would cease to be as matter, in any present conceived sense of that term. And we may infer, from this philosophical principle, that one of the chief agents employed by creative power in the original formation of the material universe, with all the innumerable varieties of bodies which exist, was this same primordial form of force by which the basic elements of matter were caused to cohere, first into the gaseous forms, thence into the liquid, and finally into the solid forms of the present infinite variety of material shapes, textures, densities, etc.

This substantial form of force, lying as it does at the very foundation of material existence, and constituting as it does the very elemental basis upon which all material bodies were originally formed, it is entirely rational

to suppose the cohesive form of force to be the governing force of the universe next below the force of vital intelligence. It is reasonable to suppose also, that this basic force-element, in its variously modified forms as incorporated in matter, is what constitutes the innumerable peculiarities of material bodies around us, and what gives them their properties and characteristics, such as elasticity, hardness, mobility, ductility, brittleness, malleability, porosity, compressibility, fusibility, impenetrability, combustibility, volatility, transparency, opacity, conductibility, sonorosity, etc., etc. Being the fundamental force upon which the very existence, nature, and character of all material bodies depend, it is rational, it is even imperative, that we consider it the dictating force, so to speak, by which all other forms of force in Nature are permitted to act upon or in any manner to influence a material body. Even heat cannot disintegrate the particles of a material body only as permitted by this cohesive force. It is easy to say that the peculiar property of a body, such as hardness or transparency, depends upon its *molecular structure* or the *atomic arrangement of its material particles*. But this most unsatisfactory solution means almost nothing, since it does not begin to get down to the real basis of the problem. It involves, after all, only the material particles, without pretending to explain how they received their peculiar "structure," or how they maintain their characteristic "arrangement" of particles. By putting this active substantial force of *cohesion* at work within a material body, with the energy to arrange, modify, and control the structure as originally given to it by the intelligent First Cause, the mystery of such body's peculiar existence and properties is at once solved, as only the Substantial Philosophy can solve it.

A man visiting an uninhabited island, goes into a well-constructed house with its furniture, utensils, and compartments beautifully designed and adapted to their respective uses, and suited to the comforts of a family, and seeing no mechanic or any human being to inform him, he infers that the character and fitness of this residence, which so nicely adapt it to the uses of a family, are all owing to the peculiar structure and arrangement of its furniture and utensils! Would such a philosophical description of the probable cause and design of this building's existence and adaptation to use, be likely to prove satisfactory to those who may have sent him as an expert to the island to report upon the newly-discovered building? That is exactly the report which present scientists give of a material body whose particles are so exquisitely constructed, arranged, and held together, as to exhibit the most wonderful

properties and adaptations to use. They see no working or living mechanic within the lump of crystal, for example, who has so arranged its molecular windows, as to let the light shine through them, or *vice versa*, in the lump of coal; nor do they detect any artistic genius within the ball of caoutchouc, which has so marvelously constructed and arranged its molecules as to allow them to store up mechanical energy, and thus be enabled to return to their normal position by utilizing such energy after having been distorted by some external force, which property we call elasticity. Substantialism, however, sees in every material body, whether solid, liquid, or gaseous, not only the primordial and basic force of cohesion by which its atoms exist as matter and the body coheres as a mass, but it beholds this invisible substantial energy acting or ready to act in co-operation and sympathy with various other forms of force, or to resist them, as the case may be, frequently modifying their effects, sometimes neutralizing them entirely, occasionally augmenting them, and often itself being modified, neutralized, augmented, or annulled by their superior action and energy.

Thus while cohesive force has so arranged the material particles of the limpid crystal as to let the light force enter and pass through unimpeded, it has so improved this same transparent arrangement of the diamond's molecules that the regnant force is enabled to co-operate with the form of force called light, and thus augment its brilliancy, allowing it to emerge with increased intensity of action. This is even true when the diamond is defective in limpidity and texture. Is it, then, strange, in the light of this philosophy, that a material body, such as water or quicksilver, should have its particles so arranged, controlled, and permeated with cohesion, that this dominating force which holds them together is enabled to co-operate with sound force, and thus augment its volume and capability to travel to a distance, as Capt. Carter has proved? We showed in the March number of this journal, in our article, the "Substantial Nature of Sound Demonstrated," the same state of facts here suggested, where the tone of a sounding fork is augmented a hundred-fold by transferring it to a spruce chip so small as not more than to double the action of the fork itself on the air, thus demonstrating that sound does not consist of air-waves. How natural is such a result in the light of the New Philosophy! The cohesive force of the wood has the particles so arranged and related to each other, that this controlling energy in possession of the material body is enabled to lend assistance, and thus augment the quantity of sound-force a hundred-fold,

while the molecules of a piece of iron, of the size and form of the chip, are so arranged by this same force of cohesion that it is not able to augment sound to a perceptible degree.

Nothing but one substantial immaterial force can augment, retard, or neutralize another force. Matter, *per se*, can do nothing. Cohesion being the prime force, reigning in all material bodies, as here set forth, it is plain to comprehend the reason why one body conducts electric force better than another, and why some bodies will not conduct it at all. This force, which controls the material properties of different bodies, either aids, retards, or refuses entirely to admit electricity according as it has prepared the atomic structure of the material body and arranged its textural particles. No scientific analysis of any material body can throw the least light on the reason why one body conducts electricity and another does not, since no scientific investigation has ever gone deeper into these natural laws than matter itself, either in its solid, liquid, or gaseous form, leads him. No investigator, prior to the announcement of the Substantial Philosophy, ever dreamt that the physical forces, acting within material bodies, were substantial entities, and that they alone were the moving, efficient, controlling cause, and contained the sole explanation of natural phenomena.

Heat, like electricity, is conducted with varying facility through different material bodies, not by virtue of any difference intrinsically in the material itself, but alone by virtue of the substantial cohesive force which has arranged the particles under certain forms of physical law, and which is thereby enabled to aid, augment, or resist the progress of this and other forms of force differently through different substances.

No physicist attempts to give a reason for the non-consumption of *asbestos* when exposed to the fire, or why other material bodies consume readily, except it be by the unsatisfactory combination of other forms of matter with them, such as oxygen, hydrogen, etc., drawn from surrounding Nature. We have searched in vain for any rational or fundamental explanation of combustion itself, or of the phenomenon of flame. But these problems are all easy and natural in the light of Substantialism. In *asbestos*, for example, the cohesive force has such control over the particles and can assume such antagonism to other force as to keep out heat, or if heat is forced in by outside causes, it has so arranged the particles that its disintegrating effect is neutralized by this same counteracting force of cohesion, which refuses to admit oxygen to assist heat in combustion; while in wood, cohesion relinquishes its control at the approach of heat, or blends with it, transforming the fiber so as to admit oxygen and thus enable it to call

in the aid of electricity, thereby re-enforcing its disintegrating effect in the form of a flame or blaze. That the flame of burning combustibles is chiefly the combination of heat and electricity—both immaterial substantial forces—would be acknowledged at once by physicists could they recognize the basic truths of the Substantial Philosophy, since the electric flame in the vacuum tube, as well as in the lambent streamers of the *aurora borealis*, are such good imitations of common flame. Heat always tends to generate electricity and retain it ready for assistance, and we know a very learned scientific experimenter, who believes firmly that an electric generator will yet be constructed by the action of heat alone which will supersede the common dynamo machine. Why not, then, explain the blaze or flame in combustion as but the efficient action of two substantial forces combined (heat and electricity) under the abdication, permission, and possible co-operation of cohesive force, rather than to assume the unaided co-operation of oxygen or any other material element which could no more burn or consume than could *asbestos*, except by the co-operative interaction of the substantial force of cohesion? To illustrate this principle, take oxygen and hydrogen as combined and held together by cohesive force in the form of water, though both highly inflammable materials, and, so far from burning, they mutually extinguish fire alone by virtue of the manner in which cohesive force has united, acts upon, and controls their particles. But the moment cohesion lets go of the combination, though it holds each set of particles together as firmly as before, but under different conditions, this very substance, without one particle added or taken away, which just now extinguished fire, flashes like powder. Why? Simply because of the modified relation which is now sustained to it by this governing substantial force called cohesion, and nothing else. If oxygen, which is regarded as the sole aid of combustion, could act independently of the co-operation of the substantial force of cohesion, why does not our atmosphere take fire and burn up, since such a large portion of it is pure oxygen? What chemist can answer this question, based on purely material relations? Are we told that it is because the oxygen is mechanically mixed with nitrogen in composing the air? That does not answer it, since powder and sand can be mixed in the same proportion, but a match touched to it will cause the powder to burn out and scatter the sand. The truth is, it can only be explained by the presence and influence of the substantial force of cohesion which so unites the particles of oxygen and nitrogen in constituting air, and by a higher law than mechanics, that heat cannot consume the

former, and can only utilize it as needed in the combustion of other bodies by permission of cohesive force.

We do not believe that any physical investigator, who thinks deeply upon these subjects, has ever been satisfied with the purely corporeal explanations of natural phenomena as they have always been made, and as they have necessarily been limited to the material particles of bodies, however much they may have been reduced in size to molecules, atoms, etc., thus leaving out the forces entirely as but mere modes of motion of these same particles, and in no sense substantial entities. Chemical affinity, attraction, or combination is a meaningless jargon of words, unless the forces of cohesion, attraction, heat, electricity, etc., are to be regarded as substantial entities which, by correlation, interaction, co-operation, and interconvertibility, produce what we call chemical affinity. Chemistry, as a science, needs to be wholly reconstructed on the basis of the Substantial Philosophy, both as to its terminology and as to its imperfect and unsatisfactory solutions of the ultimate causes of observed results from not including the action of the natural forces as substantial and efficient agents; and we are glad to know that the eminent chemist and physical investigator, Dr. Henry A. Mott, already contemplates such a task as among his most important labors in the near future. When that work is completed the marvelously ingenious chemical action observed in the production of crystal formations of various patterns, instead of seeming to the superficial observer to supersede the necessity of a God, and of proving the truth of atheism, as Prof. Haeckel urges in his "History of Creation," it will be found to demonstrate exactly the contrary doctrine, since the active, substantial forces which can so intelligently and artistically arrange inert material particles into fixed and definite forms of beauty and utility, could not have received their powers nor operate by such intelligent laws of action except from a primordial intelligent source. How easy then are all chemical problems to be solved in the light of the substantial nature of any given force with its active power and influence over other forms of force given to it by the intelligent Author of the Universe!

This subject was more than hinted at in our article—"The Immaterial is the Real" in the October MICROCOSM, present volume, and also in our first review of Sir William Thomson's address in the August issue. We there showed instances in which the force of cohesion and even gravity had evidently been modified, if not neutralized, under the combined action of other forces. Dr. Mott has recently given us, from his own observation, a confirmation of this

view in the case of oil-tempered glass vessels, such as goblets, which have instantly become disintegrated as by an explosion, being scattered all over a room into particles no larger than the points of needles. These glasses he had previously seen thrown upon the floor and dashed against the side of the room without breaking them, so tough was their structure; yet without any warning or known cause the disintegration, repulsion and explosion of the particles as just stated would frequently take place, and which might have proved fatal to persons in the room but for the minute division of particles into which the goblets would fly. Now it is probable, as a true explanation, that the cohesive force, in the peculiar chemical process of producing such vessels, must have been brought under great tension by the action of other forces involved till its tenure of control of the material particles was limited to a certain fixed condition of heat, electricity, etc., which, in some manner culminated in the room at the time of the explosion. What that exact condition of tension and limit of cohesive power was, or what that exact combination of other forces in the room could have been, which neutralized the force of cohesion, called in the force of repulsion and caused the explosion of particles, will be a matter for future experimental science of the most refined character to determine. Should the details ever be found out, then the same line of experimentation which leads to it may ultimately tell us the true cause of steam-boiler explosions, a problem never yet solved and never to be solved, as we firmly believe, except in pursuance of the suggestions here outlined by Substantialism. The supposition that a sudden and extraordinary generation of steam causes the boiler to explode is all very well, and even that the oxygen and hydrogen composing the steam may have suddenly separated, thus augmenting the pressure enormously, is still better; but what caused the one or the other is the problem which the Substantial Philosophy would aid in finding out.

Plainly, whenever such an explosion occurs there is, as generally known, but a small quantity of water in the boiler, and this water is, of course, very hot, under great pressure, and consequently in a condition to generate electricity, which permeates the boiler, surcharging all its parts. All the while the force of cohesion, in both the water and the steam, is jealously holding the fort against the threatened disintegration of the water and steam, and keeping the particles of both under its control. Still, as the heat force augments and the liquid water decreases in bulk, it yields its grasp upon their particles step by step, till at last the electric condition reaches the culminating point

which accords precisely with the cohesive tension and heat-expansion, the combination is completed, the fatal moment arrives, heat and electricity triumph, cohesion succumbs, as in the exploding goblet, when both water and steam dissolve back into their elementary gases, thus instantaneously generating a mechanical pressure which no boiler ever constructed would be able to withstand.

While the true philosophical cause of all such catastrophes is thus rationally outlined and made possible by the Substantial Philosophy, attributing it, as must justly be done, to the neutralizing effect of one substantial force upon another, this philosophy does not propose to carry on the experiments required for ascertaining the scientific details, and which will be needed to guard against such disasters in the employment of so valuable a servant as steam power. These things will be reached in the distant future when other generations of scientists, having fully accepted the Substantial Philosophy, will set about the proper experimental investigations looking to the real causes of all such physical phenomena, conducting them upon a more rational and fundamental basis of research than anything ever dreamt of in materialistic philosophy.

We are free to announce here that we do not believe there exists a single problem, difficulty, or mystery in Nature of which the Substantial Philosophy is not master, and of which it cannot furnish a rational and satisfactory explanation, at least in principle, admitting first of all the correctness of its basic propositions, that all force is substantial, and that the forces originally emanated from an intelligent substantial source.

We have only referred to a few of the mysterious problems of science as a mere specimen of what the New Philosophy is capable of doing. We could name and analyze a score of equally profound problems, had we space sufficient. Take the hitherto inexplicable mystery of phosphorescence, a problem which no physicist pretends to solve on the basis of the mere combination of material particles, and resultant ethereal undulations. With the aid of Substantialism we can see the fire-fly, for instance, calling into play its substantial vital force under the guidance of its substantial mental powers, thus starting into operation its minute electric battery which discharges this stored-up force-element, sending it forth transformed as substantial light-particles. The fox-fire of the rotten tree, under the combined forces of heat, cohesion, and electricity in the process of yielding to decay, stores up the light of day within the embrace of these forces, allowing it visibly to issue at night. Nothing in the material world can cause the decay and consequent disintegra-

tion of a physical body but the neutralization of cohesive force under the counteracting influence of some other force or combination of forces; and as this substantial force of cohesion yields, it may become transformed and thus converted into other forms of force, such as light, heat, electricity, etc. Can any mere materialistic theory tell why heat will run along a strip of copper when it will not travel at all along a strip of mica of the same size? or why electricity will dart through a rod of iron but will absolutely refuse to travel through a rod of glass of the same weight? Before such mysteries as these the materialistic scientist is dumb. But the Substantial Philosopher is never more at home than in facing such problems. The reigning substantial force of cohesion, which controls and holds together the particles of the rod of iron blends them with the substantial electric force in such manner as to take it by the hand, as it were, and lead it forward, while the same ruling force, presiding among the particles of the rod of glass by agreement with its texture, refuses admission to this obnoxious form of force. The same line of thought and reasoning applies to the strips of copper and mica in the conduction of substantial heat, and to the various material bodies which conduct sound at such different velocities and intensities.

And this leads us to the telephone, through whose connecting wire the substantial sound of the human voice embraces the substantial form of electricity, and by permission of the reigning force of cohesion, the two travel together to the distant receiver, where the electric vehicle discharges its freight of words. No mode of undulatory motion or vibration of the transmitting diaphragm or wire can disturb this substantial solution, since by universal admission, words are known to pass through the wire when spoken against the naked end of the magnet without any vibratory motion, and without any transmitting diaphragm whatever. (See "Problem of Human Life," p. 384.)

But further:

Take the marvelous fact that three certain metals, when combined as an alloy, will fuse at a temperature but little above 100° F., when either of these metals alone requires more than four times the intensity of heat to melt it. What theory, based on material particles alone, can solve such a mystery as this? But regarding any particular force as a real entity, which may be modified, weakened, or strengthened as it may have been acted upon by some other form of force, thus modifying material properties, and the solution is plain. When these different metals, whose particles were made to cohere under a certain degree of force, were combined under the superior action of heat, it

is not unreasonable to assume that the cohesive force which now controls their particles may have become crippled somewhat, thus letting go its hold upon the alloyed particles with a much less action of substantial heat than before the different metals had become united.

Analogous to this physical puzzle, why does one metal expand under the action of heat and another, as in the case of bismuth, contract? No physicist pretends to attack this problem. Yet it is easily solved by applying to it the logic of Substantialism. Heat alone, if no other form of force were involved, would inevitably expand all material bodies if it would expand any, as it would melt all bodies at the same temperature if it could melt any. But heat only expands a body as it combines in action with the co-ordinate forces of cohesion, gravity, etc., and as cohesion was the original force which arranged the particles by which density, porosity, gravity, etc., are determined, it is plain that expansion or contraction by heat is only its influence upon the reigning force of cohesion, thus causing it to rearrange the particles with more or less porosity, as the case may be.

An equal mystery for Substantialism to solve is the fact that the compression of air generates heat, while its expansion or rarefaction lowers its temperature. No one taking the materialistic view of its particles—that they are naturally widely separated, and that in the act of compressing they are only brought nearer together, but never so near as to touch—can begin to give a rational solution of this generation or reduction of heat. We would like to see one of the great physicists, such as Sir William Thomson or Prof. Helmholtz, try it. Their materialistic attempts at such important explanations would only excite sympathy in the mind of an average investigator. For how can heat, only a mode of motion, be generated by bringing isolated particles nearer together, with no substance connecting them and holding them apart, since there can be no material friction unless the particles actually touch something? But assume the air-particles to touch each other, as they rationally must, and that their structure and composition are caused by and are kept under the control of the substantial force of cohesion, it becomes an easy matter to see that a disturbance of cohesive force among these particles, either by compression or expansion, might require either its reduction or augmentation, as the case may be. If less cohesion is required, as the particles are compressed by external mechanical force, such surplus cohesive force is converted into heat force, and when more cohesive force is needed, as the air-particles are expanded, the normal heat of the

air is converted into cohesive force to supply the deficiency, and the expanded air becomes cooler. How plain and easy of comprehension does the Substantial Philosophy make all such problems!

Take one more case of scientific mystery, as it is presented in Prof. Cooke's celebrated work on chemistry, in which he undertakes to prove that the ultimate molecules of water are larger than those of alcohol, ether, etc., and that, so far from touching each other, they are separated by many times their diameter. His demonstration consists in first converting an ounce of water into steam, inclosed in an airtight globe, and then injecting into the same globe, through a stopcock, an ounce of alcohol and an ounce of ether, which he does without increasing the pressure in the slightest degree, even with both changed into vapor and kept at the same temperature as was the steam before their injection. He assumes that no possible explanation of this fact can be given except upon the molecular theory, namely, that the molecules of the alcohol and ether, when converted into vapor by heat, being smaller than those of steam, find an abundance of room within the interstices of the latter, as sand might fill up the spaces between shot, and hence that they may thus co-exist there without an increase of the steam's original expansive force. But if the molecular theory be correct, that the molecules of steam do not touch, but are several diameters apart, why did Prof. Cooke use alcohol and ether, in order to get smaller molecules for these interstices, when he could just as well have used two other volumes of steam without increasing the pressure, since their molecules would have had plenty of room between those of the first ounce of water without touching them? *Reductio ad absurdum.* If there is anything between these molecules of steam to keep them separated several diameters from each other, such as repulsive force, then this force must be a real substance, as Substantialism teaches, since clearly the motions of the molecules themselves, without a real substance to move in, could not affect each other in the least unless by contact. If there is a real substantial force which keeps steam molecules several diameters apart, then the smaller molecules of alcohol and ether ought to have a similar substantial force to keep them apart, and this repulsive force ought to add to the steam's expansion when the two additional sets of molecules, with their repulsive forces, are injected into the globe, no matter what the sizes of the molecules are, since the real cause of expansive force, according to the theory, is that only which keeps the molecules apart, and not the sizes of the molecules themselves.

Having thus disposed of the molecular theory

on its own ground, let us see if the Substantial Philosophy will not come nearer a sensible solution of the problem in question.

Let us first premise that *heat*, as a substantial force and at a given degree of temperature, will usually so act upon its correlated force of *cohesion* as to expand bodies in proportion to their elastic and other properties, which properties are superinduced among material particles alone by the primordial action of cohesive force incorporated with their peculiar structure as material masses. We also premise that this regnant force of cohesion bears such relation to the material particles of all bodies as to determine the effect which any other form of force shall produce upon a given body, or whether any effect shall be produced at all. In fact this is the physical basis of the Substantial Philosophy so far as relates to the structures and properties of all material bodies. Let us illustrate: Heat is known to expand some solid bodies more than others, and different solid bodies in various degrees of enlargement, owing, as the new philosophy claims, to the varied relations of cohesive force to their different material particles; while heat is also well known to contract some substances, as recently intimated, owing to a still different relation of this substantial force of cohesion to their material structures. These apparently strange and contradictory facts have hitherto defied explanation on any known principles of physics. But all such problems yield up their mysteries to that philosophy which has so lately and satisfactorily shown a rational reason why platinum will fuse easily in the comparatively low temperature of a bath of melted lead, while it resists a hundred-fold higher temperature when immersed in a bath of melted iron. (See October MICROCOSM, present volume.) Plainly, if cohesive force will permit such varied action and effect of heat upon a body associated with different material particles, is it strange that its expansive effect upon three vapors combined should be vastly different from its effect upon either vapor separately? As every particle of those vapors has its dimension, size, and density definitely determined by virtue of the ruling force of cohesion, why may they not vary the property of expansion in contact with each other, somewhat as platinum varies its property of fusibility when in contact with fused metals of different nature and temperature? In a word, if the composition or alloy of three metals, as we know, so changes the relation of the substantial cohesive force which holds their combined particles together as to reduce their property of fusibility many times below the fusibility of either substance separately, as is well known to be the case, why may not the

composition of three different vapors, under the same co-operation of substantial heat with this regnant force of cohesion, so modify the relation of this force to those combined particles as to reduce their property of elastic expansion to one-third that of either vapor separately? And what has either the reduced fusibility or the reduced expansibility to do with the sizes of the different so-called molecules or their distance apart? Thus both the point and edge of Prof. Cooke's great problem disappear in the scorching light of the Substantial Philosophy.

We have thus endeavored to show what the new philosophy is capable of doing by way of explaining the hitherto inexplicably mysterious phenomena of Nature. Those alluded to in this paper are but a sample of many scores, if not hundreds, everywhere encountered by the investigator of chemical, physical, and physiological, as well as psychological science, not one of which, as before remarked, can stand undiscovered before the all-searching scrutiny of Substantialism. We deemed it an imperative duty we owed to coming investigators, before crossing over the dark river toward which we are gradually tending, to leave on record these specimen solutions, as the keynote to all other problems that may ever come up for explanation. Let it therefore be remembered by every young student, *that the invisible—the intangible—the immaterial—is the real in Nature*, and that as an absolute proof of the fact, as intimated at the start, let the single invisible and immaterial force of cohesion be instantly annulled, except in man, and the entire material universe would become to him intangible and invisible, though in reality every atom of its substance would still exist as really and truly as when in a visible, tangible, and ponderable form. How important, therefore, must be the Substantial Philosophy in the coming investigations of science!

THE MOON PROBLEM.

In last month's issue we were obliged to omit a portion of our editorial on the motions of the earth and moon about their common center of gravity, as taught in the text-books on astronomy. This portion omitted contained no part of our argument, as that was printed complete, but related to correspondence between Dr. Mott and several astronomers upon the claimed new discovery. As this correspondence is not yet terminated, but will probably be extended, he suggests that all present reference to it be withheld. We have only to say that several professors who have taught astronomy in colleges have written us approving of the new departure as an important discovery in science, and expressing their astonishment that such a manifest error should have been so long overlooked. We will quote something on the subject next month.

THEOSOPHY.

We have received from one of our subscribers in India a copy of an Oriental monthly magazine, called the *Theosophist*, a publication issued at Madras, and devoted to the Eastern philosophies of which so little is generally known in this country. This magazine is a study. Even its appearance is weird, cabalistic, and unearthly, so unlike anything ever seen published here that one involuntarily shudders, on looking at the cover, as if he had stumbled into a Rosicrucian cave where the occult secrets of the elixir of life and the philosopher's stone had been delved for in darkness for ten thousand years, more or less. On glancing through this number, however, one sees many scintillations of intellect on various philosophical questions which can only have resulted from long and profound study of the subjects discussed. The contributors to its pages are certainly men who think far below the surface of things where ordinary intellects find their only plane of research. By some means unknown to us, the editor had received a copy of the August MICROCOSM, present volume, and was naturally struck with the fact that there was a new philosophy coming into vogue in far-off America, called *Substantialism*, which was worthy of the attention of his philosophical Hindoo readers. So he prints an article on the subject describing it as well as he could from that single copy of THE MICROCOSM. As an Oriental treat to our readers we copy the article entire as it appears in the *Theosophist*.

THE SUBSTANTIAL PHILOSOPHY.

'From the August number of WILFORD'S MICROCOSM, a Christian journal published at New York, U. S. America, we find that what is called "The Substantial Philosophy" is now gaining ground in America. The chief theory of modern positivistic material science is that matter is the be-all and the end-all of the whole universe, and that force, whether vital, mental, or any other, is nothing else but a *mode* of matter. The logical inference, drawn from this hypothesis, is that the force, "by which the motions of our bodies are caused and controlled, is but the molecular motion of the material brain- and nerve-particles of the living organism; and that, consequently, as soon as the body dies, and these material particles cease to vibrate, the life, soul, mind, or spirit, necessarily ceases to exist, since motion, *per se*, is confessedly nothing entitative, being merely a *phenomenon of matter*." This is the cornerstone of the materialist's philosophy, denying the survival of man after his physical death. To prove that mind can act independently of the brain, the phenomena of mesmerism and clairvoyance have often been cited. Those, who have witnessed these wonderful phenomena, know full well that a person, in mesmeric sleep, can act independently of his bodily organs, thus showing that there is something in man, which represents his consciousness, and which can hear sounds, see sights, and take cognizance of occurrences far beyond the reach of the ear, the eye, and the other senses upon which a man in his normal state, has to depend. The higher phases of clairvoyance and trance flatly contradict the materialistic hypothesis; but there are many who ignore the occurrence of such phenomena, among these being the conductors and the principal contributors of the journal under notice. At the same time, being

believers in a future state of existence and in the survival of the "soul" after death, they attempt to controvert the theory of their powerful opponents. They seem to have resolved to break the force of the above theory by attacking, and, if possible, overturning this mode-of-motion citadel as universally taught in physical science, and asserting every force in Nature to be a real "substantial entity." The founder of the "Substantial Philosophy," therefore, selected *sound* as *par excellence* the representative "mode of motion" in physics, "so regarded by science, out of which all the other so-called modes of motion had developed." If the celebrated "wave-theory," concerning *sound*, it was thought, could be overturned, then "*sound* could be nothing else but an immaterial substance from the sounding body—a substance which travels by conduction through various media analogous to substantial but immaterial currents of electricity." It was thus expected to make the *sound* controversy, "including the truth or falsity of the undulatory theory, the real battle-ground of the Substantial Philosophy." Experiments of a various nature were made; and they have satisfied the adherents of that Philosophy that "*sound*, instead of being air-waves, water-waves, iron-waves, or waves, or molecular motions of any conducting medium whatever, is a veritable substantial form or department of force; that all the physical forces, as they manifest themselves to our conscious or sensuous observation, such as light, heat, electricity, gravity, magnetism, etc., are but different forms or transformations of the one universal force-element of Nature; and that this original or primordial force-element, from and out of which all the manifested forms of force come or are generated by the various methods, . . . derives its active power alone from the vital, mental and spiritual fountain of all force in the universe . . ." This discovery about *Sound*, we are told, was made about three or four years ago, and has since been gaining strength in America. Its advocates were so firm in their conviction that in the beginning of this year Professor Drake addressed a letter to Professor Tyndall, drawing his attention to the same and asking his opinion whether the experiment, brought to his notice, could sustain the "wave-theory." The English Professor gave a brief reply stating that in no way did it affect his theory; but he is reported not to have expressed his opinion about the experiment, nor to have given any explanation. Subsequent communications were therefore addressed to him on the subject; but, as no reply has been received, the American Professor drew the conclusion that Mr. Tyndall is unable to refute his arguments and also unwilling to admit his error. However that may be, a large number of Professors, Scientists and others, are said to have thrown overboard the wave-theory and become adherents of the "Substantial Philosophy." The latter has now been admitted in most of the American Schools and Colleges and threatens to become almost universal. The editorial writer, in the magazine under notice, says:—

"The Substantial Philosophy teaches that everything in the universe, visible or invisible, tangible or intangible, of which the mind can form a positive concept, is *substance* or *entity*, in some form or degree of grossness or attenuation.

"It teaches that the substances of the uni-

verse, as above expressed, are naturally and rationally divisible into two main departments, namely, *material* and *immaterial*, which means nearly the same thing as *corporeal* and *incorporeal*; and that, while all matter is *substance* or *substantial*, it by no means follows that all *substance* is *matter* or *material*. The term *matter*, as thus viewed, only embraces a small portion of the substances of the universe, namely, those substances which are ponderable or otherwise susceptible of chemical or mechanical test, or such as are absolutely limited by material conditions. The term *substance*, on the other hand, not only embraces all material things, however gross or tenuous, but it includes all immaterial things, or such imponderable entities as are not confined by material limits or conditions, and hence, such entities as cannot be proved to exist by any chemical or mechanical tests."

Then the immaterial aspect of *substance* is defined. It includes every force of Nature or in Nature, physical, mental, vital, or spiritual, and includes every form of energy which in any way can produce a manifestation or motion of a sensuous body.

"It is as impossible," says the writer, "according to the Substantial Philosophy, for the intelligent mind to conceive of a living animal moving and doing work by means of a vital force within it that is not a real substance, as to conceive of an engine moving and doing work by the force of steam, while such steam is not a substantial entity, but a mere molecular motion among the particles of the water."

We may say that the teaching of the Substantial Philosophy concerning the ONE SUBSTANCE, underlying all phenomena, the two aspects or poles of which produce an infinite variety of correlations—approaches a good deal the teachings of almost all the Asiatic Philosophies, with certain differences, the principal one being that the adherents of the new philosophy invest that SUBSTANCE with *personality* which the Eastern philosophies do not. In connection with this review, the reader may peruse, with advantage, the articles: "Is Electricity Matter?" and "What is Force and What is Matter?"—published in the *Theosophist* for September, 1881.

MAN; HIS ORIGIN, NATURE AND DESTINY.

We have received a fine copy of a duodecimo volume of 370 pages, bearing the above title, written by E. L. Dohoney, of Paris, Texas, and published by John Burns, of St. Louis, Mo. The book is beautifully printed and bound, and from the brief examination we have been able to give it, is, without doubt, worthy of a careful perusal by any one who is fond of philosophical reasoning on the subjects of which the work treats. It is not written in the line of any old beaten ruts, but the author fearlessly strikes out in new paths, taking the responsibility for his original ideas. The drift and tendency of the work are clearly sound and in the right direction. Address the author or publisher as above.

A RARE CHANCE FOR OUR BOOKS.

To those who are interested in our publications we make the following rare offers:

We have about 100 copies of the first volume

of THE MICROCOSM separately and beautifully bound in cloth, which we will send prepaid by express or mail for \$1 each. We have also the first and second volumes bound in one book, same style, which we will send prepaid for \$2; or the first three volumes bound, same style, for \$3, and the fourth volume in numbers free, as premium. We will send the "Problem of Human Life," either present edition (prose) or as originally published (meter) by express prepaid for \$1, both of them \$3 books. We will send either "Universalism against Itself," or "Walks and Words of Jesus," prepaid, for 75 cents, and we will give the present volume of MICROCOSM or Dr. Mott's book on Sound free to any one purchasing \$3 worth of any of the above-named books. These offers are made to put the works named in circulation and not for any profits in the books, as there are none. Persons desiring these books should take advantage of the above offers, since there will be a radical change of prices, terms, etc., at the close of the present volume.

Address

HALL & CO.,
23 Park Row, New York.

ERRATUM.—In last number, page 219, first column, 24th line from bottom, for "earth's surface" read earth's center.

A BEAUTIFUL EXPERIMENT.

In the February MICROCOSM, in reply to Prof. Reppert's article as copied from the *Christian Standard*, we noticed an objection urged by the professor, based upon the fact that the string while sounding has a blurred appearance, giving no definite outline to the vision, especially at the center of its motion. The professor inferred from this that it must be traveling with enormous velocity or its outline of figure, during these brief periods of travel, would be recognized by the eye. He did not, however, consider the well-known fact that the rapid succession of the separate motions of a body above a certain limit, does not give time for the eye to recognize the form of the moving object distinctly. An illustration of this is observed in allowing the faucet to be so turned that a stream of water, just heavy enough not to appear to the eye to be separated into drops, may steadily run. Still it is a fact that this stream is really a succession of separate drops, as may be proved by allowing the eye suddenly to follow it from top to bottom, in which the drops will have time to make their individual impressions upon the retina. The same law may be proved by reversing the experiment. Let the stream be reduced in quantity so as barely to be recognized as a succession of drops; then glance the eye suddenly from bottom to top, and for the instant the line of drops will be transformed into a continuous stream of water.

Now for the experiment which we started out to give, in which Prof. Reppert's difficulty is so beautifully explained away that a child can demonstrate it in a few minutes. Take a lead pencil or pen and ink, and draw a succession of fifty or more parallel lines close together on a piece of white paper. Have the lines, say, not more than a sixteenth of an inch apart, to represent stretched musical chords. Now instead of vibrating one string and trying to retain its form while it is rapidly changing

position. reverse the operation by placing a card over these lines with a long slit through it running lengthwise of the lines. Then move the card slowly across the lines, while you try to look at them through the slit. The effect is precisely the same as if a single string were too rapidly reversed in its motion to make a distinct impression upon the retina. The result will be, when carefully tested, that if the card be passed over the lines only at a velocity of one inch in a second not one of the lines will be seen separately, but a blurred appearance will fill the slit the same exactly as in the case of a single vibrating string.

We gave an illustration somewhat similar to this in the article referred to, consisting of stretched strings, but the present experiment, of a succession of parallel lines and slitted card, is so simple and inexpensive that any reader can perform it, and thus take a most important self-taught lesson upon the deceptive appearances in physics. Had Tyndall and Helmholtz learned this lesson, they would most likely never have been betrayed into describing the string and prong as "swiftly advancing" for no reason in the world except their blurred, and consequent deceptive appearance while vibrating.

A PROBLEM ON SOUND.

NEW HARTFORD, Conn.

A. WILFORD HALL, Ph. D.:

DEAR SIR,—There is one phenomenon in relation to sound that I have never seen explained by any writer on that subject.

Most people have heard the low musical note made by the wheels of a wagon revolving upon the snow in winter, but all may not have observed that the loudness of the note is in inverse proportion to the temperature. Above the freezing point, it is scarcely audible, but as the mercury sinks, the sound steadily rises. At zero it is loud, and we listen in vain for its first æolian softness. At 20 degrees below, its volume is great and oppressive. At 32 degrees below, it becomes one prolonged continuous shriek loud enough to drown ordinary conversation. What is the explanation? What makes the noise, the snow or the tire of the wheels?

I have been an interested reader of *THE MICROCOSM* from the beginning, and should like to see your explanation of this curious phenomenon in its pages at some future time, if you ever have time to study it out.

With hearty good wishes for the continued success of the *Substantial Philosophy*,

I am yours truly,

E. L. RICHARDSON, A.M.

REPLY TO THE FOREGOING.

An explanation of Prof. Richardson's problem would not seem difficult to give. Snow is composed of numerous fine crystals which have a hardness and consequent elasticity or spring power in proportion to the lowness of temperature. Just at the freezing degree, 32 F., these crystals with their thin frozen points are quite soft, and their friction against each other, under the grinding influence of the wagon wheels, makes but little sound, just as soft metal tongues will not produce, when caused to vibrate, as loud a sound as they would if highly tempered. The vast number of these

elastic crystal points, which are continually made to vibrate under the wheels, combine to swell the tone to the "shriek," which becomes louder as the temperature falls and the crystals becoming harder vibrate past each other with more force. The same thing is observed in driving a wagon rapidly through sand. The harder and sharper the sand the louder the shriek, and the swifter the wagon moves the higher the pitch. Crushed glass would act nearly the same as densely frozen crystals of snow. The sand also on the beach of the ocean, under the action of the waves, produces a "screaming" sound often observed, and the harder and sharper the sand the more intense is the sound. Various other observed natural phenomena tend to confirm the very natural explanation we have here given of Prof. Richardson's problem.

ANOTHER SOUND-WAVE.

HARRODSBURG, Ind., April 21, 1835.

DR. A. WILFORD HALL:

DEAR SIR,—Last summer Mr. Carter's saw-mill boiler blew up. Mr. Ellmore Walker, a farmer, was in his oat field one mile east of the mill, putting oats into shock. He was in a valley—the mill was in a hollow—with a ridge between the oat field and the mill, which is nearly 150 feet high. It is about equidistant between the field and the mill. Mr. W. was standing with his face west, or directly toward the mill, when the explosion occurred. He states that he first felt a distinct atmospheric concussion. He then raised his eyes, which gave him a view of the top of the ridge that was between him and the mill, when he saw shooting up, to the height of about 100 feet above the ridge, the wreck of the mill roof, and immediately following this came the report of the explosion of the boiler.

Mr. Walker is a man of unquestionable veracity, and says he is positive in his statement that the order of time in the occurrence of the three things was: First, the atmospheric concussion; second, the shooting up above the ridge of the wreck of the mill roof; and, third, the report of the explosion of the boiler. The wreck was complete, pieces of the boiler being blown a quarter of a mile.

What, if any, bearing have these facts on the wave-theory of sound?

Yours truly,

E. P. F. WELLS,
Pastor M. E. Church.

REMARKS ON THE FOREGOING.

The wave-theory of sound, as presented in the popular works of the highest authorities, teaches that the concussive atmospheric shock felt at a distance from an explosion is simply the "sound" or "noise" of such explosion, no distinction being made between the two phenomena. Our readers are familiar with Prof. Tyndall's description of a great powder explosion at the village of Erith, quoted from his *Lectures on Sound* in the "Problem of Human Life," at page 105, in which he takes for granted, and as a matter of well-accepted science, that the shock or atmospheric pulse which crushed the windows of houses miles away from the magazine, was simply the sound which we hear. In our criticism

of that feature of the wave-theory we gave the first intimation ever placed on record that this jumbling together of distinct and separate physical phenomena was a dangerous and pernicious fallacy of science which should no longer be tolerated in our schools. It will be remembered also that we there made a prediction, on purely philosophical and mechanical principles, that whenever proper experiments should be made to test it there would be found a distinct difference in the rate or velocity of travel between the concussive pulse of an explosion and the accompanying sound, and this we recorded in absolute defiance of the authorities now used as text-books in all our schools and colleges. And we are pleased to state that from many reports made to us of the results of such explosions from various sections of the country, we get the same uniform information confirming to the letter the truth of our prediction. We give the Rev. Mr. Wells' letter as a single instance of such confirmations, showing positively that sound does not consist of atmospheric waves or pulses, since such pulses and sounds have a distinctly different rate of velocity. Why do scientists studiously and persistently ignore this discovery? Can the reader tell? Thank Heaven, *THE MICROCOSM* still lives to let the truth be known; and what is better, it is likely to live.

(From last month.)

OUR GREAT ENCYCLOPEDIA OFFER.

Among those who have accepted our offer of a complete set (16 leather-bound volumes) of "Appleton's Encyclopedia" for purchasing \$50 worth of books, we may name the Rev. A. McA. Pittman, of Darlington, S. C. He bought fifty copies of the "Walks and Words of Jesus," at \$1 each. We sent these books and the set of "Encyclopedia" by express, and received in return the following letter:

DARLINGTON, S. C.

MESSRS. HALL & CO.,—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the "Encyclopedia." I am more than satisfied with the books, and feel well paid for my labor. I would not take \$50 for the "Encyclopedia" alone. You have my thanks for your kindness.
A. MCA. PITTMAN.

☞ We have received several letters from subscribers since last month inquiring in regard to our *Encyclopedia* offer. Remember that for \$50 worth of our books at retail prices, or for 50 subscribers to this volume of *THE MICROCOSM*, at \$1.00 per volume, or both mixed, we will send by express a complete set (16 vols.) of Appleton's "New American Encyclopedia." This offer will not continue very long, as the sets are difficult to obtain; therefore you should take advantage of it before its withdrawal. Send for circular.

VALUABLE BOOKS.

Those wanting Dr. Tefft's book, "Evolution and Christianity," should examine our notice of it in last month's *MICROCOSM*.

We also have on hand several copies of "Through the Prison to the Throne," by our able contributor, Jos. S. Van Dyke, A. M., D.D.,

and copies of Col. Patton's book, "Death of Death." These last two mentioned books we sell at \$1 each, or give them as premium for three subscribers to this volume of *THE MICROCOSM*.

Subscribers should not forget our liberal offer of Dr. Mott's "Lectures on Sound," 103 pp., handsomely and substantially bound in cloth, and of our small Webster Dictionary, either of which we give as a premium to all new subscribers who take this volume of *THE MICROCOSM* from the commencement.

WHOLESALE PRICE OF OUR BOOKS.

Those having a little spare time would do well to take into consideration these prices, and see if they cannot make profitable use of such leisure moments in canvassing among their neighbors:

"Problem of Human Life," in cloth, \$9.00 per dozen.; in sheep, \$15.00 per doz. First and second volumes of *THE MICROCOSM*, \$15 per dozen. Third volume, \$9.00. "Universalism Against Itself," in cloth, \$6.00 per doz.; in sheep, \$9.00. "Walks and Words of Jesus," \$3.00 per doz. "Retribution," \$6.00 per doz., etc.

(From last month.)

NOTICE TO SUBSCRIBERS.

Those whose subscriptions have expired with the first half of the volume will please remit 50 cents for the last half, as there will be somewhat modified terms for the next volume, notice of which will be given in the last number. In the meantime, let all who want the present volume from the commencement and any of our books as premiums, at the exceeding low prices at which we are furnishing them, send on their names. (See last page of February number.)

TO ADVERTISERS.

We have concluded to devote a few pages of *THE MICROCOSM* to the advertisements of firms whose business is in keeping therewith, and we believe that those who obtain space in our columns will find them to be a valuable advertising medium.

Our subscription list contains the names of all the leading clergymen of every denomination in the United States, and thousands of scientific and literary readers.

Authors of Scientific and Religious Books, and all manufacturers of and dealers in Scientific and Astronomical Instruments, Church Furniture, etc., will see at a glance that *THE MICROCOSM* opens to them a most valuable field for the exposition of their goods in the proper channels. Advertisements not strictly in keeping with the character of the magazine will not be accepted on any consideration, and we guaranty our advertisers and readers that our advertising columns will be as pure and healthy in tone as the balance of the magazine. In a word, we intend to give space *only to a few select advertisements*, and our rates, which are very moderate, will be mailed at once on application.

Copy for all advertisements should be sent to our office by the 25th of each month, so that proofs may be sent for examination before going to press.

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WILFORD'S MICROCOSM.

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{ One Dollar a Year
{ Single Copy 10 Cts

THEISM vs. ATHEISM AND MATERIALISM.

BY JOHN C. DUVAL, ESQ.

It seems to me the world will never be able to discriminate between those things for which a man may be justly held responsible, and those for which he cannot. When a man, for instance, makes a failure in life financially, the world says of him, "Oh, it's all his own fault; nothing to blame but his own want of business tact and talents"—and very likely such is the fact. But who, pray, is responsible for this lack of judgment and business capacity? Is the man? Yes, just as much responsible as he is for having a snub nose or bandy legs: for most assuredly, if he had had any "say" in the matter, he would have gifted himself with the financial abilities of a Jay Gould or a Rothschild, and, no doubt, with the genius of a Shakespeare or a Byron also. But unfortunately his wishes in regard to this were not consulted at all, and therefore a man deserves no more blame for his want of mental capacity than he does for bodily defects or deformities. Neither does he deserve any credit for having the genius or talents of a Shakespeare or a Byron. What, then, some one may say, are you a *materialist*, one of those who believe that man is merely a creature of accident, a "living automaton," operated upon mechanically by the laws governing matter, and consequently without responsibility to anything? By no means: for there is no one who has a greater abhorrence for, and a firmer disbelief in, the doctrine of Materialism than I have. But I believe that man is a soul, or spirit, emanating from Deity itself, and that his mental faculties or capacities (though attributes of the soul) are dependent upon the physical or outward tenement of the soul for its more or less perfect manifestation. Paganini himself would only make discord if performing upon a cracked violin. What the violin would be to him for the expression of musical and harmonious sounds, so is the body to the soul for its more or less perfect manifestation. Through a deranged or totally disorganized medium like the brain of a lunatic or an idiot, the soul cannot manifest itself. The soul, therefore, must be regarded as alone constituting the man, the bodily frame being merely, as it were, its outward habiliments—the medium by which, or through which, it can only manifest itself to our physical senses—and when this soul willfully pursues a course which "innately" it knows to be wrong, in place of one which it knows to be right, then its responsibility begins. But, it may be said, there are many in these days who do not believe in "innate ideas" of right and wrong—that our ideas of what is right and what is wrong are solely the result of education and training. Then whence did they originally come? They must have had an origin at some time or other, and it is just as reasonable to suppose they were original in my mind as in the mind of some remote ancestor. My ideas of right and wrong when I was a child were substantially the same as those I have now, but my notions and opinions in regard to almost

everything else have been changed (by education and experience, if you will) over and over again—some of them half a dozen times. You may take one hundred men at random, of all races, classes, and capacities—Indians, Negroes, Asiatics, Europeans, Malays, etc.—comprising some of the highest order of intellects, as well as those of the lowest grade, and you will find upon investigation that their ideas of what is right and what is wrong are substantially the same. I admit that in some special instances these ideas will be found warped or distorted to a limited extent, but such instances are barely enough as exceptions to prove the truth of the general rule—from all of which I think it reasonable to infer that our ideas of what is right and wrong are "innate," implanted in us from the beginning.

I am inclined to think that good and evil are the only things in which the souls of men differ; that in all things else they are equal, none being superior to or lower than others. The soul of an ignorant Hottentot, probably, is in no wise inferior to that of a Shakespeare or a Byron, though the latter, in accordance with the mysterious plans of the Creator, were given a more perfect vehicle for the exhibition of, and more favorable surroundings for the manifestation of, their faculties. Evidently it is the design of the Creator that some should be thus gifted or favored beyond others, just as it is in accordance with the same divine plans that some men should lead lives of ease and luxury, whilst there are others, in nothing their inferiors, whose whole existence is a continued struggle with the privations and hardships of poverty.

The instant that life, and with it mind or intelligence, leaves the body, it becomes a dead, inert mass of matter operated upon and governed solely by material laws. It was simply a compound of earths, minerals, and gases which had resulted from the action of the principle we term "vitality," and as soon as life ceased, from that moment material laws resumed their original sway over it, and in a little while it is resolved into its constituent elements. The compound vanishes from our view, but every atom of which it was composed still exists in its original form of gas, earth or mineral, and will continue to exist for all eternity. But what, then, has become of vitality and its accompanying soul or intelligence? The materialist would answer, "They have been annihilated—they *were* but are not *now*." I can much more readily conceive of the utter annihilation of a pound of matter than I can of the annihilation of that power, force, or principle (whatever you may choose to call it) which for years could set the laws governing the material world at defiance, or control them to a very considerable extent. A power, force or principle (whatever it may be termed) that even for a single moment could control matter or act in opposition to the laws that govern it in its normal state, could form, mold, and convert it into bones, muscles, tendons, etc., and into shapes of invariable types, is certainly something superior to matter, and therefore can-

not be annihilated. And although in obedience to some law of which we have no knowledge, it ceases to act upon the atoms of the compound it had for so long animated and controlled, there is no reason to suppose that therefore it has been annihilated. Having once formed, molded and controlled matter to suit its own purposes, most assuredly it could do so again and again. No force or power in the universe is ever lost or annihilated. It may vary in its mode of demonstration, but the thing itself is permanent and unchangeable. The thunderbolt shivers a tree, and the force for a time is spent—diffused through air, earth and water—but the *identical* electricity that once manifested such tremendous power still exists, may again and again, under the material laws that govern its diffusion and concentration, become a thunderbolt in the clouds, and again and again demonstrate the force and power it possesses to rend the oak or shiver the lofty edifices erected by man. Everything in the universe, whether it be a material substance of which our senses can take cognizance, or merely a power or force resulting from something whose existence is only proven by the effects it produces on material objects, is and must be *something*, and being *something*, it cannot be destroyed or annihilated. Whatever produces effects upon material substances, though we can neither hear, taste, see or feel it, must be as much of a something as a pound of iron, for instance, for *nothing* can produce no effects upon *anything*—and therefore, being something, it is as unreasonable to suppose that it could be relegated into absolute nonentity, as it would be to suppose that a pound of iron could be annihilated. Forces or powers certainly contribute as much to the status of the universe as material substances, and if we do not regard them as *somethings* of themselves most assuredly they are the resultant or product of *things existing*, whether they be material or not. There must be a cause for every effect, and whatever cause produces effects must therefore be something, material or not as the case may be. In accordance with such facts (or rather, to state the case more modestly, with what are facts in my opinion), I am forced to believe that man possesses an indestructible life and mind, soul or intelligence, or all of them combined, for I plainly perceive the effects they produce on matter in its normal state. When conjoined with matter by the Creator of all things, they say, "Bring to me day by day and year by year the atoms necessary for the construction of the tenement we shall inhabit for a limited period—minerals, earths and salts for bones—water, gases, etc., for flesh and tendons and other portions of the structure, and arrange them all and mold and shape them according to the mode or manner we shall prescribe, so that in time a man shall be the result, and not an ox or a monkey"—and matter obeys the mandate, though in so doing, not unfrequently it is compelled to act in direct opposition to the laws that always govern it when not conjoined with vitality and intelligence. By force of the vital power or principle the blood circulates in opposition to the general law of gravity, and we are enabled to stand, walk or run in violation of that same general law, to which all matter devoid of vitality is always and invariably obedient. One of the most prominent materialists and atheists of the day said not long since in a lecture he delivered at Chicago, "Arrest but for a single

moment the law of gravity and a God appears"—and yet this law is being arrested ten thousand millions of times daily by this principle of life or vitality. If then it be admitted that there is a power capable of arresting this law even for a single moment and in a single instance, it is reasonable to suppose that there may be (and in my opinion undoubtedly there is) a much greater power that could arrest its action *universally*, and for all time.

The materialist tells me that every mote I see floating in the sunbeams is indestructible and will exist for all eternity, and I believe him; but when he tells me that the soul of man, with all the attributes with which it has been endowed by its Creator, will be annihilated, I do not believe him; because I can plainly perceive that in every respect it is vastly superior to matter, and that it controls, molds and manipulates it in many ways to suit its own purposes.

It is just as difficult to account for the action and origin of vitality, as it is to account for the origin and action of mind or intelligence, for all matter *en masse* is totally devoid of both. But the materialist himself must admit that vitality is a force, principle or power *existing now*, and that it must have had its origin in or from something possessing the quality of vitality, and not in matter, which, as we have said, is totally devoid of it. And so it is with what we term mind, soul, or intellect; it must have had its origin from something possessing intellect or intelligence, for the qualities of all matter not connected and controlled by it are totally different from the attributes of mind. That vitality is a force or power is demonstrated by the fact—for instance—that by its aid we are able to raise one hundred pounds or more from the earth in opposition to the law of gravity, and that we are able by the aid of mind or intelligence to raise ten thousand pounds in opposition to the same general law, shows it to be a force more potent and pronounced even than that of life or vitality. It is said to be a very difficult thing to make a whistle out of a pig's tail, and certainly it would be not less difficult to make a pig's tail out of a whistle. It is undoubtedly as much an impossibility to make something out of nothing as it is to annihilate something or convert it into nothing. But that vitality and intelligence are *things*, and very potent ones too, we think, is clearly shown by their control of and action upon material substances, and it is unreasonable to suppose that they can have their origin in matter, which does not possess a shadow of the attributes belonging to them.

A materialist speaking of a locomotive engine, for instance, would say that the material atoms composing its parts are indestructible and eternal, and yet at the same time he will assert that the mind or intelligence or the something that planned, arranged and put together the crude materials composing that most ingenious and perfect piece of mechanism *will be* annihilated or resolved into absolute nonentity. But to me such an assertion is fully as absurd as if he were to say that the atoms composing the body when separated by death from vitality and the soul or mind, would be annihilated or converted into nothing. The universe is a complete and perfect whole. Not one atom of its material substances can be lost or destroyed, nor can a single soul or intellect be annihilated, unless possibly such a thing may be done by the will of the Supreme Ruler of all things.

Let us see into what absurdities the doctrine of materialism would lead us. According to that doctrine, there results from the combination of material atoms (taking those composing the body of man, for instance) two principles or qualities, of which all matter, except that entering into animated beings, shows not the vestige of a sign, vitality or life and mind or intellect. Take the atoms of every material substance in the universe and combine them in every possible mode or proportions, and nothing but *material* substances would result. Each separate atom is *dead*—utterly devoid of life and intellect—then how is it possible to produce vitality, for instance, by the mere juxtaposition and arrangement in certain proportions of two or a million of these dead atoms? Combine the atoms of oxygen and hydrogen in certain proportions, and we get a material substance we call water; oxygen and nitrogen and we get atmospheric air, and so with all possible combinations of material atoms, material substances can only be the result. If it be conceded that mind is simply a result of certain combinations of material atoms acted upon by material laws, then it must be conceded also that matter is itself a *creator*—that it has created or originated out of itself attributes and qualities which it does not possess in the smallest degree. But materialists themselves must deny this, for such an admission would overthrow the very foundation on which the structure of materialism is built, namely, “that nothing was created, but is just as it has been eternally.”

If the alchemists of old had had the chemical knowledge we possess to-day, they never would have attempted the hopeless task of converting the baser metals into gold, for they would have known that it was just as impossible to change the ultimate atoms of one substance into those of another as it would be to annihilate them. Combination or amalgamation may, and frequently does, result in a substance differing in some of its qualities or properties from those of any of its constituents, but nothing but *material* substances can be the result, and the ultimate atoms of each constituent are unchanged by the operation, and each, by the proper chemical process, may be separated and brought back to its original state without the loss or change of a single atom. Knowing and admitting this to be a fact, it does seem very strange to me that materialists should still contend that mind, with all its attributes, was simply a product of matter. Certainly, the belief of the alchemists that the ultimate atoms of one substance could be changed into those of another, was not more absurd and unphilosophical than the belief of materialists in relation to the origin of mind and vitality. admitting, as they must, that the atoms of all the material substances in the universe are totally devoid of such property or attributes (not even excepting *protoplasm*). If any materialist will demonstrate to me satisfactorily that there is a *germ* of vitality and intellect existing in the atoms, say of a granite boulder, or anything else, I will then give in my adhesion to his doctrine—but not before. Assuredly, if you put no wheat in the mill, you will get no flour, grind as fast and as long as you may; and yet the materialist, in his “material mill,” will grind you out vitality, reason, imagination, hope, memory, and all the other attributes of mind, although nothing possessing such attributes in the remotest degree is ever placed in the hopper. Such a miracle reduces to insigni-

nificance that of the “loaves and fishes,” for there were a few loaves and little fishes in the baskets when they were miraculously filled.

One of the glaring absurdities of materialism is, that the basis on which the whole structure of the creed is reared, flatly contradicts the assertion that the mind or soul of man will be annihilated on its separation from the body. The basis of the creed is the fact (if fact it be) “that nothing was *created*, but that everything was just as it is *eternally*, and therefore could not be otherwise than it is.” Then it follows that the soul, mind or intelligence existing *now* (no matter what its origin) must have been in existence for an eternity past, and will continue to exist in some form or other for an eternity to come—or, rather, to express the basis of their creed more fully, “that every substance, law or force, existing and in action *now*, has thus been in existence and in action for an eternity past, and will be for an eternity to come.” Hence, as I have said, it logically follows that the mind or soul of man existing *now* (which is evidently *something*, or a force or power resulting from *something* differing in all its attributes from the qualities of matter) must have existed and will continue to exist forever. And the assertion of materialists that mind is simply the result of material laws acting upon certain combinations of matter, would have no bearing on the question, even if it were a fact, for we can plainly see (whatever be its origin) that mind or intelligence *exists now*, and therefore, in accordance with the principle on which materialism is based, must continue thus to exist forever. Nor is the fact that this soul or mind is not cognizable to our senses, and that its existence is only shown by the *effects* it produces upon other things, entitled to any weight; for the materialist himself must admit that there are substances or things in existence which are only known to exist by their effects upon other substances—magnetism, for instance. A solid plate of glass or of brass, placed between the needle of a magnetic compass and a bar of iron, does not impede in the slightest degree the passage of this impalpable substance, for that it is a *substantiality* of some sort is fully proven by the fact that it *moves the needle*. We know there is such a thing as caloric, though we can neither taste, hear, see, smell or weigh it, and can only feel it when sufficiently concentrated to affect or destroy the tissues of the body. Then how absurd it is to assert that only those things really exist which manifest their existence to our corporeal senses. We know that our physical senses are very imperfect—in fact, far inferior to those of many animals. Miles away from his eyrie the vulture will descry a carcass upon the ground that would be totally invisible to the human eye, and a hound will follow unerringly a deer hours after it has passed by the odor it leaves on its trail.

The imperfection of our vision, for instance, is shown by the aid it receives from the use of telescopes and microscopes. With the former we are able to see objects so distant, and with the latter objects so small, as to be totally invisible to the naked eye. But for the aid of the telescope we would probably never have known that there are volcanoes on the moon, and but for the aid of the microscope that there were “snakes and eels in vinegar” and monsters of various forms in every drop of water we drink—and “small thanks to it for that same!” If our vision were perfect—that is,

if it were not limited by the remoteness or minuteness of objects—there is no doubt we would be able to see the air itself swarming with thousands and tens of thousands of forms and substances of which we have not now the least conception. We would see myriads of animals (which we call insects simply because they are comparatively of diminutive size) totally unknown to any of our scientific classifications; we would see all the innumerable odors and exhalations of flowers and other substances; we would see the electric current coursing along the wires, and a miniature world teeming with life in every dew-drop; our finest and most delicate fabrics would appear as coarse cotton bagging or canvas, and the smooth, soft skin of beauty would seem to be rougher and thicker than the hide of the rhinoceros, and we would turn away in disgust from our food, for we would see that it was alive with monsters of all forms and shapes, and possibly we might see the medium by which or through which the sun grapples with all objects within our planetary system.

And so it would be with our hearing, if it were perfect—that is, if the organ were so perfect in its structure as to enable us to hear all sounds at the same instant, no matter how remote, or how inappreciable they might be to our existing sense. Silence would be a thing unknown, for at all times we would hear the dashing of billows on rock-bound coasts—the roar of cannon and of “heaven’s artillery”—cries of pain and distress—wails of woe and grief—laughter, sighs and sobs—the murmur of waters—the rush of winds—the clanking of engines and machinery, and the buzzing, creeping and crawling of myriads of insects. And for this reason, in order to better fit us for our condition and surroundings, it was wisely ordained that our senses should not be more perfect than they are—their very imperfections adding, as it were, to their completeness.

Is not the assertion that the immortal works of Shakespeare, for instance, were conceived and written out by material substances or by any combination of material atoms, a most palpable absurdity? And yet that is exactly what the materialists do assert. In what atoms of earths, minerals, salts, or gases, pray, originated such thoughts and sentiments as we find throughout the works of that author? The question is easily answered. They do not owe their origin to matter at all, but *solely* to the soul, mind, or intellect with which matter is temporarily associated. They originate entirely from the action of the attributes of that soul or intelligence—attributes utterly wanting in matter of all kinds, shapes, formations and combinations. Take away vitality and the soul or spirit that animate and control the physical frame of man, and instantly it becomes a dead, inert mass of matter, subject only to material laws, and as incapable of thought, volition, will, or movement as the clods or stones that strew the surface of the earth. Tell me, then, that the taking away of *nothing* from this matter has produced such a great and wonderful change, for, according to the creed of materialism, the soul or spirit is *nothing*. Take away *nothing* from any given quantity of matter, and it is evident it would remain in *all respects* wholly unchanged. How is it, then, when we take away vitality and this soul or spirit from the atoms that form the physical frame of man—this *nothing*, as it is termed by materialists—

that instantly it becomes a dead, inert mass, incapable of will, thought, power, or motion, and is passively acted upon, and as obedient to all material laws as it was before its connection with—*nothing*? A materialist would tell you that the vitality of an oak tree and the tree itself were solely the result of material laws acting on matter—but in this, as in many other things, I think they put the cart before the horse. I should say that the oak was the product of vital power acting upon matter, because I plainly perceive that so long as its action continues, it controls or governs matter, and because it is unreasonable to suppose that matter could originate or create a power or principle *superior to itself*, and capable of controlling its own creator, and of arresting for a thousand years or more the action of those material laws to which all matter unconnected with this “vital force” is subject.

EL PASO, Texas.

PHENOMENA OF HABIT.

BY REV. T. NIELD.

Habit is a tendency to the repetition of acts, which tendency is in proportion to the frequency and regularity with which they are performed. Physical acts performed outside the domain of will, have not the nature of a habit; for from the beginning they have a fixedness of tendency to repetition. Habits may be formed in which the action of the will is so unconscious to ourselves that their beginnings are unnoticed; such as a peculiar blinking of the eyes or twitching of the mouth. It is obvious that such acts must at first have had the will’s assent. Still, it does not follow that an assent of will is necessary in every repetition of the act by which it matures into a habit. Certainly, after the habit is formed the acts are performed without consent of will, and sometimes in spite of will, as is discovered when the person tries to break the fetters of his habit.

At first, the tailor’s apprentice keeps a watchful eye upon his needle, where and how to thrust it in and draw it out. Slowly he learns the knack of drawing out his arm the proper length. All this time the will is very active. After years of practice he can sew, and be unconscious as an automaton while his thoughts are far away. Now, sewing is a habit. The initial acts were by an effort of the will. The habit formed, the repetition of the act is carried on by memory, as the proxy of the will.

Men sometimes form the habit of awaking at a pre-determined hour. First, the will determines on the object to be gained, and impresses the fact upon the memory, and when the will becomes inoperative memory performs the will’s behest. Thus we see that memory has the power to act upon a pre-determination of the will, even when the latter is inoperative, and the other faculties repose in sweet obliviousness.

In an infant learning how to walk, the memory acts as servant to the will, noting what muscles must be used, and how, to carry out the purpose of the will. Thus memory is the storehouse of experience, whose deductions are denominated knowledge. The infant knows how to walk when memory has recorded all the failures and successes to the point where every move that fails is laid aside, and what succeeds is easy to perform. The habit then is

formed. Thenceforth the will is passive, and the memory represents the will. This will be seen in one who, lost to his surroundings, stumbles as he walks the street. He makes a move to keep his balance long before his consciousness can act upon the will to prompt the mind to guide the motors of the body. Memory acts responsive to the general purpose of the will, which was to stand instead of fall; and how it acts depends on the deductions of experience.

We learn from the foregoing that while the basis of the acts is in the will, the basis of the habits, which is the tendency to repetition of the acts, is in the memory.

Let one be awakened at a given hour for several nights, and he is almost sure to awake the following night about that time. The judgment being passive during sleep, memory records and duplicates the act, as though it were a product of the will. True, the tendency to duplication is not near so strong as it would have been had the act originated in an effort of the will; probably because the will arouses all the faculties to active co-operation in its efforts, while in the awaking done without an effort of the will, the other faculties are sluggish in their action, and the general lethargy results in corresponding weakness of impression on the memory. Still, since it requires an effort of the will to overcome the habit, we conclude that the habit is based upon the action of the memory, not the will.

In dreams the memory is more or less active. There are times when the imagination seems to play alone like heat-lightning around the horizon of the mind. But memory, too, must be awake, making record of the acts of the imagination, in the instances when we have the power to recollect those acts. In such dreams memory does not furnish the imagination with the raw material, as it were, from which to weave its web of unrealities, but leaves it to supply itself with both the warp and weft. At other times, memory furnishes the imagination the raw material of the past, and this is woven in with most grotesque associations, having now a kaleidoscopic harmony of blending, and again a strange and monstrous incongruity. In other instances, the action of the memory when it recalls a subject that the will had chosen to consider just before retiring for the night, is as the echo of the will, and its likelihood to recur to that subject is in proportion to the intensity with which the will had fixed the mind upon the subject during wakefulness. Such action may be termed a momentive mental impetus generated by the will. Thus it is evident that memory has the power to act in dreams upon the pre-suggestions, or pre-impulses of the will, even when the will itself has ceased to act. Again, if we repeatedly recall, and repeat with minuteness, all our dreams, we shall have more vivid dreams, and dream more frequently. Here, again, we see that former action of the will may suggest and cause a later action of the memory when the will is passive.

And further. In our dreams memory often resurrects the buried past, to which neither the will nor the memory has recurred before for years. Even when awake, the memory often brings, unbidden, some old snatch of song, a scene, a perfume, a departed friend, a grief, a joy, a dream, a wish, and makes them live again, as in embodiment, before the mind. And these things often spring upon us by sur-

prise, without the aid of, and, in many instances, against the will.

From the foregoing phenomena we deduce the following facts:

1. Habit is based on memory.
2. Memory may act as servant, or as proxy to the will, carrying out its purposes under the impulse of a former action.
3. It may do particular acts under a general impulse formerly imparted by the will.
4. It may act independently of the will.
5. It may act even in spite of the will.

A dozen years ago the writer saw a girl of twelve, and her brother nine years old, operate with planchette. As they answered our questions through planchette we noticed a few things.

1. There was a difference in the answers given equal to the disparity between the older and the younger mind as one or the other operated.

2. The answers contained no more than the operators knew, or were supposed to know, upon the subject of the questions.

3. When the operator was ignorant, or uncertain on the subject of a question, the answer would be either ambiguous, irrelevant, or false. Sometimes, when the operator's mind was weary or confused, the answers were in part profane—a thing that shocked them both.

Now neither of the operators knew what answers had been written until they read them afterward. The mystery of this may be explained as follows: As we have seen, memory may act without specific reference to the will; yea, without our being conscious of its acting. It often acts, both when sleeping and awake, upon a pre-suggestion of the will. And, many times, its action is as independent of our will as if we had no will. So in planchette. The operator's mind is on the question as it is in dreams upon the subject that had occupied the mind before we went to sleep. The trend of will is toward the answer. Memory acts obedient to the impulse of the will, and yet unconsciously, as when we sew or walk absorbed in thought; for the operator settles down into a mood of self-surrender and expectant listlessness, while memory moves the motors to transcribe its records. Every somnambulist performs as great a feat. Asleep, he does a score of things—some of which he could not do awake—as guided by the memory, in profound unconsciousness. In planchette the operator gives up all attention to the process, waiting for the mind to act upon the will's suggestion. Then, unconsciously, the motors move and write what memory dictates. The profanity in certain answers, doubtless, had been heard upon the street, and, by the shock it gave, had caused a stronger tendency of memory to recur to it. Hence, while she was in this listless and abnegative mood; while memory was without restraint—dependent of a specific action of the will, though acting on a general impulse; while the memory had no answer that was relevant; and while the mind was in a similar state of irritation to that produced when first the words were heard, those are the very words we should expect to be the first on hand.

One who was present at the time referred to asked planchette a question, and in the answer was the name of one of his relatives whom she could not recollect having ever heard him name. But that was nothing strange when we state that he was boarding with the family of

which the operator was a member, nor unaccountable when we remember that, unbidden, memory brings to us from her recesses, almost every day, some long-forgotten relic of the past. Musical composers sometimes copy forms that they have heard. They recollect the forms, but not the fact that they are merely recollections. One went so far as to publish as original a tune that he had heard when young. Memory had treasured up the tune, but not the fact that it had but been memorized; which suggests that all the so-called mysteries of planchette are explicable.

It may be added, that a large majority of persons cannot operate planchette. Evidently, this is because they lack the power of that oblivious self-surrender, that withdraws attention from the operation and allows the motors to be moved as prompted by the memory. All cannot be somnambulists. We have seen that habit has its basis in the memory; that memory forms the habit by a repetition of the acts that had their origin in will; and that, when habits once are formed, the memory acts as proxy for the will. This gives habit somewhat of the nature of involuntariness, since memory acts without dictation from the will; and the longer this continues, the more momentive are the habits, and the more inextricably they become inwoven in the texture of our selfhood.

Here it may be noted that mind and body act and react on each other. Hence memory, prompted by the will to do the bidding of the appetites and passions, takes its cue from their indulgence, suggesting repetitions, until memory takes the place of will and the practice has the fixedness of habit, mind and body having formed a league of sympathy. Then the will may countermand her orders; but she has to master both the mental and the sensuous self before the habit can be utterly eradicated.

But there is a higher realm in which the will dictates and memory executes her mandates; where, by the welding blows of repetition, habit is eternized in fixedness. "Habit is second nature" in the lower realm. It becomes an essence of our nature in the higher. The tailor, though his hands may lose their deftness, cannot unlearn his trade while mind endures. And so with all the habits of the spiritual faculties—they have an element of lastingness.

The judgment has its habits—sometimes of submitting to be domineered over by an imperious will; sometimes of crouching to the appetites or passions, temperament or outward circumstances. These, by degrees, become involuntary; that is, memory suggests and re-suggests the repetition of the acts that are the basis of the habit, and the judgment acts as prompted by the memory, not the will. This involuntariness is one of the greatest factors in determining their fixedness.

The memory has its habits, and their strength or weakness constitutes a good or bad memory. The inveterate novel reader has the slipshod habit of deliriously rushing through a multitude of books that leave no greater trace upon the memory than the drift upon a beach whose tide has ebbed and left an empty channel. He may renounce his novels, but it will cost him years of effort to arouse the memory and reverse its course.

The will itself has habits, and these destinate the eternal future of the spirit. Their character depends upon the motives prompting them, their strength upon the vigor and persistency

with which the will enforces its determinations. The prompting of the memory that suggests the former action of the will, and which is an impetus to future action, will be automatically followed until consciousness is started, and the judgment challenges and then condemns the action, and the will arouses to reverse its first determinations and resists the impetus to repetitions.

Physical habits, as in the drunkard, may be deeply rooted, and proportionately difficult to overcome. But let the habits of our higher self become as instincts, then it becomes a hundred-fold more difficult to disenthral ourselves. When the judgment has been long addicted to perverting facts and giving wrong decisions for the action of the conscience, a tremendous power of will is needed to reverse the habit. So when the memory has become the proxy of the will—the equivalent of a second or auxiliary will—only a desperate effort of the real will can conquer it. But when the will itself has welded for itself a chain of habit—the habit of resistance to the judgment, to the conscience, to the higher will of the Eternal One; the habit of persistence in its domineering self-assertion, until that becomes, as it were, an instinct of the soul—only Omnipotence can break the chain. But the will may go so far that it defies Omnipotence, hence the sin against the Holy Ghost. When the Pharisees, in the despotic pride of will, resisted both their reason and their conscience, and, while owning the supernaturalness of what the Spirit did in casting out devils, sought a refuge from conviction in attributing the work to Beelzebub, they exhausted the resources of Omnipotence; for a will that judgment, conscience, and the acknowledged presence of the supernatural cannot overcome, will not submit, for the obvious reason that no further power remains to be exerted.

And every soul that leaves this world in sin has resisted every means that Infinite Wisdom and Love employed for its salvation. Who, then, shall say that such a will, after it has overcome the lifelong efforts of omnipotence; after it has thus become self-enslaved; after it has acquired the momentum of a life that whirled it on the fiery axis of its habit;—who shall say that it may be subdued, rise from its chains, and stand before the throne amongst the sanctified, in lowly fealty and humble reverence? Who would dare to say that such a soul does not deserve its doom? who lay the responsibility before the feet of God?

GREENSBURG, Ky.

A GREAT REVIEW OF THE "PROBLEM."

Shortly after the "Problem of Human Life" made its appearance, a writer signing himself "E. L. T." gave in the *Scientific Reporter* a long review of the book, which for clearness, fairness, and fullness has never since been surpassed if it has been equaled. It was that review which gave the first impetus to the sale of the "Problem," and which induced us to procure extra copies of the paper containing said review to send out with copies of the book. Some of our subscribers have therefore seen that review. Several of those have urged us to

print it in installments in *THE MICROCOSM* for the benefit of those who have not seen it, regarding it as too valuable an exposition of the initial presentation of the New Philosophy not to go on permanent record in this magazine. We have concluded to do this, and we therefore give herewith the first installment, which, as the reader will see, has not been overestimated in its importance by those making the request. We shall give it from month to month in sections so as not to interfere essentially with our regular contributions. To get the full benefit of this review, it would be well for the interested reader, on the appearance of each new installment to glance over the preceding portions to refresh the memory. Here is the first installment:

**A GREAT REVIEW OF THE "PROBLEM."
NO. 1.**

(*From the Scientific Reporter of Oct., 1878.*)

It is seldom the reviewer has his attention called to a work of such singular interest, and of so many varied characteristics, as the one forming the leading subject of review for the present number of the *Reporter*. It is not only a work of unique arrangement and scope, but the questions discussed are those of the present time, interwoven with original hypotheses, amounting, many of them at least, to positive discoveries of exciting moment to the scientific world. So revolutionary are some of the propositions announced, that it is deemed within the legitimate province of the reviewer to apprise the reader in advance that, should they be sustained by the evidence and reasoning brought to bear, they are well calculated to produce a sensation among advanced scientific thinkers. Especially is this true of the novel hypothesis of *sound* as consisting of substantial or corpuscular emissions, in opposition to the present accepted theory of atmospheric wave-motion; as also of the original arguments urged in solving the difficult problems of modern evolution, as presented by Mr. Darwin and Professors Huxley, Tyndall, Haeckel, and others.

At the commencement of the work the author assumes, as a pivotal proposition, around which much of his subsequent reasoning clusters, that the life and mental powers of all living creatures, including man, are demonstrably substantial entities,—parts of an interior and invisible organism consisting of real substance, and of which the outer or corporeal structure is but the tangible or visible counterpart.

To strengthen this hypothesis, and prepare the reader for the acceptance of such a broad principle in psychologic physiology, he assumes the collateral position that all the natural forces or so-called modes of motion, such as gravitation, magnetism, cohesion, electricity, light, heat, and even sound, are constituted of substantial corpuscles emanating from their respective sources; and argues with force that, although infinitely attenuated, their effects on our senses and on insensuous physical bodies can only be caused by some sort of substantial emissions,—repudiating utterly the idea that

such effects can result from wave-motion, whether of air, ether or any other hypothetic substance.

As one representative class of phenomena, and as an illustration confirmatory of this broad assumption, he selects the problems of sound generation and propagation as the most unlikely of all the natural forces or modes of motion to be regarded as coming within the scope of this substantial hypothesis (such a supposition having never been suggested by any scientific investigator), and in an exhaustive argumentative treatise on the subject, he assails the current wave-theory of sound, and examines and explains the scientific facts and data on which it has always rested.

In the preface to the book the author gives his reasons for introducing and assailing the accepted theory of sound, one of which is to demonstrate the unreliability of the so-called scientific theories in general, as well as their modern advocates, and thus indirectly to disparage those theories especially which place science in opposition to the religious sentiment and intuition of the world, as, for example, the theory of modern evolution. Accordingly, he attacks Professor Tyndall's popular work on "Sound," in order, as he declares, by exposing its fallacy, to weaken the cause of evolution, as based on the prestige of these great scientific authorities, Professor Tyndall being one of the ablest and most aggressive advocates of Darwinism.

Another reason for this introduction and investigation of the sound-theory as in any way connected with the problem of human life, was, as before suggested, to show that no rational objection can be urged against the substantial or entitative nature of life and mind if sound should be conclusively proved to consist of real substantial corpuscles instead of the wave-motion of air or whatever other conducting medium. If sound, he insists, should be clearly shown to be some kind of substance, however tenuous or even immaterial, then the most carping atheist need not object to the entitative existence of a personal God, nor the most radical materialist deny the substantial entity of the human soul distinct from a corporeal organism, on the ground that they are beyond the recognition of the senses.

The author does not rest his case, as to our substantial nature of mind and life, alone upon such analogical considerations as these, however strongly they may tend to favor it, but enters the domain of pure science, like one at home among the cryptic phenomena of Nature, and gleans from the universally admitted facts of biology and physiology, as adduced by Mr. Darwin and other evolutionists, numerous reasons going to show that without the recognition of an interior vital and mental organism, having as real and substantial an existence as the physical structure of blood, bone, and muscle, no such thing as transmission by inheritance from parent to offspring could, by any possibility, take place either among men or the lower animals. His reasoning here is not only new to physiological and biological science, but is in the highest degree revolutionary, opening up a new field of thought for the logical unfolding of a rational solution of the problems of Darwinism and materialism, the value of which can scarcely be overestimated.

A few only of these scientific facts and physio

logical considerations can be here enumerated, though enough, perhaps, to convince the thoughtful student of Nature that the author, in grappling with this profoundest of all problems,—the nature of mind and life,—has substantiated his position, startling as it undoubtedly must be to investigators of science.

At the proper place in his chain of argument he proceeds to show by the well authenticated testimony of anatomists and physiologists, including Professor Huxley himself, that the transmission of the likeness or other physical characters of either parent, even to the second generation, according to the purely physical conceptions of the evolutionist, must be an absolute impossibility, since the child within seven years, or thereabout, from its birth, loses every corporeal ingredient which at first constituted its body, or physical organism; and hence, that every atom of ancestral blood or structure which it originally possessed must have been dissipated in the waste and wear of growth and decay, and substituted by new material atoms from the vegetable, animal, and mineral kingdoms, through the process of food-assimilation, many times before the child could become a man or a woman. What, then, he asks, is there within the physical organism of man or beast by which family resemblance, diseases, or mental peculiarities, can be transmitted and maintained through many succeeding generations, unless there also exists an invisible and incorporeal vital and mental entity of the being which constitutes the essential and animating substance of the physical structure? And must there not be something which is not liable, like the merely corporeal molecules, to displacement and substitution, but which goes to make up the *ego* or *self* of a living creature, thus alone maintaining the generic form or specific identity of its race?

Although this consideration alone would seem to form an unanswerable argument in support of his general hypothesis of the substantiality of the life and mental powers of every living creature, he appears not to be satisfied with anything short of positive and direct proof; and accordingly adduces the well-known fact that the child partakes equally of the physical character and likeness, as well as mental qualities, of both parents, while, as is also well known, not the one thousandth part of the original corporeal structure or blood of such child at birth comes from the father, nearly all, if not absolutely all, of its body being supplied by the mother; thus demonstrating beyond the possibility of doubt that all transmissions of family resemblance and peculiarities must come, not through the physical organism at all, as evolution and physiology necessarily teach, but through the vital and mental corpuscles constituting the life-germ equally derived from both parents at the first impulse of being, and which there and then combine to animate the physical ovule of the mother, and to thus give shape to the real but intangible structure which determines the corporeal form or specific outline of the embryonic being.

It is difficult to imagine any psychical or physiological hypothesis more completely demonstrated scientifically, or more thoroughly supported by admitted facts and phenomena occurring in Nature, than is this novel and gratifying proposition that within us there exists an invisible but substantial duplicate of our tangible structure—a supposition often mooted

in theological discussions, but never before claimed to be susceptible of scientific demonstration. The author of this missing link in the chain of substantial evidence tending to confirm scientifically a probable immortality for the human soul, deserves the thanks of the world, and will no doubt receive the unstinted gratitude of every intelligent reader of his book who has ever tried, with aching eyes and desolate hopes, to look beyond the pale of physical existence to the separate life and beatification of the spirit.

Whatever evidence religion and revelation may furnish as to the personal and conscious indestructibility of the human spirit, it has always and admittedly lacked the strong confirmatory testimony of science—no direct proof, properly coming within the scope of scientific evidence, having been previously adduced to show that the soul, or life, or intellect, of man, even exists as a substantial entity within the present physical structure. The Christian believer has now—thanks to this invaluable revelation of science—not only the evidence of the higher impulses and nobler intuitions of his nature, coupled with that of the sacred record, that substantial immortality attaches to the spiritual principle in man, but he can now grasp the long-sought-for scientific proof, confirmed by the physical and vital laws of our being, that the soul possesses a real organism as literal and substantial as that of flesh and blood, but vastly the more important entity of the two.

Carrying forward this train of reasoning, and thus augmenting the demonstrative character of the evidence in favor of his pivotal hypothesis, the author quotes Mr. Darwin's statement, where he declares in support of evolution, that every species of animal, including man, is originally developed from an ovule but the 125th of an inch in diameter, and that "the ovule of the man differs in no respect from that of the horse." The author, in his masterly style of replication, for which his arguments through the entire volume are so marked, turns this admission directly against the physical theory of natural selection, by showing that if these corporeal and tangible ovules of the various animal species "differ in no respect," it is clear that within each of them at the commencement of being there must exist an invisible and substantial organism constituting the actual difference which we know does exist in some way from the results of development, or otherwise there is no reason which can be given by the purely physical theory of evolution why an elephant should not, by mere chance, breed a tiger, or a cow accidentally give birth to kittens, since their ovules "differ in no respect." Thus the assumption of Mr. Darwin, which seemed so strongly to favor evolution, turns out to be the most conclusive argument in support of the author's fundamental hypothesis. It seems strange that this great naturalist, in so broadly assuming that the ovules of the man and the horse "differ in no respect," could not see, as the author points out, that he thereby laid the ax at the root of his physical tree of descent, by demonstrating the necessity of vital and mental organisms within these ovules, embracing the real specific differences in the animal kingdom.

According to this analysis of the principles of evolution, it would not help the matter even if Mr. Darwin should, by dint of expanded

imagination, assume, with the great French naturalist Buffon (as he practically does in his famous hypothesis of *pangenesi*s) that the true specific difference in the ovules of different races of animals lies in the ultimate molecules which constitute them, and that these infinitesimal material atoms are of course too small to be even observed under the most powerful microscope. Such a quibble, the author insists, would not mitigate the difficulty in the least, as it would be simply guess-work to escape from a serious inconsistency—shifting the trouble from the visible to the invisible, without even the plausibility of analogy to aid it. If the ovules and their physical particles, even when finely comminuted, “differ in no respect,” observed under the microscope at the very boundary line of magnifying power and observation, it is but logical, according to every principle of analogy and sound reason, to infer that if a microscope could be constructed which would reveal the comminution still lower down, even to the ultimate physical molecules, they would still be found to “differ in no respect,” but, like the ovules themselves and their smallest visible particles, would be precisely the same, physically, just as Mr. Darwin correctly asserts. Hence, the author maintains that the only assumption which throws any possible light on this question of the development of so many animals of varied form from ovules differing, physically, “in no respect,” must be the one involved in his broad and demonstrated hypothesis that within each ovule, after the fecundating impulse takes place, there exists a substantial but incorporeal life-germ organized with a form corresponding in all respects to that of the parent species when fully developed.

In harmony with this law of substantial life-germs, he shows how beautifully it illustrates the fact that the offspring in case of a cross partakes of a medium form half way between those of the two parents, which could only result from a compromise vital organism formed between the two intangible life-germs as they mingled and assumed shape within the physical ovule of the mother. To give anything like a satisfactory view of this part of the argument would require the bodily transcription of a dozen pages.

In this connection the author pays his respects to the hypothesis of *pangenesi*s, which will be anything but pleasant reading to the inventor of that celebrated—and, as the author amusingly shows, desperate—device for evading the force of his own logic. By a literal as well as necessary construction of the language in which the hypothesis is framed, it is shown that the assumption of “dormant gemmules,” as Mr. Darwin supposes, handed down in an inactive or quiescent state and circulating in this condition in the blood of a million generations, as must have been the case according to the requirements of evolution, is impossible, and utterly subversive of every principle on which the theory is based, as well as laughably self-stultifying. It would be well for any one who has ever supposed that “*pangenesi*s” helps evolution, even in a remote degree, to read this racy criticism.

The writer then takes up the well-known fact in natural history, referred to and made so prominent by Mr. Darwin, that if the leg of a salamander, for example, should be cut off, a new leg will be reproduced by growth from the stump, even to the smallest minutia of the texture and color of the cuticle. As usual, this

class of facts is turned against the physical theory of evolution by an ingenious course of reasoning, which, at the same time, adds another strong evidence in favor of the cardinal assumption of the author that a vital counterpart of the physical body, in the form of a duplicate substantial organism, must necessarily exist within the corporeal structure of every living creature.

According to the new solution of the mystery here referred to,—a mystery, by the way, which no physiologist or evolutionist has pretended to explain,—when the corporeal leg of the salamander is amputated, the internal or vital leg remains intact, embracing, though invisibly, the substantial essence of every bone, muscle, joint, ligament, nerve and fiber of the physical leg, such vital form not being subject to the corporeal operations of the knife any more than we could expect to cut out a block of atmosphere from open space and leave a vacuum. After the tangible or corporeal leg is removed, the vital leg, remaining in perfect outline, forms the structural guide for the laws of growth to build upon, and thus add one by one the physical particles in the exact line and form needed to reconstruct the lost organ. Without such a substantial guide to designate and limit the structural outline of the new physical leg, and thus give direction to the deposition of organic atoms, the author defies any physiologist or anatomist to give a shadow of scientific reason why an additional tail might not result in such a case from growth instead of the reproduced leg of this reptile!

To deny the existence of such a vital organism, as the animating substance of the physical body of the animal and as the guide to this reconstructive process, would be to assert that the reconstruction of the leg takes place by chance, or by the accidental combination of the particles of skin, bone, and muscle, as they are projected from the stump through the action of the circulating fluids. As no physiologist would venture to recognize such chance-work as possible or conceivable in Nature, hence the author claims that no hypothesis for the solution of this problem is admissible or supposable, save the one here framed, namely, that though the physical leg is removed, yet the substance of the vital leg remains, in all its form and outline, to guide the physiological atoms to their proper localities for the new formation.

(To be continued.)

A CAMPING TOUR TO THE MOSEMITES VALLEY AND CALAVERAS BIG TREES.—No. 7.

BY PROF. I. L. KEPHART, A. M., D. D.

Sunday morning, July 6th, dawned upon us bright and clear. The air was chilly—frosty. The roar of the distant falls, and the rippling of the swift-flowing Merced, were the sounds that saluted our ears, as we awoke after a sound, refreshing sleep. A little reflection was necessary to enable us “to resume the broken thread of time and find our relation to former and present things.” Peeping out between our wagon-curtains, we caught a glimpse of the towering, snow-capped summit of South Dome, glittering in the sunshine. How very near it seemed! Within short gun-shot of us! Surely it could not be distant more than 200 yards at most! Imagine our surprise when, upon consulting our guide-book, we learned that that

immense rock towers 5000 feet perpendicularly above the ground on which our wagon stood, and that it was one mile, in a straight line, from our camp to its base! This circumstance will give the reader an idea of the deceptive appearances, as to distance, of things in this valley.

Well, it was the Holy Sabbath, and having, in the last five days, traveled 150 miles, we all felt like rendering thanks to our kind Heavenly Father for having set apart one day out of seven as a day of rest; and although surrounded by such wonderful scenery, to tempt us to stroll around, we resolved to properly observe this day. In due time a substantial breakfast was prepared, rich, sweet milk was procured from Mr. Harris' dairy near by, an arranging of toilet suitable to rest was attended to, a portion of Scripture was read, and we all knelt in family prayer around our camp-stools. But did ever five persons kneel in prayer surrounded with more stupendous, more grand, more awe-inspiring evidences of the mighty, wondrous works of God! The very atmosphere seemed freighted with messages from Him, expressive of His majesty and power.

Worship over, we sat in a little cluster and enjoyed a social chat, in which the pleasures, scenery, and hardships of our long journey were recounted; and then we began to notice more particularly, and speak of the scenery that immediately surrounded us.

Due south from our camp was South Dome, referred to above. This is an immense granite rock (all the rock in this valley is fine gray granite). A trail leads up to within two thousand feet of the top of this Dome, and the remaining ascent has to be made, if made at all, by the aid of a rope fastened to iron pegs inserted in holes that were drilled into the rock by one Ferguson, who has since died. He performed this wonderful feat several years ago, but at this time the rope was down, hence we did not attempt to scale South Dome, nor did any tourists this season.

Looking to the right of South Dome, in a south-westerly direction, we see the chasm through which flows the south branch of the Merced River, and by walking two hundred yards from our camp west, we could see up the chasm and catch a glimpse of Illilouette (500 feet), Nevada (700 feet), and Vernal (350 feet) falls. The Illilouette Falls are in a creek of that name, which empties into the south fork of the Merced, a mile above its junction with the north fork; and the Vernal and the Nevada falls are both in the south branch of the Merced. Between these two streams towers Mount Star King, 5100 feet, and Mount Clark, or Cap of Liberty, 3100 feet. Looking due west from our camp, we had a fine view of Glacier Point, 8200 feet high, and of Sentinel Dome, 4125 feet high. Of these, more will be said hereafter.

Looking to the left of South Dome, in a south-easterly direction, we could see up the chasm through which flows the north branch of the Merced; and, in the distance, we could see the immense, snow-capped summit of Clouds' Rest, towering 8150 feet above where we sat, and by walking half a mile in the direction of South Dome, so as to change the line of our vision, we could see Mount Watkins and Washington Column; and due east, and very near by, towered North Dome, 8725 feet, which, in shape and appearance, looks as if it had been split off from South Dome. Looking

up this immense ledge we see on its face the Royal Arches (which are immense arches on the face of the ledge), and near to these the Royal Arch Falls, which are formed by a small stream of water plunging down the face of the rocks, a distance (almost perpendicular) of 2000 feet.

The north branch of the Merced unites with the south branch at the head of the Yosemite Valley, one-fourth of a mile west from our camp. It flows down from beyond Clouds' Rest, washing its base and that of South Dome, and separates these from Washington Column, Mount Watkins, and North Dome. It descends by a succession of foaming cascades, and at the base of Clouds' Rest, Washington Column, and Mount Watkins, and half a mile above its passage between the North and the South Domes, it spreads out into the beautiful, tranquil Mirror Lake, so named because of the mirror-like transparency of its waters.

The above description will give the reader an idea of the favorable manner in which our camp was situated for taking in at a glance many of the prominent sights of the valley. It should be remembered, also, that the heights given of the peaks and domes are their heights *above the level of the valley*, and that the level of the valley is 4060 feet above the level of the ocean. Add to this last, the height given of Clouds' Rest, and you have 10,210 feet as its height above the level of the sea. The valley is about six miles long, and from half a mile to a mile and a quarter wide, and is inclosed by almost perpendicular granite walls that tower up from 3000 to 5000 feet high. It is heavily timbered with cedar, fir, yellow and sugar-pine, together with all the shrubbery peculiar to the Sierras. In the summer the heat never becomes oppressive here, and in winter the snow falls to a depth from two to five feet. Observers differ in their opinions as to how the valley was formed, some contending that it is the result of glacial action. To me this seems erroneous. The indications surely point to the valley's being formed by some mighty geologic rupture that resulted in making this wonderful rift in the backbone of the Sierras. In no other way could I think it was formed. The Indians assert that in ancient times this valley was the home of the Children of the Sun, whose chief, Tu-toch-ah-me-lah, dwelt on the huge rock (El Capitan) that still bears his name. They have a pretty legend about this chief and his people, which time and space will not permit me to give.

Having become tired of remaining in camp, the professor and I determined to take a walk while the women prepared dinner. Our stroll was up the north fork of the Merced, and before we were aware of it we were at Mirror Lake, a beautiful sheet of ice-cold water that covers two acres. On its shores lay mighty granite boulders that had, in the past years, thundered down from the immense walls that hemmed us in on every side. After enjoying a little boat-row on this lake, and feasting our eyes on the indescribable scenery all around, we returned to camp, where dinner was awaiting us. Dinner over, our whole party took an afternoon's stroll of a mile and a half down to the hotels, where we enjoyed a pleasant chat with other tourists, and, visiting the photographer's gallery and the museum, we saw many fine stereoscopic views, and a fine array of curiosities peculiar to the valley, one of which was an \$800 registry book in which all il-

lustrious visitors are requested to register their names, and another of which was a pair of snow-shoes for horses. From the hotel we had a distant but very fine view of the Yosemite Falls, and their perpetual thundering constantly roared in our ears.

Returning to our camp, we partook of a hearty lunch, and then, as the evening was chilly, we built a large camp-fire, around which and beneath the wide-spreading limbs of a huge oak we sat, chatting and singing in turns, until nine P. M., when, having decided upon a programme for the next day, we betook ourselves to our "wagon chambers" and "lay down to pleasant dreams."

The camp-fire gradually faded,
The campers retired to rest,
Their hearts, by their wondrous surroundings,
With a sense of God's presence impressed.
The river continues to ripple,
The cascades continue to leap;
The falls still unceasingly thunder,
But the campers unconsciously sleep.

WOODBIDGE, Cal.

IS LIFE A MODE OF MOTION?

BY REV. JOS. S. VAN DYKE, A. M., D. D.

In seeking an answer to this question we invite the reader to an examination of the following facts:

1. Those who consider life a mode of motion, and regard the living and the non-living as substantially one, can furnish no explanation of the difference between a living organism and the same organism when dead. They cannot tell us the difference between a seed when its germ still has vitality and the same seed when vitality has been lost. The most they can do is to assert that the one differs from the other in degree only, not in kind. Life is a thing of degrees. The crystal, on this theory, must be regarded as having life. The stone is a "creature." Man is a thing. Certainly, it seems quite as reasonable to assert that the difference between a living germ and one incapable of development is that one has "vital force" and the other has not, the difference being the same as that which yawns between the living and the non-living, between the crystal and the moneron. It certainly seems like a misapprehension of the term "Life" to talk about the life of a piece of quartz. It tends to inextricable confusion. To appearances, one might as well talk about the ponderability of moonshine, or the materiality of a shadow, or the contents of a perfect vacuum, or the conscience of an ideal megalosaurus.

2. The assertion that life is a mode of motion rests exclusively on repeated reiteration. Of evidence there is absolutely none. We are not bound to accept unsupported hypotheses. If evidence existed it would no doubt have been presented long since.

3. Matter may be subjected to any and every known mode of motion, that is, to any and every physical force, and still be destitute of life. There is electricity, magnetism, heat, light, and even motion (the movement of still living bioplasts) in the corpse. The non-living may be subjected to the influence of electricity, of magnetism, of light, of heat, still it cannot be made to leap into the kingdom of life. If life is a mode of motion, either one of the ordinary modes of motion, or a mode of motion allied to the ordinary physical forces, and intercon-

vertible with them, then it ought to be possible to revitalize the corpse. Let it be done, and argument ends. If we are to be told that life is an undiscovered mode of motion, then we are disposed to wonder whether we need trouble ourselves over the guesses which find their way into scientific treatises.

4. Since, as we have been told for twenty years, motion is indestructible and convertible, science ought to be able to tell us what becomes of this particular mode of motion when the organism dies. Into what is it converted? It must be converted into some other mode of motion, for every mode of motion is indestructible, only disappearing in one form to appear in another. Into what is it transmuted? Those who are able to trace a physical force—every mode of motion—through the transmutations it is capable of undergoing, and to present us its exact equivalent in each of the new modes which it can assume, ought to be able to tell us into what this life-mode of motion is converted. What is the equivalent, for instance, of self-consciousness? How much light, heat, electricity, magnetism, or chemical affinity does it represent? What is the mechanical equivalent, in light, for example, of anger? What is the equivalent, say in heat, of the concentration requisite to solve an intricate mathematical problem? What is the equivalent, in electricity, of my intense affection for an absent daughter? Would it be equal to the transmission of a telegram under Atlantic's heaving billows? What is the equivalent, in magnetism, of the resolute determination to be rich, honestly if I can, but rich? Would it be adequate to the production of such attractions and repulsions as to render my "mode of motion" the plaything of two contending principles, right and wrong? If, however, as Dr. Bence Jones asserts, "Death is the stoppage of the conversion of latent force into active force, then we ask, Does the magnet die? Does the corpse never decompose?"

5. All the motion of the non-living universe has not produced a trilobite from inorganic matter. Spontaneous generation has become bankrupt in reputation, not for lack of admirers, but because it has never produced even one little moneron. Life is from pre-existing life, not from some mode of motion. Nor has any chemist succeeded in originating life in the laboratory, which apparently he ought to have done, if life is a mode of motion.

CRANBURY, N. J.

CHOICE AND VOLITION RE-EXAMINED.

BY J. W. ROSE, M. D.

MR. EDITOR.—I see in your magazine frequent allusions to the foreknowledge of God in connection with the transgression of our first parents, the propriety of which I am disposed to question.

I hold that Adam never fell; he transgressed, as all beings of his necessary endowments would have done; and these endowments, or characteristics, were necessary to a being who was destined to take dominion over the earth, with all her vast products of animate and inanimate nature.

Seeing, feeling, hearing, tasting, and smelling, are common to all the higher classes of animate nature, hence, necessary in man for his own comfort and safety.

Then his moral attributes were equally necessary, as without the principle of love there would have been no human attachments; without a gregarious principle there would have been no society; without self-esteem there would have been no elevation of thought; without ambition there could have been no excellence; and without reverence there could have been no worship or adoration of the Great Creator. And so it was equally necessary to furnish him with other endowments which I hardly know whether to call mental or physical. These: acquisitiveness, inquisitiveness, combativeness, anger, hatred; without the first of these he would have been lazy, indolent and incapacitated for active pursuits; without the second, his acquisitiveness would be paralyzed and of no use; without the third he could never have subdued the ferocity of all his surroundings, he would have been an imbecile in a world of activity; without the passion of anger, the third would have lacked its stimulants and lain inactive; and without the principle of hatred he could not have made a choice and turned with disgust from the unsavory.

Thus we see that Adam must have been a man in organization, mentally, morally and physically, such as we now see man, and was thus made by the Most High, and this too, of necessity, as he could not have withheld any one of the above attributes and adhered to his first design.

Now Adam was placed in the garden in a perfect state of innocence, surrounded by all the gifts his wants demanded; but was he a righteous man? He was not; no man can be righteous without the resistance of temptation. An infant is innocent, but not righteous. My neighbor's horse strays, he searches for him until all resource is exhausted, then gives him up as permanently lost; all this time I remain innocent of offense in this case; but now I take a journey, and after traveling sixty or a hundred miles I come across the animal in question, quietly feeding on the commons. I know him to be my neighbor's horse; I know he is given up, and I am left at liberty to appropriate him to my own use, or return him to his rightful owner. Here is an election to be made: here on the one hand stands acquisitiveness, and justice on the other; both eloquent in their pleadings. I yield to the one or the other as the case may be. If I yield to the first, of course I become condemned; if to the last, I stand forth as a righteous man in so far as this act is concerned, but all the while exercising prevarication, as a free agent, in the premises; and so it is in the transaction of all the concerns of life, and so it will and must be, so long as man is possessed of the various attributes of character he now possesses and ever has possessed; and so it was with our foreparents: they were placed in the garden, innocent but not righteous, and to make them righteous it was necessary to give them a chance of choice, by which they might demonstrate their true nature; which they did just as you or I would have done under similar circumstances. Though you may be placed by some great potentate in possession of comfort, every luxury of life, under the restriction of being compelled to dine once a day in a room by yourself, surrounded with all the viands your palate could suggest, of which you could partake freely with the exception of one plate turned bottom side up about the center of the table which you were not to touch;

would you undertake the job? You might; but how long would you prove yourself faithful? Three weeks? I doubt it; and so it was with our foreparent, endowed with a free will to do as he pleased, for this he must have had, or he would have been no man in a proper acceptance of the term, and God did not say he should not, but pronounced the punishment in case he did. Did God know that he would do the deed? He certainly did, and he knew, moreover, that were the tree not placed there he would necessarily, from his very composition of mind, violate the first or some other injunction issued, unless prevented by divine interference, which was not in the divine plan, for God did not from the beginning intend to make a machine, but an intellectual being of choice. Besides it was right; it was in accordance with the plan of redemption. Adam had to transgress, and thus become an alien to God, before he could have any chance for repentance toward God; and thus become an heir to Heaven; the only destiny of the good, from the beginning; but which could be entered through a perfect acknowledgment of allegiance to the Most High God, which could only be assured by an abiding knowledge of past transgressions, followed by remorse and repentance.

Thus we see that our foreparents were of necessity characterized by all the attributes now belonging to man, and to fill his destiny it was necessary for God to have made him so, and these very attributes would necessarily lead him to transgression, and disqualify him for the resistance of temptation, and furthermore, that God is not the author of sin, as contended by some; as according to all human reasoning, he could not have taken from him a single endowment or faculty, and left him a being able to work out even his physical destiny (God as he was).

SPRING HILL, Mo.

MASTODON REMAINS IN HARRISON COUNTY, IOWA.

BY CHARLES W. LAMB.

I have a large piece of the leg bone of some monstrous animal of past ages—probably a mastodon; not petrified, but heavily coated in places with a deposit of lime, and not so old but that it still retains the smell of old bone. It was found one mile east of Magnolia, Harrison Co., Iowa, by men who were working the road, and who seem to have decided without a dissenting voice that it was a *petrified stump*!—the thought never occurred to them that a bone could be so large. It was therefore broken up, and several took pieces, as it might make good whetstones, it seeming to have a fine, smooth grain; and one piece afterward was given to a barber of Council Bluffs, I believe, to make a *hone* of. None seem to have entertained a thought of its being bone until I saw the piece I now have, which had got into the hands of a blacksmith.

Only the other day, while looking along a spring branch two miles south-west of Magnolia for mound-builders' pottery, where many broken, variously ornamented specimens are found after washing rains, I picked up a large petrified tooth, which I believe to be that of a mastodon. It measures four inches and one-eighth in circumference near the base where it entered the jaw-bone, and is two inches and one-half long, all of which stood out above the

jaw-bone. The root of the tooth is gone. The tooth tapers on the sides, or on one side, from the base, so that the top of it, which ends in two pair of very prominent flattish conical projections, is not so thick through as the base. Is it the tooth of a mastodon, or of some monstrous flesh-eating animal?

MAN A CONTEMPORARY WITH THE AMERICAN ELEPHANT.

Perhaps those who are of the opinion that man dwelt here in ancient times contemporaneously with some species of the extinct American elephant, may see in the close proximity and association of the remains of these huge mammals with the pottery of the ancient Americans, some evidence favoring their theory.

In fact, the huge elephant mound in Grant County, Wisconsin, which must have been made by a people familiar with elephants; and the engravings of elephants on tablets found in mounds; and the recent discovery in the quarry at Carson, Nevada, of human and elephant foot-marks, *one human foot-mark being obliterated by the subsequent passage of an elephant*, the foot-mark of the latter showing up beautifully, would seem to be evidence sufficient to establish the fact beyond a doubt, that man and some species of American elephant dwelt in ancient America together.

Prof. G. Frederick Wright conjectures that the so-called human footprints at Carson, Nevada, were those of a bear, made long by lapping of the tracks of the hind feet into those of the fore feet. He thinks some such supposition necessary to account for the large size of the tracks—nineteen inches in length, six inches across the broadest part of the heel, and seven inches at the base of the toes. He forgets that there were giants in those days, as is proven by the giant skeletons exhumed from mounds in various parts of America. And then, Mr. Wright's conclusions do not at all tally with the description of these tracks, by those who carefully examined them, which description shows that "these impressions clearly indicate rights and lefts, and deviate to either side from a straight line about as much as the ordinary step of a man. * * The hollow under the instep is remarkably prominent, and characteristic of the human foot, as is also the curvature around the toes. The impression is exactly like that of an Indian moccasin pressed into shallow mud. No separate impressions of toes are visible, from the fact that the whole interior of the impression clearly appears as if a sandal had been worn. The sharp line corresponding to the cut edge of a piece of hide is visible everywhere."

Perhaps instead of a mere sandal, a rawhide shoe, with a sole on it, was worn. This would account for other things noticed. The reporter to the New York Weekly Herald of Nov. 18, 1892, further says:

"I was shown by Prof. Harkness, of San Francisco, the tracing of the sole of a shoe, worn by a Sonoran, which measures exactly eighteen and a half inches, just half an inch less than the fossil footprints."

He further says of the fossil footprints:

"The straddle or distance between rights and lefts varies from almost nothing to sixteen inches. Neither of the above measurements is remarkable when we consider the proportions

of the individual, as indicated by the size of the feet."

Besides all this evidence that they are human footmarks, is it not more than probable that, if they were those of an animal, the *lap* of the hind upon the fore-feet tracks would show somewhere, in so many tracks—over one hundred?

MAGNOLIA, Iowa.

A HINT FROM CAPT. CARTER.

DEAR DOCTOR HALL:

A letter from a friend calls up a suggestive point. He says:

"I have often thought that sound did not move at all. That it is where the mind locates it. . . . If this be true, then what we now call the motion or velocity of sound would mean only the current extending from object to subject, and constituting simply the means or condition through which we obtain a knowledge of sound. This theory could not be maintained, however, if you in Chester could hear a sound created there no longer than I could hear it here, for the simple reason that the current would leave you first and arrive at me afterward; and if I could hear *after* it left you, it would prove that there is sound in the current, or pulse, itself."

Of course the latter statement is set at rest by numerous observed facts. A man striking sharp strokes with a hammer, when observed from a distance, is seen to strike twice before the first sound reaches the listener. Of course the sharp click of the first stroke has entirely faded from the hammerer's consciousness or hearing before the second is made. This, therefore, shows that a sound made at one point starts in all directions from the center of agitation and proceeds outward. This sound may occupy several seconds in reaching a distant point: but, if it be a sudden stroke, or report, it will be entirely inaudible at the center long before it is plainly heard on the circumference. Imagine a man upon an open plain, surrounded by a circle of listeners five miles distant. His hand operates at will the throttle of a steam siren, and he so moves it as to allow short blasts to issue at intervals. Suppose a blast of one second duration. Manifestly the circle of listeners will hear nothing whatever for twenty-four full seconds (allowing 1100 feet to the second). This is nearly one half minute. Now it is certain that after one or two seconds the operator will hear absolutely nothing, if there be no reflecting surface anywhere to produce an echo. We are then confronted by the fact that sound is actually traveling five miles in every direction from the producing cause, inaudible to a listener at the center.

Ever yours, R. KELSO CARTER.

FREE WILL AND NECESSITY.

BY RICHARD LIVSEY, ESQ.

After so many great minds, on so many occasions, have tried to settle on a basis not to be overturned the question as to whether man is actuated by voluntary choice or is pushed on by human necessity, it may be presumptuous in me to attempt the task. Much may be and has been said very cleverly on both sides, and were it not that I wish to look at the matter from still another point I wouldn't have now

troubled you. Man clearly has not absolute free will, for he can't control his location of birth, early associates, circumstances, and education, and these being forced upon him may almost control his after-life into good or evil courses, accordingly as the first involuntary conditions were good or evil. Still no life is so utterly depraved that its mind has not at frequent intervals some glimmer of good and bad, and a debate within itself as to which line of conduct it will pursue. From advanced youth to ripe old age the mind sees, judges, and chooses without the slightest suspicion that it is not exercising untrammelled volition, and it only becomes aware of its bondage when sophistry pounces upon it. If man be only a creature controlled by necessity, he is a mere machine and not rightly punishable for doing what he is obliged to do whether willing or not.

In order to deliver itself from the bondage of will, one party assumes that God did not know when he created man that sin would follow. Hence on the assumption of Divine ignorance this party will admit that as God did not decree, man could choose for himself. The other party contends that God's foreknowledge does not detract from the freedom of the will, and I think its contention is quite justifiable. If man's free will be perfect on the assumption of Divine ignorance, how can it be otherwise supposed God knew of the sin to be committed? Man's choice or necessity is not one whit different whichever assumption we make, for we can only determine the probability of either by a system of logic.

Now the first-named party seeks to avoid charging God with making sinful man by way of confessing Divine ignorance, while the second party owns to God's foreknowledge, but lays all the blame for sin upon man.

My purpose is to admit both God's foreknowledge and Man's free agency, and further, that God arranged that man *should sin* as a matter of absolute necessity for perfecting human nature. Without sin man would not have risen above the brute. 'Tis sin which makes virtue the more glorious. Without sin humanity would be on a level plain of inert virtue without the conscious bliss which struggling with vice gives. It is sin which makes our patriots and philanthropists. The direct suffering and the greatest evils give humanitarianism and beneficence their widest scope of action. The battles of life give the main strength to humanity, and without them the physical constitution would fade away and the intellect become a wreck. It is necessary that we should have sin and evil bodily among us, for though we may form a theoretic idea of the badness of these things, theory won't do as a substitute at all. All the great and famous men of the earth are they who have become so by their warfare and victories with sin, evil, suffering, and difficulty. We can no more know virtue without vice than a shadow without light, a valley without hills, and *up* without *down*. Health can only be fully appreciated and enjoyed when the mind has an experimental knowledge of the pain and inconvenience of disease. The difficulties of daily life are needful to invigorate the body and strengthen the mind; pain gives the greatest zest to health, and had human nature no dark side it could have no bright, for nearly all things are known and valued *per contra*.

It may be said that God would be cruel to create man with the intention for him to sin,

and then to punish him for sinning. So it would, but it is not at all likely that such a sinner will, after this life, be subjected to that penalty. Future punishments, if they be indicted for deeds done in this life, will probably be apportioned in the ratio of the knowledge and opportunities to do right at the time when the sins were committed.

One party would limit God's omnipotence, while the other claims for him all that the term implies. It is not my belief that God had not a plan of creation, which he could fully see the effect of when he arranged the Universe. Still there are certain things which even he can't do. Truth can't be made a lie, nor a lie truth. The two ends of a straight rod can't be made to join, nor two parallel lines to run together. There are numerous things which we can easily see are impossible to be done by even God himself, and it is extremely probable that the noblest form of human destiny could not be attained without sin being an important factor in producing it.

It may be said that God acts unfairly by making one man to be the sinner, while another is made to practice virtue. Even sin has its carnal compensations, and the sinner with the remoter rewards of virtue before his eyes will every time choose the immediate indulgence of vice as being more in accordance with his ideas of enjoyment. It is highly probable that every sentient being is designed for enjoyment of a certain kind suited to its organism, and it is in the contemplation and repugnance of these carnal and groveling modes of seeking pleasure that the intellectual and virtuously minded of the human family rise to their loftiest destiny.

WYMORE, Neb.

A TELLING INDORSEMENT FROM CAPT. CARTER.

PA. MIL. ACAD., Chester, May 18, 1885.

DEAR DR. HALL,—I have just read in the May MICROCOSM your article, "The Substantial Philosophy Various Applied," in answer to the query propounded in my letter. Let me say with deliberation that there is more solidly original thought in those fourteen columns of THE MICROCOSM than I have ever found in any entire work on science in my lifetime. The mere statement that upon the force of cohesion depends the materiality of the universe, does not seem especially new or particularly startling; but in reading the article in question, the marvelous reach of that proposition begins to dawn upon the mind; and, by the time it is finished, one is ready to take a new view of the theory, advanced in the "Problem of Human Life," that God framed the material universe by condensing a portion of His own infinite, but immaterial essence.

The puzzling scientific problems taken up, and so easily handled, may still be said to be unsolved, in the sense of arriving at the *ultimate* cause, the precise how and why; but you have certainly given an extremely plausible suggestion, which thrusts the outermost veil aside, and leads us a long step further into truth.

When you say in conclusion, "Let it therefore be remembered by every young student, that the invisible—the intangible, the immaterial—is the real in nature," you tread upon lofty ground, and express a great fact that is rapidly coming into active relation with correct views of the Creator and his work. It is a perception of this princi-

ple or fact, that has brought about the writing of such books as Henry Drummond's "Natural Law in the Spirit World," and which is the nucleus round which crystallizes the personal realization of the marvelous and sublimely mysterious truth uttered by the Son of God, when he said, "I am the living bread which came down from heaven; if any man eat of this bread he shall live forever." And again, "As the living Father hath sent me, and I live by the Father; so he that eateth me, even he shall live by me." The great reality of the immaterial is what makes a man a man. The vegetable and animal kingdoms exist almost wholly in the material; but man, with his soul and his reason, soars above the coarse outward universe, and finds another—the immaterial realm—in which no substantial cohesion holds him down to one small orb; but where, on fancy's pinions, he can soar at will above the clouds and beyond the flying worlds. His conversation and his thought unquestionably form the greater portion of his existence. But both these are essentially immaterial. True, the conversation and thought may be committed to material paper and ink; but they both lie dead until the immaterial consciousness of a reader grasps the inert words, neutralizes cohesion, and transforms them into the immaterial again.

Now, if it be so self-evident that nine-tenths of man's life on earth lies in the immaterial, surely we are not stepping very far when we conceive that when death dissolves the cohesion of this material body and soul, the immaterial part—the soul—may simply find itself in its own element, free to move without restraint, impelled by those wonderful forces of thought which made themselves so marvelously manifest in spite of the material environment of the earthly state. Well! may we ponder upon the words of the inspired penman, "For the things which are seen are temporal; but the things which are not seen are eternal." Could the apostle have more plainly declared that "the immaterial is the real"?

Ever yours, R. KELSO CARTER.

EXAMINATION OF THE PRESENT THEORY OF FORCE AND ENERGY.—No. 3.

BY HENRY A. MOTT, PH. D., F. C. S.

In my first and second papers the various theories of Heat, Light, Electricity, and Magnetism were clearly set forth—in the present paper we will consider such facts relating to Gravitation as will be necessary to bear in mind when the scientific value of the various theories of Force and Energy are submitted to a careful analysis.

We are quite familiar with the effects of Gravitation; "but," says Daniel,* we "cannot yet say that we know what the force of gravitation is."

The law of universal attraction was the first generalization of modern science. In its most complete form it may be stated as follows:†

"Between every two material particles in the universe there is a stress, of the nature of an attraction, which varies directly as the product of the masses of the particles, and inversely as the square of the distance between them."

* Prin. of Phys. Alf. Daniel, p. 17—1884.

† El. Text Book on Phys. Anthony and Brackett, p. 69, vol. 1.

A good illustration of the attraction of a large for a small mass of matter is seen in the fact that a plumb-line in the neighborhood of large mountain masses does not hang perfectly vertical, the "bob" being attracted toward the mountain, as was clearly shown by experiments made near Schehallion,* an isolated mountain in Scotland.

If a stone be raised above the surface of the earth, it will be attracted by the earth and the earth will be attracted by the stone; if now the hold on the stone be released, both the stone and earth will be pulled toward each other until the stone, being the smaller body, rests on the earth's surface. The stone does not fall to the earth, or the earth to the stone, the two bodies are pulled, or attracted, to one another. A piece of iron does not fall up to, or down to, a magnet, as the case may be—the fact is, it is pulled, or attracted, to the magnet.

"The earth," says Daniel,† "and the stone together constitute a system; when this is deformed by pulling the stone away from the earth, the system tends to return to its original form, and there is a stress between the earth and the stone, which continues until the stone is allowed to fall back to the earth. If the stone had been connected with the earth by a band of india-rubber, we would have seen the india-rubber to be stretched or under stress, and would easily see that if the stone were liberated, it would be pulled back toward the earth; but the question is, what is under stress in the actual case? for there is no visible connecting cord between the stone and the earth. If we could state what this was, we should be able to arrive at the cause of gravitation. As it is, our knowledge ceases. That there is some medium, and that it may be under stress, is a theory necessary for the exposition of Electricity, of Light, of Magnetism, and of Heat, but we are as yet not entitled to say that stress in this medium is the cause of gravitation."

By allowing a body to fall freely in *vacuo*, by determining its rate of acceleration, a direct measure of the earth's attraction, or of the force of gravity, is obtained.

It is found that a body so falling, at latitude 40 degrees, will describe in one second about 16.08 feet or 490 centimeters.‡ Its acceleration is therefore 32.16 in feet and seconds, or 980 in centimeters and seconds.

A body falling freely from rest will, in a given number of seconds, move over a distance which is found by multiplying the square of the number of seconds by 16.08, and the body moves over spaces proportional to the consecutive odd numbers (1, 3, 5, 7, etc.), in each of the consecutive seconds during which the motion lasts.

Taking the force of gravity at the earth's surface as 32, on the surface of Jupiter it is represented as 78, which means that in one second a body allowed freely to fall would attain a velocity of 78 feet in one second. Bodies weighing one pound on the surface of the earth would weigh on the surface of Jupiter, 2 1-2 pounds, and since the sun weighs 330,000 times as much as the earth, a body weighing a pound on the earth's surface would weigh 27.71 pounds on the surface of the sun.§

The density of the earth has been calculated as follows:—

* See Energy in Nature. Carpenter, p. 22.

† Prin. of Phys., p. 37.

‡ See Anthony and Brackett, p. 72.

§ The Laws of Nature, Mott, p. 20.

Cavendish and Hutton,
from the attraction of Balls, 5.32
Reich, " " " " " 5.58
Bailey, " " " " " 5.66
Maskelyne.

from the attraction of Schehallion, 4.71
Airy,

from gravity in the Harton Colliery, 6.56

Of these different results, Newcomb and Holden say—"that of Bailey is probably the best, and the most probable mean density of the earth is about $5\frac{3}{4}$ times that of water. This is more than double the mean specific gravity of the materials which compose the surface of the earth; it follows, therefore, that the inner portions of the earth are much more dense than its outer portions.*

"Assuming," says Barker,† "the density of the earth to be 5.5, its weight would be 6,500,000,000,000,000,000 tons, and its impact (according to certain formula) would be 1.025,000,000,000,000,000,000,000,000 foot-tons."

"The popular notion," says Arnott,‡ "that a heavy body falls quicker than a light one is confuted by the fact that the time of vibration of a pendulum is unaffected by the weight or material of which it is composed. Equal pendulums of lead, or ivory, or glass, or wood, or iron, are all alike in this respect; and a hollow ball vibrates at the same rate, whatever be the nature of its contents, whether air or water or mercury." And according to Ball§ experiments have established "the very important result that the time occupied by a body in falling to the surface of the earth if dropped from a point above it, is independent of the mass of the body as well as of the materials of which the body is composed." For two masses of lead placed at a certain distance are attracted by the same force, as two equal masses of iron would be when separated at the same distance. "The attraction of gravitation is therefore," says Ball,|| "a very different force from that kind of attraction called magnetic attraction, where the character of the masses is of the utmost importance."

If the earth were a perfect sphere and did not rotate on its axis, the intensity of gravity would be the same over its entire surface and the acceleration of gravity would be increased 3.3908 cm. per second, and the weight would be increased in the ratio of 288 to 289. There is a slight variation from two causes, namely—(1) The elliptical form of our globe, and (2) the centrifugal force generated by its rotation—in fact, if the earth rotated 17 times as fast as it does loose objects would, at the equator, fly off its surface.

Strictly speaking, the last-mentioned cause (2) is not a change in the real force of gravity or of the earth's attraction, but only an apparent force of another kind acting in opposition to gravity.¶ For the reason that the intensity of gravity changes from place to place, while the mass does not change, our standard "weights" which are used in our balances, are really standard masses.**

A pound of tea in Canton, when carried to Newfoundland, weighs more than a pound;

* Astronomy, Newcomb and Holden, p. 194.

† Correlation of Vital and Phys. Forces, Barker, p. 67.

‡ El. of Phys., Arnott.

§ Ency. Brit., Article, Gravitation.

|| El. of Astronomy, p. 311.

¶ See Astronomy, Newcomb and Holden, p. 202.

** See Nat. Phil. (Deschanel), Everett, p. 106—1883.

but if in Newfoundland we balance it against the same weights used at Canton, it will still balance a pound weight. The force of attraction between the particles of the tea and the earth, and the particles of the standard weights and the earth, is less at Canton than in Newfoundland; yet the amount of matter in the volumes of the two substances remains the same.*

"A pound mass standing on the surface of the earth would (if the earth were a sphere of radius 4000 miles) require the expenditure of 21,120,000 foot-pounds of work, and no more, to remove it to an infinite distance, this force being exerted *against* the gravitation; and, therefore, any point on the surface of the earth, thus assumed to be spherical, would be at a negative potential of 21,120,000, while the potential of any point at an infinitely great distance would be zero. By a special exception, however, the potential of a point at the surface of the earth is considered to be zero, and a body lying on the earth has no potential energy; while a pound mass removed to an indefinite distance could have no more than 21,120,000 foot-pounds of potential energy stored up in it; and the gravitation-potential of a point at an infinite distance is + 21,120,000 in British or foot-pound-second units."†

If a shot were fired horizontally *in vacuo*, at the rate of about 26.077 feet‡ per second, it would never fall to the ground, but would travel around the earth at the level of the gun's mouth. The reason for this is simple, and is because the projectile force which would tend to send the bullet off on a tangent utilizes all the attraction of gravitation exercised by the earth on the bullet, so that all the latter can possibly do is to divert the course of the bullet and require it to encircle the earth, not being able to exercise sufficient attractive force to bring the bullet to the earth.

"There is another property," says Arnott,§ "which constantly and inseparably accompanies matter, and which we are equally powerless to control. This is the power of *attraction* or *gravitation*, according to which all matter draws, and is drawn by all other matter. . . . Of the nature of the invisible cords by which this attraction, or pulling, takes place, we are as yet ignorant, though we know the laws or mode according to which it operates." . . .

In a paper|| on the relation of the law of gravitation to the principle of the conservation of energy, Rev. George P. Young, of Toronto, proposes to show that if this principle be accepted, it must follow that the force of gravitation, which, at ordinary sensible distances, is one of attraction, must at a certain limit necessarily undergo a transformation into a force of repulsion. He concludes, moreover, that there is a higher law than that of conservation of energy, which law is expressed by him in certain mathematical formulas, from which he deduces both the law of gravitation at ordinary limits and the law of repulsion within certain limits.

The Duke of Argyll¶ says in respect to gravitation, "Although we have an idea of the *measure*, we have no idea of the *method*, of its operation. We know with precision the *nu-*

* See New Physics, Trowbridge, p. 14.

† See Prin. of Phys., Al. Daniel, p. 171.

‡ See Daniel, p. 181.

§ El. of Phys., Arnott, p. 7.

|| Canadian Jour. of Science, xiv., 589.

¶ The Unity of Nature, p. 10.

merical rules which it obeys, but we know nothing whatever of the way in which its work is done." Speaking of the human organism, he says every part "is fitted to conditions which would all be destroyed in a moment if the forces of gravitation were to change or fail. It is, indeed, evident that a force such as this must govern the whole order of things in which it exists at all. Every other force must work, or be worked, in subordination to it."

"The force of gravitation seems to be all-pervading,* and to be either an inherent power or property in every kind, or almost every kind, of matter, or else to be the result of some kind of energy which is universal and unquenchable." The Duke of Argyll says in a note, "So far as known the luminiferous medium is not ponderable. But, on the other hand, it is, not improbably, concerned in gravitation as a cause." He further says, speaking of gravitation, "The sense of weight in ourselves and the universality of its effects on the things around us, make it so familiar that we are apt to regard it as a thing of course, and as needing no explanation whatever, and yet the physical causes of gravitation are absolutely unknown. Why and how it is that the particles of matter are drawn or impelled toward each other, in direct proportion to each other's mass, and in a definite inverse proportion to the distance from each other, is quite inexplicable in the present state of our knowledge. Attraction is almost certainly not what it appears to us to be. 'Action at a distance' is not really conceivable; so that when two distant bodies seem to exert any influence on each other, the effect must be really due to some intervening medium by which they are pushed or pulled."

Tait† says, "Why two masses of matter possess potential energy when separated—in virtue of which they are conveniently said to attract one another—is still one of the most obscure problems in physics. I have not now time to enter on a discussion of the very ingenious idea of the Ultramundane Corpuscles, the outcome of the lifework of Lesage, and the only even apparently hopeful attempt which has yet been made to explain the mechanism of gravitation. The most singular thing about it is that, if it be true, it will probably lead us to regard all kinds of energy as ultimately kinetic."

Tait‡ speaking of vortex-atoms says: "In general, vortex-atoms if they be at a moderate distance from one another, will not exhibit in their behavior to one another anything of the nature of gravitation. That result at all events we can derive by our modern improvements of mathematics. How, then, is gravitation to be accounted for on this theory? The theory of vortex-atoms, being as it were complete in itself, must be rejected at once if it can be shown to be incapable of explaining this grand law of nature, which tells us that every particle or atom in the universe attracts every other with a force proportional to their masses conjointly, and to the square of their distances inversely. Now the only even plausible explanation of gravity which has been propounded was given long ago (at the beginning of the century) by Lesage of Geneva. He showed that gravitation can in all cases be accounted for by the

not improbable supposition that, in addition to the gross particles of matter—I should, perhaps, rather say the particles of gross matter; but, as you will see, the term gross particles of matter also comes in as specially applicable to the hypothesis we are dealing with:—in addition to these grosser particles, which are the atoms of tangible or sensible matter, infinite as these are in number, there is an infinitely greater number of much smaller ones darting about in all directions with enormously great velocities. Lesage showed that, if this were the case, the effects of their impacts upon the grosser particles or atoms of matter would be to make each two of these behave as if they attracted one another with a force following exactly the law of gravity. In fact, when two such particles are placed at a distance from one another, each, as it were, screens the other from a part of the shower which would otherwise batter upon it. If you had a single lone particle, it would be equally battered on all sides, but when you bring in a second particle, it, as it were, screens the first to a certain extent, in the line joining the two; and the first in turn screens the second, so that, on the whole, each of these two is battered more on the side opposite to the other one than it is on the side next the other one; and, therefore, on the whole, there is a tendency to bring the two together by the excess of battering outside over that inside. Now, it is a very easy mathematical deduction to show that the result of this is equivalent to an attraction, inversely as the square of the distance; and therefore, that it exactly agrees with the law of gravity. But it is necessary also to suppose that masses of matter have a cage-like form, so that enormously more corpuscles pass through them than impinge upon them; else the gravitation action between two bodies would not be as the product of their masses. This supplementary hypothesis requires, from Thompson's theory, an explanation of the supply of energy to these smaller particles; which must, of course, be smaller vortices. "This has, as yet, not been fully given, though certain advances have been made. With a little further development the theory may perhaps be said to have passed its first trials at all events, and, being admitted as a possibility, left to time and the mathematician to settle whether, really, it will account for everything already experimentally found. If it does so, and if it, in addition, enables us to predict other phenomena, which, in their turn, shall be found to be experimentally verified, it will have secured all the possible claim on our belief that any physical theory can ever have."

Prof. Clerk Maxwell,* in his article on "Attraction," says:

"The configuration of a material system can always be defined in terms of the mutual distances of the parts of the system. Any change of configuration must alter one or more of these distances. . . . The study of the mutual action between the parts of a material system has in modern times been greatly simplified by the introduction of the idea of the energy of the system. The energy of the system is measured by the amount of work which it can do in overcoming external resistances. It depends on the present configuration and motion of the system, and not on the manner in which the system has acquired that configuration and motion. A complete knowledge of

* Unity of Nature, p. 135.

† Ibid., p. 210.

‡ Recent Adv. in Phys. Sci. P. G. Tait, 3d ed., p. 228.

§ Ibid., p. 303.

* Ency. Brit., Article, Attraction, vol. lii.

the manner in which the energy of the system depends on its configuration and motion is sufficient to determine all the forces acting between the parts of the system. For instance, if the system consists of two bodies, and if the energy depends on the distance between them, then if the energy increases when the distance increases, there must be attraction between the bodies, and if the energy diminishes when the distance increases, there must be repulsion between them. In the case of two gravitating masses m and m' at a distance r , the part of the energy which depends on r is $-\frac{mm'}{r}$. We may therefore express the fact that there is attraction between the two bodies by saying that the energy of the system consisting of the two bodies increases when their distance increases. The question, therefore, Why do the two bodies attract each other? may be expressed in a different form—Why does the energy of the system increase when the distance increases?

The force of gravitation is inversely as the square of the distance, but it differs from the electric and magnetic forces in this respect, that the bodies between which it acts cannot be divided into two opposite kinds, one positive and the other negative, but are in respect of gravitation all of the same kind, and that the force between them is in every case attractive. To account for such a force by means of stress in an intervening medium, on the plan adopted for electric and magnetic forces, we must assume a stress of an opposite kind. . . . We must suppose that there is a pressure in the direction of the lines of force, combined with a tension in all directions at right angles to the lines of force. Such a state of stress would, no doubt, account for the observed effects of gravitation. We have not, however, been able hitherto to imagine any physical cause for such a state of stress. It is easy to calculate the amount of this stress which would be required to account for the actual effects of gravity at the surface of the earth. It would require a pressure of 87,000 tons' weight on the square inch in a vertical direction, combined with a tension of the same numerical value in all horizontal directions. The state of stress, therefore, which we must suppose to exist in the invisible medium, is 8000 times greater than that which the strongest steel could support."

Sir William Thomson* has shown that if we suppose all space filled with a uniform incompressible fluid, and if we further suppose either that material bodies are always generating and emitting this fluid at a constant rate, the fluid flowing off to infinity, or that material bodies are always absorbing and annihilating the fluid, the deficiency flowing in from infinite space, then, in either of these cases, there would be attraction between any two bodies inversely as the square of the distance. If, however, one of the bodies were a generator of the fluid and the other an absorber of it, the bodies would repel each other.

"Here, then," says Clerk Maxwell, "we have a hydrodynamical illustration of action at a distance, which is so far promising that it shows how bodies of the same kind may attract each other. But the conception of a fluid constantly flowing out of a body without any supply from without, or flowing into it without any way of escape, is so contradictory to all our experience, that an hypothesis, of which it is an essential

part, cannot be called an *explanation* of the phenomena of gravitation."

Dr. Robert Hooke, in 1671, endeavored to trace the cause of gravitation to waves propagated in a medium. He found that bodies floating on water agitated by waves were drawn toward the center of agitation.* He does not appear, however, to have followed up this observation in such a way as to determine completely the action of waves on an immersed body.

Prof. Challis has investigated the mathematical theory of the effect of waves of condensation and rarefaction in an elastic fluid on bodies immersed in the fluid. He found the difficulties of the investigation to be so great that he has not been able to arrive at numerical results. He concludes, however, that the effect of such waves would be to attract the body toward the center of agitation, or to repel it from that center, according as the wave's length is very large or very small compared with the dimensions of the body. Practical illustrations of the effect of such waves have been given by Guyot, Schellbach, Guthrie and Thomson.†

A tuning-fork is set in vibration, and brought near a delicately suspended light body. The body is immediately attracted toward the tuning-fork. If the tuning-fork is itself suspended, it is seen to be attracted toward any body placed near it.

Sir W. Thomson has shown that this action can in all cases be explained by the general principle that in fluid motion the average pressure is least where the average energy of motion is greatest. Now, the wave-motion is greatest nearest the tuning-fork, the pressure is therefore least there, and the suspended body being pressed unequally on opposite sides, moves from the side of greater pressure to the side of less pressure, that is, toward the tuning-fork. He has also succeeded in producing repulsion in the case of a small body lighter than the surrounding medium.

"It is remarkable," says Maxwell, "that of the three hypotheses, which go some way toward a physical explanation of gravitation, every one involves a constant expenditure of work. Le Sage's hypothesis of ultramundane corpuscles does so. . . . That of the generation or absorption of fluid requires, not only constant expenditure of work in emitting fluid under pressure, but actual creation and destruction of matter. That of waves requires some agent in a remote part of the universe capable of generating the waves.

"According to such hypotheses we must regard the processes of nature not as illustrations of the great principle of the conservation of energy, but as instances in which, by a nice adjustment of powerful agencies not subject to this principle, an apparent conservation of energy is maintained. Hence, we are forced to conclude that the explanation of the cause of gravitation is not to be found in any of these hypotheses."

A REVIEW OF THE DISCUSSION ON SOUND.

BY REV. J. I. SWANDER, A. M.

It is our purpose in this paper to attempt a retrospective view of the sound controversy. Men who have already reached the end of scientific perfection may look upon a continua-

* Posthumous Works, edited by R. Waller, pp. 217 and 184.

† Phil. Mag., June, 1871.

* Proc. Roy. Soc. of Edinburgh, 7th Feb., 1870.

tion of this discussion as a waste of words; and stupid intellects will wonder why the pages of *THE MICROCOSM* are not devoted entirely to questions more simple of solution, and filled with those articles of pulpiness and gush so eagerly sought after and devoured by the indolent hordes of sickly sentimentalists. The credulous stupidity of the average reader is more alarming than wonderful. It is evidence of an effeminate tendency when the popular mind, so inflated with the sweetened wind of fallacy and fiction, has no longer any considerable relish for those facts in science which can be ascertained only through the process of laborious mental effort. When truth is hard to find error is a convenient substitute. Thus eminence is made easy, and some men become pre-eminent fools. In science, as in religion, those tenets which offer an easy explanation should be looked upon with suspicion. The shallows murmur with fallacious jargon, while the silent deeps are filled with stores of knowledge for those who take to their intellectual diving-bells and leap after the hidden wealth which is never found floating upon the surface. It is because the general mind has been educated to take a surface view and make a mere superficial search for the cause of things, that stupendous errors have come to prevail in science. The wave-theory of sound is one of those popular errors which have thus crept in, and which must be broken down in order to open the way for correct thinking in some other departments of human knowledge.

It is not expected that there will be any sudden change wrought for the better in the prevailing taste and tendency of the reading public. The pernicious habit of thoughtlessness, like some other iniquities of the fathers, is generally visited upon the children to the third and fourth generation of them who inherit hereditary wretchedness with such morbid sentiments of epidemic satisfaction. There is, however, a law in the divinely ordained constitution of things which in the fullness of God's own time asserts itself in arresting the false tendency of the popular mind, and in stimulating to arise and act upon a higher plane of reflection, inquiry and progress. It does not always act directly upon the masses, but usually makes a natural selection of some master spirit to open the gate and lead the way. God still continues to show his ways unto Moses before he makes known his acts unto the Children of Israel; and although the contemporary people may curse their Moses by all the false gods of the age, the time is sure to come when subsequent generations will read his writings in the worship of their synagogues, and engross them as the binding statutes of their commonwealth. Thus shall it be in the coming years of Scientific Emancipation. The science of Acoustics will then no longer be obliged to make brick without the straw of truth. There will be concessions to the claims of the Substantial Philosophy as important in their bearings upon the last chapters of the world's history as were those ever made to the demands of human rights in the birth of Magna Charta, at Runnymede.

The history of the Sound controversy is full of interest and edification to all who have the disposition and ability to make its acquaintance. Dr. Hall's startling treatise upon the subject, embracing 270 pages in the "Problem of Human Life," and which made its appearance before the public in 1877, was received only

with merciful toleration by many who looked upon the other portions of the book as the most masterly argument ever made against the audacious assumptions of atheistic infidelity and materialistic evolution. Even the earliest converts from the wave-theory did not at first understand why the said treatise should have been placed in the middle of the volume. The author's purpose and tactics are now becoming more manifest. The claims of materialism were to be tested at one point for every possible issue anticipated at other points along the line. Other theories were to stand or fall according to the truth or falsity of the undulatory doctrine. There was, therefore, a beautiful significance in the battle-plan by which the middle of the invincible book was made to represent the advancing center in the line of attack upon the opposing forces of the enemy. As the center began to advance, comparatively little account was made of the conflict so far as the acoustical question was concerned. Some friends thought that Wilford ought to be indulged in his supposed sham-battle chivalry on account of the valuable services he had rendered in putting Darwin, Huxley, and Haeckel to flight. Men of scholastic prejudice heard the peculiar thunder of the corpuscular artillery, but for them the intensity of the sound decreased as the square of their distance—from the truth. Thousands of learned, honest men saw the smoke of battle rising to mingle with the approving smiles of Heaven, and then passed on in ignorance of the tremendous issue that the conflict involved. Others who knew the issue and feared the consequences of a successful revolution in science cared less for the triumph of truth than for their professional position in the world's richly endowed centers of something called education.

It does not fall within the scope of our present purpose to make mention of the many learned and thinking men, both in this country and in Europe, who have publicly announced their indorsement of the new hypothesis, some of whom have not only commented favorably upon its reasonable claims to respectful consideration, but who are now also engaged in collecting and arranging substantial data for text-books, or in teaching the doctrine in its present unformulated condition. One of the weaknesses of the writer's nature, if not one of his besetting sins, is his propensity for amusement; and at this time nothing is more entertaining than to see the wave-theory hang itself by the use of its own native hemp. For this reason we dedicate this paper most affectionately to those critics who have arrayed themselves upon the undulatory side of the question. They are at present doing the cause of truth great service by sapping the sandy foundation of the old theory. This is being done by their contradictory teachings, which mutually annihilate each other, and by their constant change of position, which betrays a radical misapprehension of the fundamental principles and facts underlying the subject upon which they have so voluminously theorized.

One of the first men to sound the alarm against the new departure in acoustics was Prof. Brockett of Western Maryland College. The interesting correspondence growing out of his criticism appears in the revised editions of the "Problem," p. 386. The effort of Prof. B. was not so much of a thorough and impartial review as it was a rehash of old books, with a

charge that the founder of the corpuscular hypothesis had been guilty of jugglery. "The author," says Brockett, "uses the accurate knowledge he possesses to teach error." What a serious indictment! Wilford Hall dishonest? O fair and righteous Heaven! Is it possible that such an insinuation can be made against the man who voluntarily made himself of no reputation among the "*au fait*," that by his unselfish efforts he might convert and scientifically save a hemisphere of men who are either rascals or teachers of "error," because they have no "accurate knowledge"?

Following and in beautiful contrast with Brockett came some questions and objections from Prof. I. L. Kephart of Western College, Iowa, now of California, which lead to an edifying discussion concerning some of the principles of Natural Philosophy as they were supposed to underlie the science of acoustics. In this discussion, Prof. K. dropped a pebble into the tank of water, and Dr. Hall, who was always suspected of having great faith in the efficacy of baptism by immersion, took the Professor *down into the water* and initiated him into the glorious mysteries of Substantalism. While the aforementioned baptism was being administered it was fully shown that the books were wrong in attributing to the mechanical action of the pebble that which should have been set to the credit of *gravity*, another *Substantial entity* in nature which materialism had overlooked for thousands of years. By parity of principle it was also shown that the locust and tuning-fork's prong had no such mechanical power in throwing off sound-waves, as the undulatory apostles had foolishly supposed and taught. Whereupon our good California brother *came up out of the water* scientifically regenerated, and has ever since held his well-merited position at the head of the MICROCOSM's contributorial staff.

The next man to take the hazardous work was Dr. W. B. Hazard, of St. Louis, who in 1880 wrote to Wilford: "*It seems to me that you have risked too much on your ability to refute the wave-theory of sound.*" From the standpoint of casual utilitarianism Dr Hazard was right. Dr. Hall risked and lost the golden opportunity of gathering the shouts and shekels of popular favor. Had he been less risky, he might now be standing in the garret of fame's proud temple, blowing out the candle with a wave of sound, in consideration for which services he would now receive the salary usually paid for giving respectability to false theories in science. Foolish man! that he should esteem the reproach of truth greater riches than the treasures of Egypt.

Now about that time critics began to appear upon the field in great numbers. There seemed to be a growing opinion among men that the discharge of a few inkstands was the only sure means of reaching scientific immortality and glory. The Rev. Dr. Buckley, of the New York *Christian Advocate*, attempted to wipe the whole "Problem" out of existence with one magisterial wave of his insolent hand, and, as a merited reward for his folly, soon found his pharisaic superciliousness hoisted upon the point of his own ponyard. Then came Prof. Noyes, of the Johns Hopkins University, and Prof. Humphreys, of Vanderbilt, seeking the young child's life to destroy it, and by so doing helped to advertise and spread the truth. Next appeared Prof. Reppert in the *Apostolic Times*, followed by a batch of beautiful consistency in

the New York *Independent*, in which the literary editor said: "*Such a treatise we confess we do not read, because it is certainly wrong.*" No wonder that Wilford called him "the Sitting Bull of journalism." Then came Dr. Errett, of the *Christian Standard*, Cincinnati, and President Braden, who proposed some scholarly questions concerning Dr. Hall's denial of the claim made by the leading exponents of the wave theory that *sound intensity decreased as the square of the distance*. In the course of this edifying correspondence, Dr. Braden did honor to his Christian manhood by making his bow to the majesty of an unpopular truth. He wrote in 1891: "I have reached the following conclusion: Its [Hall's argument] refutation of the popular theory of sound is complete and overwhelming." At this point the discussion of the question of the decrease of sound intensity took a very natural turn toward the memorable controversy of 1882, concerning Newton's alleged oversight.

Previous to the spring of 1888, there had been no thorough criticism of Hall's position attempted. The attacks were generally from a set of gallant bushwhackers who seemed to fear a fair fight in an open field. But the battle was about to commence in earnest. Prof. French, of Urbana University, stepped into the arena, and with a paper of twenty-six pages, attempted a defense of the old theory. The Professor said: "*If Mr. Hall can make good his assertion that the prongs of a tuning-fork do not advance swiftly, then has he indeed dealt the wave hypothesis a staggering blow.*" It is now a fact of history that "Mr. Hall" has made good his assertion. He has dealt the "staggering blow" to the wave-theory, and although Mr. French is yet alive, there is only a slight hope of his scientific recovery. Prof. W. C. Strong, of Boston, next made his appearance in *Zion's Herald*. He wrote in support of tympanic vibration, or the drumskin argument, so much relied upon by wave-theorists; and before he finished his paper, he actually conceded much that belongs peculiarly to the corpuscular theory by attributing sound to *molecular action*, the very thing that Dr. Hall had suggested in the "Problem," p. 93. Then came Prof. Comstock, of Knox College, with his Elasticity-of-the-atmosphere argument, to the relief of the locust which had been required by the wave-theorists to move 20,000,000 tons of air. The Professor seems to have written for the prevention of cruelty to bugs.

About that time Dr. Hall was called to give a little attention to Prof. Carhart, of Northwestern University, Ill., whose pretended criticism was swept aside in his usual style of answering such presumptuous veridancy.

Prof. Stahr, of Franklin and Marshall College, Lancaster, Pa., gave a new impetus to the whole business of criticism when he, in the July number (1893) of the *Reformed Church Quarterly*, drew his "*Two-Edged Sword*" in defense of the undulatory theory. His paper was respectable in ability and intellectual culture, but unamiable in its contempt for a veteran who had passed successfully through several campaigns. The Professor announced that sound was a "sensation." True or false, the declaration created a considerable "sensation," which flew fast and far. Probably not at 1120 feet per second, as the Professor would claim for his other "sensations," but still at a comparatively high rate of speed. This it did from the fact that it was an unexpected emanation

from a teacher in a college whose peculiar philosophy lays great stress upon the *entitative* and *objective* nature of things in the constitution of God's great universe. In the same paper, Prof. S. says that—"No motion in the air, unless it is sufficiently rapid to produce condensation and consequent rarefaction, can ever produce sound." He also defines what he means by rapid motion:—"A stroke upon the particles [of air] with such velocity that they have no time to move aside or slide over each other." This assertion, although the same claim had been made by Tyndall, the acknowledged guardian of the wave-theory, was the occasion which called forth Dr. Hall's "*Finishing Demonstration*," as it appeared in the October MICROCOSM of 1883, and laid a new challenge at the door of the learned world.

That number of this magazine reached us in our sad sojourn through Florida. We read the "*Finishing Demonstration*" with astonishment. Dr. Hall seemed perfectly calm in his announcement that the prongs of a tuning-fork sounded audibly when moving at the slow rate of one inch in three hours. This was more than we could believe. We threw THE MICROCOSM aside, and under a stunning blow of amazement wondered whether the man was crazy, or whether the wave-theorists were a set of chronic lunatics in science. We were disposed to believe the former, and expected soon to see a stupendous cob-house fall with a crash and bury its fanatical founder beyond the possibility of a resurrection. On our return home we learned that Capt. Carter had carried the "finishing demonstration" ten thousand times further into the region of the marvelous than Dr. Hall had claimed. We wondered why the advocates of the wave-theory, committed as they were to the necessity of *swift motion* in producing sound, did not rise in their might, demonstrate the falsity of such apparently reckless assertions, and hush these blatherskites forever. On the contrary, the voice of criticism was hushed almost immediately. Nearly two years have since passed, and no one has dared to dispute with Dr. Hall and Capt. Carter upon that point. Prof. Reppert admitted the truth of the essential feature of the argument made by Hall and Carter, but denied that the point was ever disputed by any "living scientist." Thus the chivalrous Kentuckian surrendered the (air) castle without consulting his superiors in command. Surely in this case the ox did not know his owner, neither the ass his master's crib. The unanswerable argument of the "*Finishing Demonstration*" has thrown the enemy's camp into confusion. There now seems to be a "hurrying to and fro, and mounting in hot haste" the fragments of the undulatory steed. Prof. Stokes, of Cambridge University, on learning that Dr. Mott had indorsed Hall's departure from the old doctrine, proceeded to *change the line of defense*. He announces that it is not the velocity or *swiftly advancing* movement, but the "*rapid alternation*" in the movement of the fiddle-string that produces the sound-pulse by whirling the poor little heads of the air particles around until they squeal from sheer dizziness.

It was this new line of defense raised in behalf of the wave-theory that Dr. Hall shattered into atoms in his April editorial—*Confused Ideas on Physical Science*—and which, together with Capt. Carter's letter in the May MICROCOSM, opened the way for the most startling

exposure of fraud ever laid bare by a scientific detective, and the most searching and masterly paper that the founder of Substantialism has ever bequeathed to the cause of scientific truth. It is revolutionary to-day, but it will be appealed to as standard authority in the better years to come. Under God, the sustentative and motive powers of the universe are lodged in the immaterial and unseen entities thereof. The writer of this article has no reputation as a prophet; but he has the hope of a blessed immortality, and is willing to stake that hope upon the truth of the assertion that the general framework of physical science as now held and taught in the centers and circles of the learned world, is radically wrong, and must undergo a change of heart or be damned in its own unscientific rottenness. The God of nature will not always wink at such ignorance. Students of nature are already placed under a new responsibility. Light has come into the world. The editorials of April and May are worth more than whole libraries of scholastic nonsense written from the old materialistic standpoint. The reply to Prof. Stokes is simply unanswerable. It shows that atmospheric condensations and rarefactions cannot be the cause of sound. The wave-theory is annihilated. The farce is ended. Let the stage be cleared for a better entertainment, and the galleries for a better audience.

We have but one criticism to offer upon the April editorial. Its defect is excessive amplification. We see no reason why palpable truth should be everlastingly administered to overgrown babies with a teaspoon; and yet such treatment is valuable as showing the patience and gentleness of the nurse. But after patience has done her perfect work, peevish obstinacy should be spanked and put to bed, and we are not sure but what a little of such spanking was administered in the said April editorial; and if it should be found necessary, we are in favor of having the doctor repeat the application. Counter-irritants are supposed to be of great use in some diseases of the brain. There is at least no further room for patience. The point has been reached when the dust of the materialistic city should be shaken from the feet of the Substantial evangelists. The time is at hand. He that is scientifically unrighteous, let him be unrighteous still. If the present generation of wave-theorists choose to pass away in unbelief, Substantialism may well afford to carry its case to the higher court of the future, and wait with confidence the righteous verdict of that great hereafter which is close at hand.

But the friends of the wave-theory may ask, "Is not this vast array of learned and adverse criticism in itself sufficient to place the new doctrine under the ban of scientific condemnation?" We think not. Learned criticism has always been opposed to the truth upon the first appearance of new doctrines, whether in religion or in science. We mention the faith of the Hebrews in Egypt, the Gospel of the Nazarene in Judea, Christianity in the old Roman Empire and Evangelic Protestantism in Europe as cardinal points in the religious compass. Similar observations may be made in the respective spheres of astronomy, medicine, philosophy and every other department of science. And yet there is nothing in the above-mentioned line of incontrovertible facts that can be construed into an indiscriminate approval of every ridiculous vagary that can possibly originate in the cranky caverns of a diseased brain. This much, however, is true. According to the

utterances of Revelation and the recorded facts of history, the wisdom of the world is foolishness with God; and why should it be looked upon as an unusual departure from the well established order and line of His Providence if Jehovah should again, in this present age of the world, "take the wise in their own craftiness." But it is said that the voice of the people is the voice of God. Nonsense! In heaven it is true. On earth it is a lie. Majorities have nearly always been on the wrong side of the question. They are on the wrong side of all great questions to-day. Christianity is in the minority as over against the religions of the world. Protestantism is in the minority as over against the Catholic millions. And it is quite possible that true spiritual Protestants are in the minority as compared with the number of those who hold to the form while they deny the power of evangelical godliness. In no sense, then, is Substantialism an exception to the general rule which has prevailed in all past ages, and which now prevails, both in the Church and in the world. And further, as all other heaven-born principles and systems of truth ever announced among men have gradually spread toward the sure and full inheritance of the earth, so is it now, and ever shall be, with the Substantial Philosophy. The ratio of its increase already appears as something more remarkable than even the array of opposition which has crossed its pathway to beneficent power. THE MICROCOSM has now advocated the new theory of sound before the public for about three and a half years; and the philosophy underlying its teachings has to-day more openly avowed followers than had either Christ or Mohammed after a promulgation of their respective doctrines for a corresponding length of time.

FREMONT, O.

KIND WORDS NEVER DIE.

The following kind word from the late Rev. Dr. Raby, of Kimberton, Pa., who had so long shown himself such a substantial friend to THE MICROCOSM, is welcomed as a strain of sweet music floating into the back windows of 23 Park Row, as from the unseen world:

Your *rousing offers* ought to give your works an extensive circulation, which they deserve on their own merits. Please send me circular of your books and I will see what I can do to help forward the good work. My opinion is that you are master of the situation. The church and the world needed a Luther to liberate the truth in the Book of Revelation, and he was given; the church and the world needed a Hall to unfetter the truth as it is in the Book of Nature, and wrest both Bible and Nature from the contaminating touch of infidelity, and he is here. Yours very truly,

P. RABY.

FRIEND WILFORD:—I have not had time to study the "Problem of Human Life, Here and Hereafter," thoroughly, but have *looked into it*, and am fully satisfied that this reasoning will lay out many of the followers of the *evolution theory*. You are to the church a blessing, and to many Christians you are *more than a blessing*. The Substantial Philosophy has been

a benefit to me, and I am only *beginning* to learn it.

I am now a subscriber to THE MICROCOSM and will endeavor to increase the circulation of it wherever I may go.

It seems very much as though God had raised you up in a dark hour for this especial field. May He keep you, guide you, and bless you and your work.

Yours, in behalf of the good work,

C. E. WALKER,

TWIN BROOKS, Dakota.

Dr. Balsbaugh, Union Deposit, Pa., writes:

"BELOVED WILFORD,—I hate to take even one or two of your precious minutes, but I must reprimand you. Have you no bowels of compassion for the misguided scientists? Your logic is as terrible as King David's—2 Sam. xii. 31. I hope you have not been converted back to vivisection, after printing Mr. Lewis' just rebuke. I cannot but exclaim, as I watch the application of your scientific lash, Woe unto the modern Ammonites of materialism, evolution, wave-theories, weather-prophecies, war-witchings, and the apostles generally of everlasting mud! Your substantial sword seems to be growing longer, and heavier, and more divinely-edged every month. I like the Rev. J. I. Swander's articles, because they always have a divinely substantial point to them. God bless you with wisdom from above."

Rev. Jos. S. Van Dyke, our contributor of Cranbury, N. J., writes:

"I am greatly pleased with THE MICROCOSM. You are holding your ground admirably. The enemy will have to swing forward heavier guns or surrender. Their smaller pieces are already spiked and useless. . . . Your success has secured for you a measure of honor which should cheer your declining years, and I humbly hope will bring you ample pecuniary reward."

Rev. J. W. Lloyd, Branchville, N. J., ends a cheering good letter thus:

"I can only now wish you God-speed in your noble work, and pray that Substantialism may continue to spread till it shall slay and bury out of sight the godless system of Materialism, which has so long defied the armies of the living God.

Fraternally yours,

"G. W. LLOYD,

"Pastor Presbyterian Church."

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Those having a little spare time would do well to take into consideration these prices, and see if they cannot make profitable use of such leisure moments in canvassing among their neighbors:

"Problem of Human Life," in cloth, \$9.00 per dozen; in sheep, \$15.00 per doz. First and second volumes of THE MICROCOSM, \$15 per dozen. Third volume, \$9.00. "Universalism Against Itself," in cloth, \$6.00 per doz.; in sheep, \$9.00. "Walks and Words of Jesus," \$6.00 per doz. "Retribution," \$6.00 per doz., etc.

WILFORD'S MICROCOSM.

23 Park Row, New York, June, 1885.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE GROWTH OF SUBSTANTIALISM.

A party of believers in the Substantial Philosophy in a western city were recently discussing its merits and the progress it had made during the short period since its first announcement, when the question came up as to the probable number of adherents to this new doctrine at the present time throughout the world. We have been asked if we have any reliable data upon the subject. In reply we would say that we have no definite statistics, since no effort has been made either publicly or privately to collect them. The only possible present medium through which to gather information bearing on this question would be *THE MICROCOSM*, which is the acknowledged organ of the Substantial Philosophy, and whose readers, past and present, are supposed to embrace the bulk of the adherents of this new departure in philosophy, science and religion. We have good grounds for believing that there are not less than 25,000 regular readers of the present volume of *THE MICROCOSM*, consisting, as we may fairly judge, of the most thoughtful and intelligent classes of men and women in the reading community, since none others would be likely to spend their time over such literary matter as its pages contain. As each successive number is filled with more or less discussion bearing directly on the Substantial Philosophy, elucidating its evidences and general applications, it is fair to believe that every reader has more or less knowledge of its teachings upon that subject, while it is reasonable to believe that the vast majority of its patrons take and read the magazine chiefly on account of its advocacy of this new doctrine which so logically and rationally adds to the basis of the Christian's hope the solid collateral evidences from Nature that the invisible, imponderable, and immaterial are the real of all existence. This is not saying that all who read and understand the new philosophy have accepted its teachings as infallibly correct. Out of thousands of letters, however, from subscribers and contributors, a majority of which, directly or indirectly, allude to the Substantial Philosophy, we do not remember half a dozen which have objected to its teachings, and these only as to some of its details; whilst with hundreds upon hundreds, Webster totally fails them in adverbs and adjectives for the full expression of their enthusiastic admiration of the new philosophy. We may safely say, therefore, and as we conscientiously believe keep within the bounds of truth, that there are at the present writing not less than 10,000 persons who intelligently embrace the teachings of the Substantial Philosophy as the long desired and ardently expected

couciliation of natural and revealed religion, and as the rational bond of faith and fellowship by which all Christians may unite in the adoration of the one Great First Cause of all things, sinking and merging minor differences of biblical exegesis into that expanded element of charity which, hoping all things and enduring all things, covereth a multitude of faults.

The enthusiastic and intelligent indorsement of the Substantial Philosophy by so many of our readers, especially by so many educated and pious ministers of the different religious denominations, is rapidly and necessarily making many new converts, as well as tending to strengthen in the faith those who had not fully imbibed the doctrine in its all-searching and satisfying application to the religio-philosophical and scientific problems and mysteries of nature everywhere encountered by men and women who do their own thinking, and who refuse to take things any longer alone upon simple faith and trust. Believe what you must, on authority, where all explanation or confirmation is beyond your reach, but as soon as you can strengthen and sustain your faith by rational, confirmatory, and collateral facts from Nature and science, by all means grasp them, and thus add to your faith courage, and to courage knowledge. This is what the Substantial Philosophy inculcates, and what it enables every Christian man and woman to do. The materialistic unbeliever tells us that it is all very well to accept the facts of religion and rest the basis of a hope of a hereafter for humanity on pure faith, without confirmatory and collateral proofs, for those persons whose minds are so constituted, and whose scientific education is so limited as to admit of such circumscription of intellectual power. But he insists that a trained mind, accustomed to close philosophical reasoning, cannot accept on simple authority alleged supernatural facts as a basis for faith and conduct here, and for hope hereafter, without the strongest confirmatory considerations drawn from God's other volume—Nature. This is by no means without foundation in truth. But let such a thoughtful skeptic be scientifically convinced that every natural force, such as light, heat, sound, electricity, gravity, cohesion, magnetism, including vitality, instinct, mind and spirit, is a real substantial entity, and even vastly more real and important than are the material, ponderable bodies around us, since such bodies depend on the imponderable forces for their very existence, and at once he will confess his mental introduction to an all-pervading world of entities which mere authoritative faith had never divulged, and of which the great lights of our modern schools and colleges have, up to the present time, been totally oblivious. To a

thoughtful mind thus suddenly enlightened by initiation into a world of invisible and intangible entities of which it had no previous conception, it is but an easy mental step to accept the further position that away back of these imponderable, intangible, immaterial entities there must of necessity exist a fountain of intelligent force—of mental and vital force—from which the physical forces, with all their manifold capabilities, had received their powers of action, and in pursuance of which the mental and vital forces of the animal and vegetable kingdoms had been enabled to work out the innumerable designs in living forms, evincing such wonderful and intelligent adaptations to use as we now see everywhere around us. In a word, the moment the intelligent skeptic shall have understandingly grasped the principles of the Substantial Philosophy—God's thesaurus of natural mysteries—he is then prepared to believe on scientific principles in an entitative, personal, intelligent First Cause of all things, as fully as he believes in the intelligent and substantial vital and mental forces in a human form, which, as real but incorporeal entities, must in the nature of things continue to exist after the physical body, as their pericarp, has molded to dust. If gravity, cohesion, electricity, heat, and magnetism may exist all around us in Nature as actual energies and entities, and not as mere *nothings*, or modes of motion, as so-called science persists in teaching, and if these substantial, active, persistent forces are wholly beyond the range of our comprehension or even recognition except by their manifestations to our reason, why reject the personal intelligent existence of God as the primordial and necessary Cause of all things, or the probability of our own personal existence after death?

We urged in the "Problem of Human Life," and repeat it here, the unavoidable necessity of the intellect's accepting some final mystery, as the ultimate unsolvable problem of existence, and for which no satisfactory or even conceivable rational solution can ever be expected. To trace each animate or inanimate thing we may see, back to its unknown origin or start, and there be compelled to leave it as an inexplicable mystery, as does the atheist, is to involve ourselves in an infinite number and variety of unfathomable problems only to puzzle and confuse the intellect, when by merging them all into the one unfathomable mystery of an intelligent First Cause, acknowledging Him as the personal God of the universe, we solve all the tens of thousands of minor mysteries, thus letting the mind rest upon one unsolvable problem and that one alone. Which is the more wise and rational course to pursue.

Darwin has said that the origin of life on this planet (even with evolution to develop that life after it originated) was a problem that man could never expect to solve. True enough, according to all atheistic or materialistic notions of the universe. But accept, as we have just been insisting, the single unavoidable mystery of a self-existent, intelligent source and fountain of life as the First Cause of all things, and as the intelligent power which gave energy and ability to the substantial forces of Nature to work out and carry forward all natural processes and phenomena, and the origin of life ceases at once to be an unsolvable mystery, and even evolution itself would cease to be irrational as soon as the evidence should be forthcoming of its probable truth as a system of facts. Thus the satisfactory solution of all mysteries depends with us upon the simple acceptance of the one culminating, crowning mystery of God's vital, personal, and intelligent existence. And therefore the manifest importance of the Substantial Philosophy as a system of faith, which leads the mind back step by step through the various grades of visible objects, then through the invisible, imponderable and immaterial, but substantial entities of Nature, by the most rational gradations and logical sequences up to the intelligent God of Nature as the author and source of all things visible and invisible, and whose admitted existence, as just seen, solves all the minor mysteries of the universe.

Hence it is that THE MICROCOSM is continually pressing the claims of this philosophy upon all theists and Christian ministers of whatever name or denominational belief, knowing that by its teachings alone will they be enabled to beat back the assaults and arguments of the materialistic philosopher and defiantly give him a scientific reason for the hope they entertain of a real substantial existence for the intelligent spirit when this mortal shall have put on immortality. Away, then, with your sectarian bickerings about the meaning of this or that text of Scripture, as if the salvation of the universe depended upon its particular exegesis. Let us drop this superficial contention about childish non-essentials for a season, and confine our energies to the grand work of inculcating the broad principles of Substantialism in all the churches and schools throughout the land, and thus may we lead thinking men, who have become disgusted with sectarian trifles, through the straight and easy paths of the Substantial Philosophy up to the very presence of the substantial God of Nature.

Until theological teachers and scholastic divines can be made to see the importance of incorporating the elements of the Substantial Philosophy into their pulpit labors, making it

an essential feature and factor of their weekly inculcations, they can rest assured that, but for those ecclesiastic barricades with which fortune has favored them, they are at the absolute mercy of the weakest disciple of Haeckel or Huxley who might choose to assail them, and who could wind them around his fingers like a flaxen thread, with all their biblical lore to support them, the moment he could induce them to answer his questions in public. Yet, knowing this fact, as they have been repeatedly warned in these pages, a few of them, to our knowledge, persist in speaking contemptuously of the new philosophy as of no account, and one of them even writes articles against the substantial nature of sound, light, heat, etc., insisting upon the correctness of the wave-theory, apparently to emphasize his ignorance of his own helpless condition should he be attacked by an intelligent materialist. Suppose that such a scientific skeptic should publicly declare, with Haeckel's "History of Creation" open before him, and in the presence of this reverend professor's congregation, that the life-force, spirit-force, and mind-force in man are nothing but the molecular motions of the brain and nerve particles placed together in a complex and varied manner, and that since *motion* is nothing *entitative*, being a mere phenomenon of matter and necessarily ceasing to exist as soon as the moving molecules come to rest, hence this force of life, soul, mind, or spirit, being but a mode of motion of the material particles, ends necessarily with the death and consequent quiescence of the material body. Away! the defiant materialist flauntingly proclaims, with your puerile nonsense about the immortality of the *soul*, a thing, like a shadow, which is nothing but a name,—a mere mode of motion of material particles,—and which can no more continue to exist or be immortal after the body ceases to move than can a puff of sound-force or a flash of light-force continue to exist after the air-waves or ether-waves (of whose motions it consists) cease to vibrate. The intelligent members of the congregation, alarmed at this attack, appeal to their pastor for aid to suppress the assailant and overturn this terrible materialistic logic, which so conclusively destroys at a single blow all hope of immortality, and which does it, too, according to the very mode-of-motion philosophy of modern science as taught in all our colleges. But their orthodox, scientific pastor is dumb, for he is a professor of physical science as well as a clergyman, and teaches in his college chair that *sound* is nothing but the *motion of air-waves*, that *light* and *heat* are but the *motions of ether-waves*, and that electricity, magnetism, gravitation, etc., instead of being substantial forces and real entities, are but the

molecular vibrations of material bodies, and which necessarily cease to exist as soon as the vibrating particles causing them come to rest. And why, then, are not Haeckel and his daring disciple right in teaching that the analogous forces of life, mind, and spirit are likewise but modes of motion of material molecules and which necessarily cease to exist at death? Why is he not right on scientific principles in denouncing the idea of the immortality of a mere *mode of motion* as but the vagary of a superstitious brain? The poor bewildered pastor hides away from his dumb-founded people, locks himself in his library, and there racks, if not wrecks, his brain in trying to prepare a suitable exegesis on some abstruse text of Scripture for their next Sunday's delectation, while the more enterprising of his congregation go to a neighboring village in search of a well-posted believer in the Substantial Philosophy to "come over into Macedonia" and help them wipe out this materialistic blaspheming Philistine who thus boastfully defies the armies of the living God. Alas! the picture thus hastily sketched is to be substantially repeated as a drama in real life in the near future in those Christian communities, whose pastors, having been educated in the scientific departments of our colleges, permit their stubborn and unprogressive dispositions to prevent their acceptance of the magnificent light of Substantialism which is now shining abroad and offered to all without money and without price.

Plainly and unequivocally the time has already arrived when the Christian ministry of this land is to be forced to accept the teachings of this new philosophy in regard to the substantial and entitative nature of all the forces, or else ingloriously and unconditionally surrender to the materialistic scientist in the impending controversy about the immortality of the soul and the possibility of a future life for man. There is no other alternative to choose. We rejoice that we have lived to see the lines on this question thus clearly drawn, and it shall not be our fault if, in future issues of this magazine, the clergy and all thinking laymen are not kept so informed upon the necessity of recognizing the truth of this philosophy as to be left without excuse.

DR. SWANDER'S EXCELLENT PAPER.

WE take pleasure in referring the reader to a very able review, in this number, of the Sound Controversy, by our esteemed contributor, Dr. Swander. There has no single paper appeared in this magazine which has so thoroughly gone over the entire discussion from its very inception as this, and no paper, we may add, that has even approached it for completeness in that direction. We trust that no reader

will fail to read and even make a study of that critical exposition.

But while we thankfully recognize the able and thorough character of the review, and while we are especially grateful for the doctor's kindly allusions to our part in this revolutionary controversy, we must take exception to a single conclusion of our valued contributor, and will try to give our reasons for such exception. Dr. Swander honestly thinks, that there have been given so many and conclusive proofs and demonstrations of the fallacy of the wave-theory of sound, and consequently of the correctness of the Substantial theory, that it is time this elementary discussion were dropped, and that THE MICROCOSM should proceed to other matters; considering, as he now does, the matter of the sound controversy as settled for all time. We differ from this view. Although we believe as firmly as does Dr. Swander, that enough has been written and printed in these pages to satisfy any competent and unbiased mind that the undulatory theory is erroneous, yet there are but a comparative few of the professors of physical science in our thousands of colleges whose prejudices have permitted them to examine or even see the crushing arguments that have been urged against the old theory; and it is quite improbable that any new convert, however friendly to the cause, would go voluntarily on a search through back volumes of THE MICROCOSM, and which may not be readily accessible, for the many fine and critical discussions of controverted points with which our old readers have been familiar. These new recruits from the professorships of colleges, as they enter the ranks of the substantial army, will be very apt to take and read THE MICROCOSM in the future, and the continued presentation of the fundamental principles upon which the Substantial Philosophy was originally founded, if reiterated, illustrated and corroborated with new facts and observed phenomena, with copious references to past demonstrations, and the fatal admissions of opposing scientists, will be apt to lead such interested converts to search back for the data referred to, and thus enable them to meet at a glance any attack from new opposers who would, of course, most likely not be aware that their objections had been previously answered and set aside. No better illustration of this same view of the case can be had than that given in the present great paper of Dr. Swander. He cannot begin to guess how many recent converts to the Substantial Philosophy will take advantage of his careful digest of the various discussions which have occurred during the past three or four years, secure the back volumes of THE MICROCOSM, and thus be enabled to master the critical investigations alluded to in order to fortify

themselves in defending the new departure in science.

Our earliest contributor, the Rev. Dr. L. W. Bates, wrote us some time ago, urging upon us the very course we are here claiming as correct. He insisted that no matter how strongly and invincibly the proofs against the truth of the wave-theory had been presented heretofore, these same proofs if need be, with various modern improvements, modifications, and additions, should be constantly re-presented, like "line upon line and precept upon precept," in order to reiterate and impress this fundamental element of the new departure in science, not only upon the attention of new readers, but thereby also continually to freshen the memories of the old subscribers as to this foundation-stone of the Substantial Philosophy. He urged the fact that even very few scientific readers, engaged in the busy pursuits of life, would be likely to remember back a couple of years the details of a critical argument upon such intricate questions as the sound-theory involves, and that since this question, more than any other, lies fundamentally at the very basis of the Substantial Philosophy, too much cannot well be written upon it, especially if duly interspersed with new discoveries and new methods of illustration and proof. This view, as taken by our noble and venerated friend, impressed itself upon our mind so forcibly that we have not since touched our pen to paper upon that subject that we have not thought of it as a praiseworthy suggestion.

But what we have here said does not embrace the only reason for a constant and vigilant discussion of the sound question as one of paramount importance in these pages. If any one thinks that the controversy has yet reached the bottom of the science of acoustics, solved all problems, or met and settled every difficulty that will be raised against the Substantial Philosophy in the future, he is mistaken. The present undulatory theory has not been inaugurated, maintained, elaborated, and formulated at such enormous cost and care by the best mathematical minds of the present and past centuries, and in explanation of which whole libraries of books have been written, to be wiped out by a single brief campaign of half a dozen years, so that we may say it is laid upon the shelf never again to show signs of life. As well convinced as we have been, and still are, of the unanswerable and invulnerable character of our general position against the undulatory theory of sound, we have never been quite so self-inflated by the discovery as not to realize that there was yet a mighty work on our hands and on the hands of those brave teachers of physical science who are aiding us in our investigation, and who are

to continue the Substantial campaign after the time of our departure shall come.

To catch a glimpse of the probable contest that is yet to be waged for the life and supremacy of the old theory, which has cost so much wear and tear of brain of the best intellects of the world, we have only to look at the great work of Lord Raleigh, F.R.S., of Cambridge, England, recently issued in two immense volumes filled from lid to lid with the most profound and intricate mathematical calculations intended to confirm and illustrate the action of atmospheric sound-waves as the pulses pass from the sounding body to a distance. Though much of the details of these abstruse algebraical calculations and formulas are beyond the limits of our own education, we know enough of their formidable basis to realize that such a pretentious work, so wonderfully elaborated, by such mighty scholarship, could hardly have proceeded upon the assumed infallible correctness of the wave-theory of sound, unless there had been enough merit in that theory after this late day, to make the advocates of the Substantial Philosophy realize that even yet their triumph is not to be a walk-over the course. To say, because the artillery of the enemy's batteries is at present silenced, and that in their confusion and demoralization they turned their field-pieces upon each other with deadly havoc, thus contributing largely to their own defeat, that therefore no reorganization of the scattered forces is ever to take place in the future, and that no final attack is yet to be made upon the shouting camp of the audacious Substantial army, after it shall have become "respectable," is to harbor a hope that some of the chief leaders of Substantialism do not by any means entertain. But while they have no fear as to the result of such final assault by the cohorts of scholasticism, they deem it prudent to "sleep upon their arms," and during the day to keep them polished ready for use, and their cartridge boxes well filled with the most approved Substantial ammunition. This is what they believe they are now doing in the monthly resupply and exhibit of their walled *magazine*,—a splendid car-load for its fire-proof and bomb-proof vaults having just been dumped into it by a contributor from Fremont, Ohio.

Personally the editor does not expect to take part in that "respectable" fight of the near future, when the Krupp guns of acoustics shall be trained upon our camp, and which shall finally and forever settle the acoustical controversy; nor does he expect to witness the coronation of the Substantial Philosophy by willing hands at its ultimate triumph over materialistic scholasticism, unless perhaps it should be from one of the mighty peaks of Alcione, or some other

celestial observatory; and hence it is, that he is doing his best while still present with the noble band to help meet, and carry out, and settle the objections that can be raised to the new philosophy, and thus leave these solutions so thoroughly accessible upon the permanent record of THE MICROCOSM's pages that the young investigators who may come after may have less difficulty in seizing these already sharpened weapons by which to disarm their foes or spike their guns. To such investigators of the coming generations he looks with the utmost hope and confidence, and he takes this occasion to place on record, for each and all, his profoundest and most affectionate benediction.

A NEW DISCOVERY IN ASTRONOMY.

(From the *Apostolic Guide*.)

WE have had recently announced the discovery of an error in that science which has so long been considered a fixed science. It is difficult for scientists to think that Kepler, Galileo, Copernicus, Newton, and Laplace could make mistakes. It always appeared strange to me, while in college, that astronomers could be so absolutely accurate in everything. The student is impressed more in the study of that science, than in any other, with the infallibility of science. Astronomy is called a *fixed mathematical science*, and in such we are not apt to look for a mistake. One, however, has lately been announced, to which we should at least give some attention. It is claimed that the error is vital, and that it vitiates some of the finest astronomical calculations.

In the early history of astronomy, close observers discovered that the earth has an oscillating motion along its orbit around the sun, which is caused by the moon's influence in its revolution around the earth. Newton attributed this wabbling motion to the result of the moon's disturbing influence. It appears, however, that astronomers have violated a law in physics which teaches the reciprocal attraction of the two bodies according to mass, and have substituted in its stead a kind of gravital repulsion; for they have the earth travel around a center of gravity in an opposite direction to the moon, thus making the moon's direct pull start the earth from it instead of toward it. The only explanation that astronomers have been able to give to this marvelous phenomenon has been the principle of action and reaction. The moon is made to pry the earth out of its orbit in an opposite direction to itself.

Dr. Hall, of New York, editor of THE MICROCOSM, has, in the April number of his excellent magazine, an explanation of the phenomenon which is worthy of careful attention. He assumes precisely the same law of attraction for the earth and moon that astronomers teach in reference to the sun and the planets. In this he agrees with Newton, who says that the same laws of attraction and motion must apply to suns, planets and satellites. As the sun and the planets when in line all revolve around, and on the same side of a common center of motion, the same thing must be true of the earth and the moon, or the laws laid down in the "Principia," in reference to attraction and

motion, cannot be true. Newton taught that even the smallest planet tends, in proportion to its weight, to pull the sun out of its normal position in the solar system, and that the promiscuous distribution of these small planets in every direction keeps the sun about in its normal center; but when there is a preponderance of these in one direction, the sun is moved in this direction, while the normal central position is all the time the common center of motion of the entire system. Newton calculated just how far the sun would be drawn from its normal position by the combined action of all the planets in line. When the sun is drawn toward the planets, the sun and the planets swing together around the center of motion from which the sun had been drawn. This must be true or the sun is repelled by the planets, instead of being attracted by them.

Dr. Hall explains the wabbling motion of the earth along its orbit on exactly the same principle. He claims that Newton's principle of attraction and motion, laid down in the "Principia," by which suns, planets and satellites are governed, fully explains the mysterious phenomenon. We thus turn Newton against himself, as the great English astronomer was the first to teach the present theory of the earth and moon's relative motions. It appears, then, quite evident that the position from which the earth is drawn by the moon, becomes the center of motion for both earth and moon, around which both revolve together, once in about twenty-eight days, the moon all the time carrying the earth around by its attractive pull between it and the common center of motion, instead of repelling the earth and keeping it on the wrong side of its orbit. We hope, if the present discovery bears the test, and we see no reason why it should not, that many of the moon's irregularities in apparent motion (an explanation for which astronomers have long been searching), will receive a full elucidation in an advancing scientific investigation.

REMARKS ON THE FOREGOING.

Astronomers, for once, have been made to stop and think. We do not hesitate in asserting, without fear of contradiction, that every educated astronomer who has seen and read our objection to the present theory of the relation of the earth and moon to their common center of gravity, as so correctly condensed by the *Apostolic Guide*, is hopelessly at his wits' end. We know of several leading astronomers who have been sounded upon this new and startling objection to the present system by friends of THE MICROCOSM till they have been helplessly driven to the wall and finally forced to decline to answer the simplest questions concerning it. They all admit, as of course they are obliged to do, that if the moon were thrown into its present orbit, with its present projectile force, exactly balancing the earth's attraction by which to keep it continually diverted from a tangent into its circular path, it would reciprocally pull the earth's center out from its place on its orbit just 8000 miles, or one-eightieth the distance to the moon, the moon being one-eightieth the weight of the earth. No

one would pretend that the earth, prior to the presence of the moon and its consequent attraction, had any local orbit or projectile motion from which to be diverted by the moon's presence, when it should occur, in its orbit. In truth, its only motion or projection from its path around the sun is necessarily given to it by the moon's pull, which pull is all the time, of course, directly toward the moon. But as the moon is continually swinging around the earth, this projectile force, which is given to the earth by the moon alone, is diverted by its constant change of pull into its local orbit of 6000 miles in diameter. Is not this plain enough for a child to understand? Before the earth had started to move by the moon's pull, all admit that their common center of gravity was between the earth's center and the moon just 8000 miles from the former; but the moon, by its one-eightieth power of attraction, having finally pulled the earth's center out to this common center of gravity and maintained it there in its orbital swing, thus continually diverting it from the tangent which the moon alone had created, this new place for the earth's center *still remains the actual common center of gravity of moon and earth by virtue of the fact that the earth's center is still all the time, in gravital effect, at its old place on its annual orbit, it being the actual center of the moon's orbit as well as of this local orbit of the earth.* This explains the apparently anomalous position which astronomers, in the habit of running in a well-worn rut, fail to grasp, namely, that the common center of gravity of two bodies may, under the conditions of the moon and earth, actually be at the center of the larger body instead of between them. One astronomer ridicules this idea, and says we are welcome to the credit of it. He will be ridiculed by coming scientists for not being capable of grasping and recognizing so valuable a discovery in astronomy.

In the light of this common-sense view of the position and motion of the earth, in its relation to the moon, we have the present theory in contrast, which no astronomer has attempted to explain, and which we here assert no astronomer will ever venture to attempt, unless he is candid enough to abandon his own theory as an error. His doctrine is, after the earth's center has been thus pulled out by the moon's presence in its orbit, to the original common center of gravity, that by some process unknown to mechanical law the earth begins to fall behind the moon, or, in other words, begins to fall back of the line connecting the moon with the place on the orbit where the earth's center was when the moon commenced its work. When asked what could make the

earth fall behind, or what could make the moon gain on the earth, since the earth's deviation from its orbit around the sun is due alone to the moon's direct and continuous pull, they coolly say that any elementary work on mechanics will explain this problem. But when urged to name just one such work, and cite the page or section, they are dumb! Why is this? We take the liberty to assert here that no such explanation exists in any work on mechanics, and that any man who shall seriously attempt to show how such a falling back of the earth from the line of the moon's pull could occur on any known mechanical principles, will merit, as he will receive, the ridicule of every well-informed mechanical engineer. Why. it is the simplest principle of mechanics that if the moon should start in its orbit as we have supposed, and should it begin to pull the earth out from its place, it could only attract and thus displace the earth one-eightieth, or as far as it could maintain it in a circle around such normal place on the orbit, which would then become the common center of motion of both earth and moon, the earth swinging around in its small local orbit of 6000 miles in diameter, while the moon would swing around in its orbit eighty times as large, or 480,000 miles in diameter, and both bodies of course necessarily keeping on the same side of the earth's original place on the orbit, or the place where its center would be but for the moon's pull. Can anything in mechanics or philosophy be plainer or more self-evident than this? Yet it is an astounding fact that after the moon, as astronomers admit, has pulled the earth 3000 miles from its place on the orbit directly toward the moon (as it could not pull it in any other direction), it begins in some mysterious way, according to astronomy, to slacken upon the earth, letting it fall behind more and more, till finally the earth has lost "half a month," and thus finds itself as far on the other side of its old place on its orbit as it was at first pulled out toward the moon! This is actually the teaching of all astronomers at the present time. In the name of reason, what science or mechanical sense is there in such philosophy? The youngest beginner in natural philosophy ought to see, after the moon had pulled the earth out 8000 miles, if by any means it should find itself in an orbit larger than the pull of the moon could maintain, and thus carry it around in line with its normal place on its orbit, and if, in consequence, the earth should incline to fall back of this line, that the direct pull of the moon, when it should thus get a little ahead, would instantly tend to rectify the earth's orbit by pulling it across and into a smaller circle, till this local orbit, caused alone by the

moon's pull, would be so circumscribed as only to equal the power of the moon's attraction to maintain it in line with their common center of motion. No; to accommodate a preconceived theory, the moon obligingly pulls the earth out from its place further than it can maintain it, and thus allows it to fall behind till it finally loses half its orbit, when if this same accommodating moon had exercised mechanical judgment, it would, when it had got a little ahead of the earth, have pulled it slightly "across lots," so to speak, thus contracting its local orbit and keeping it on the same side of their common center of motion, instead of allowing it to fall half a month behind. The truth is, nothing less than a mechanical conspiracy on the part of the earth and moon to suit an astronomical vagary—and that, too, in violation of all known laws in mechanics—can ever place the earth and moon on opposite sides of the earth's old place on the annual orbit, or the place the earth's center would occupy but for the new factor of the moon's attraction.

Our illustration, in accordance with Newton's teaching, of the combined planetary pull of the sun from its normal and quiescent position, when all the planets happen to fall in line, as given in the April MICROCOSM, can never be answered by astronomers, and it is safe to say that not one of them will venture to touch it. To ridicule it is to ridicule the "Principia," for Newton distinctly tells us that the sun is moved out one diameter (860,000 miles) by the attraction of all the planets when they fall in line, and this movement must be toward the planetary mass. Of course, according to astronomy, the new common center of gravity must then be about 860,000 miles still further removed toward the combined planets, around and on opposite sides of which the sun and planets must revolve as their common center of motion. This being so, a beginner in science can see that all the planets in the system must seek new orbits directly away from the sun, 1,720,000 miles further than they had occupied when the sun, in its quiescent position, was the center of all their orbits. This is actually what the present system of astronomy is obliged to teach in the light of Newton's "Principia." In the name of everything that is fair and honorable, why should astronomers keep silent upon this question when the facts are so palpably and indisputably against the present theory? Is it because "Wilford Hall is a scientific crank?" That is not a sufficient excuse. Whatever he may be, one thing is sure, his facts and incontrovertible figures are not in the slightest degree *cranky*, and independent investigators, of the near future, will let the world see this just and manifest distinction. (See our illustrated

article in the April number of the present volume.)

A VOICE FROM SCOTLAND.

We believe our readers will not object to the following brief editorial article on Evolution which we copy from the *Christian News* of Glasgow, of May 16th, one of the oldest, ablest, and best established religious weeklies of Great Britain. That the editor of such a critical and prominent journal, while disapproving of the half-concession style of the present opposition to evolution, should so heartily indorse the "Problem of Human Life," could hardly be less than gratifying to the author, in view of the unfavorable criticisms of some ministers and editors at home who condemn the book while confessing that they have never read it. Here is the contrast:

EVOLUTION.

[From the *Christian News*.]

The question of Darwinism, in the estimation of many, has now reached a position of strong probability; and the trend of modern scientific research is thought to lend greater and greater confirmation to it. Indeed, one of the ruling ideas of modern thought is that of Evolution. No one who pays any attention to what is passing on around him can fail to notice this. Its very terminology is becoming domesticated in our everyday speech, and its phrases are now interwoven with our current literature, both scientific and theological. Indeed, one of the latest popular theological treatises, and perhaps one of the most belauded, viz., Drummond's "Natural Law in the Spiritual World," is simply an attempt at a resetting of theology in terms of evolution. Its ground plan, so to speak, is Darwinism, and the superstructure is a kind of heterogeneous composite of old and new elements. In writing in this way, it must not be inferred that the theory of descent as taught by Darwin, in which man is supposed to have descended—it should rather be ascended—proximately from an ape, and ultimately from a monad, is universally credited. This would be clearly saying too much. The ape argument, indeed, has of late years fallen into disrepute, as it has been found to prove too much, and therefore prove nothing. Still there are many scientists who confidently believe in the Darwinian theory of descent. Many more accept it provisionally and tentatively as a working hypothesis. Others, again, receive it with many important modifications—modifications which go far, we think, to make it of little or no use as a theory pro-

fessing to explain the origin of life and the method of the universe, while not a few scientific men of no mean standing reject it altogether as an unproved and unverified hypothesis. Not only this, but they regard it as so burdened with insuperable difficulties and absurd suppositions as to be unworthy of rational credit. One of the most trenchant and masterly opponents of this theory is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled "The Problem of Human Life," in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley, and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin, and Co., are the most sweeping and triumphant we have ever read within the domain of controversy. The *American Christian Review*, writing of Dr. Hall and his book, says: "The author (a man of acknowledged genius and confessedly the brightest scientific star of modern times) has startled the religious world into transports of joy and praise. No religio-scientific work has received from the secular and religious press such willing and unqualified praise as 'The Problem of Human Life.' It is the death-blow of atheistic science." The *New York Illustrated Christian Weekly* says: "The book clearly annihilates the last standing ground of Darwinism as a scientific theory." The *Brethren at Work* says: "It is unquestionably the most startling and revolutionary book published in a century. There is nothing extant to compare with it, save, perhaps, Butler's 'Analogy.' It marks an epoch in the centuries." The *Watchtower* says: "Without doubt it is the most startling book of the century. We would rather have the honor of writing such a book than to be President of the United States." Professor Henry Cox says: "We believe it to be the ablest scientific book written in a hundred years." The *Gospel Preacher* says—"Nothing like it has come from the pen of man save from prophet or apostle." The *Christian Preacher*, Texas, says—"It is the production of one of the most gigantic intellects of the age," etc., etc. These are a few notices of the book out of scores that might be cited, all in the same laudatory strain. If our thoughtful and critical readers have not yet read the book we venture to prophesy that they have a treat before them. It may not be generally known that Dr. Hall, along with an able staff of assistants, edits and publishes a monthly magazine

entitled *THE MICROCOSM* devoted entirely to the investigation and discussion of religio-scientific subjects, which is very ably conducted. Every minister and student of theology should read and study it, for the age demands a thorough treatment of these subjects. We may return to this subject soon.

THE APPROACHING CHANGE IN THE MICROCOSM.

The exigencies of the Substantial Philosophy have now become such, after nearly four years of Microcosmic battling, that its acknowledged organ ought to be placed on a broader, stronger, firmer, and more enduring basis than that which has sustained it during the four volumes now nearly ended. Such a cause as that of Substantialism deserves all that humanity in its combined and enlightened efforts and energies can do to sustain and spread it abroad. And its organ, which has grown up spontaneously almost, and like Aladdin's Lamp, with magical effect, should now, after four years' probation and proof of good behavior, be promoted to a higher place in journalism than it has yet occupied. Its friends, with one accord, should say to it—"Come up higher."

We have, single-handed and alone, in the midst of poor health part of the time and in very cramped facilities most of the time, struggled and managed to keep the magazine alive, and to send it to its friends and patrons as regularly as possible for the four years now nearly expiring. We have, in order to achieve this success, and thus to build up the cause of Substantialism just getting into notice, had to use every dollar derived from the sale of our books. These have been sold so low that very little profit has accrued, so that after meeting the expenses of the office and first cost of publications, not a dollar has accumulated at the end of any year since the commencement of the enterprise. Yet it has made us individually so rich, that we would not swap our wealth for that of Vanderbilt to-day. Our riches consist in that which cannot burn up and therefore need no expensive insurance. It is the wealth which we possess in the assurances given to us by the Substantial Philosophy. To spread that philosophy and transmit that imperishable wealth to others is the aim in making the fore-shadowed change in *THE MICROCOSM*. That change will be announced in all its details by the new publishers in a subsequent number, before this volume ends.

Suffice it to say that the magazine will be enlarged and improved in style and quality of paper, and the price will necessarily be increased. The publishers and future owners are two young men of great business and excellent literary and scientific attainments.

They have come into the concern to stay, and they bid fair, in point of health and apparent longevity, to stay a great many years. May it be scores, and when they have to succumb to time's changes, may others equally worthy and competent take their places. We will only add that we expect to be with them personally in the editorial work as long as Providence shall cast our lot this side of the deep dark river. By that time it is hoped the new management will be so schooled in the substantial crusade for a higher plane of religio-scientific and philosophical thought, that our individual departure will not be missed. We rejoice that the cause of Substantialism, even now, is so far advanced as a system of intellectual belief that it is fairly able to stand alone, and that *excelsior* is now distinctly printed on its banner. May every friend of the cause lend a helping hand to keep that banner floating in the breeze!

(From last month.)

OUR GREAT ENCYCLOPEDIA OFFER.

Among those who have accepted our offer of a complete set (16 leather-bound volumes) of "Appleton's Encyclopedia" for purchasing \$50 worth of books, we may name the Rev. A. McA. Pittman, of Darlington, S. C. He bought fifty copies of the "Walks and Words of Jesus," at \$1 each. We sent these books and the set of "Encyclopedia" by express, and received in return the following letter:

DARLINGTON, S. C.

MESSRS. HALL & CO.,—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the "Encyclopedia." I am more than satisfied with the books, and feel well paid for my labor. I would not take \$50 for the "Encyclopedia" alone. You have my thanks for your kindness.

A. MCA. PITTMAN.

☞ We have received several letters from subscribers since last month inquiring in regard to our *Encyclopedia* offer. Remember that for \$50 worth of our books at retail prices, or for 50 subscribers to this volume of *THE MICROCOSM*, at \$1.00 per volume, or both mixed, we will send by express a complete set (16 vols.) of Appleton's "New American Encyclopedia." This offer will not continue very long, therefore you should take advantage of it before its withdrawal. Send for circular.

TO ADVERTISERS.

We have concluded to devote a few pages of *THE MICROCOSM* to the advertisements of firms whose business is in keeping therewith, and we believe that those who obtain space in our columns will find them to be a valuable advertising medium.

Our subscription list contains the names of all the leading clergymen of every denomination in the United States, and thousands of scientific and literary readers.

Authors of Scientific and Religious Books, and all manufacturers of and dealers in Scientific and Astronomical Instruments, Church Furniture, etc., will see at a glance that *THE MICROCOSM* opens to them a most valuable field for the exposition of their goods in the proper channels. Advertisements not strictly in keeping with the character of the magazine will not be accepted on any consideration, and we guaranty our advertisers and readers that our advertising columns will be as pure and healthy in tone as the balance of the magazine. In a word, we intend to give space *only to a few select advertisements*, and our rates, which are very moderate, will be mailed at once on application.

We do not intend to allow advertisements to encroach on the space of our readers, but shall add more pages to the magazine as our advertising patronage increases, thus giving to our subscribers the same amount of reading matter as heretofore.

Copy for all advertisements should be sent to our office by the 25th of each month, so that proofs may be sent for examination before going to press.

Address,

W. C. DUNN & CO.,
24 & 26 Vandewater St., N. Y.

(From last month.)

NOTICE TO SUBSCRIBERS.

Those whose subscriptions have expired with the first half of the volume will please remit 50 cents for the last half, as there will be somewhat modified terms for the next volume, notice of which will be given in the last number. In the meantime, let all who want the present volume from the commencement and any of our books as premiums, at the exceedingly low prices at which we are furnishing them, send on their names. (See last page of February number.)

VALUABLE BOOKS.

Those wanting Dr. Tefft's book, "Evolution and Christianity," should examine our notice of it in April's *MICROCOSM*.

We also have on hand several copies of "Through the Prison to the Throne," by our able contributor, Jos. S. Van Dyke, A. M., D.D., and copies of Col. Patton's book, "Death of Death." These last two mentioned books we sell at \$1 each, or give them as premium for three subscribers to this volume of *THE MICROCOSM*.

Subscribers should not forget our liberal offer of Dr. Mott's "Lectures on Sound," 108 pp., handsomely and substantially bound in cloth, and of our small Webster Dictionary, either of which we give as a premium to all new subscribers who take this volume of *THE MICROCOSM* from the commencement.

WILFORD'S MICROCOSM.

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• DURATION AS APPLIED TO GOD.

BY REV. J. J. SMITH, A. M., D. D.

In the last March MICROCOSM is found a very well-written article entitled "The Great Mystery," to which I wish to call attention in a very friendly way for the purpose of pointing out an idea incidentally advanced by the writer, and which I have often seen advanced before, but which I believe to be radically and essentially false. It is this, that with the Almighty there is no *past*, and no *future*, but an eternal *now*. In the paragraph referred to are these words, "Touching the Infinite intelligence there is no past, and there can be no future."

My first objection to this hypothesis is that it directly and most emphatically antagonizes the Word of God, and therefore cannot be true. It is by no means the view that he has given us of himself upon this subject. "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is and which *was* and *is to come* the Almighty." Here he speaks, in reference to himself, most distinctly of the *past* and the *future*, as well as the present. Many other passages of like import might be adduced if it were necessary, but this alone is sufficient for our purpose, as it is plain, positive, and unequivocal.

But, perhaps, it will be urged that God has used these forms of expression to accommodate himself to the imperfection of our intellects, and therefore it is to be understood as merely the language of accommodation. But where is the evidence of this? It is found neither in earth or heaven. Besides, if Duration with the Divine intelligence admits of no past or future, then one of two things must inevitably follow, namely, either that no such attribute as that of eternity belongs to God, or else there is no capacity in the human mind to receive it. In either case the Scriptures are lowered and greatly injured in their character, as a revelation from God to man. This is manifest, because, if the declaration that he is "He who *was* and *is*, and *is to come*," etc., is not true literally, it is not true figuratively, for in that case the figure rests upon no basis, and consequently it can illustrate nothing, and therefore means nothing.

My second objection to this theory that with the Divine Being there is no past or future, is that it is contrary to reason, and therefore must necessarily be false. The only way that we can think of Duration is to think of it as continued existence: and continued existence must, in the very nature of things, be made up of successive moments. The mind can form the idea of Duration in no other way. It is plainly unreasonable to ask any man to believe any proposition that the mind cannot conceive as being possible, and that it intuitively rejects as involving a manifest contradiction. I can think of no greater absurdity than there is in affirming that a *single* moment (the *nunc stans*, the eternal now) can be made to stand thus still, and be co-equal with eternity, and still be a moment. It is as absurd as it would

be to affirm that a mathematical point can be made to co-extend with all space without ceasing to be such a point.

We divide time into cycles, years, months, weeks, days, etc., down to seconds; because these are tangible periods of duration. To deny that they have such tangibility, is to deny the reliability of our senses, and thus to sap the very foundation of all of our knowledge. It does not do away with this difficulty to affirm that Duration is something distinct from these artificial measures of time. The question is still, is there not something in Duration when considered generally, or in time when considered specially, which corresponds with these artificial means and methods of measuring? To this, the answer must be affirmative. The same is equally true of surfaces. Although it can in the same way be affirmed that there is a distinction to be observed between the expanse of the ocean and the leagues by which it is measured; yet this distinction can in no way destroy or diminish the real existence of that surface. It is there all the same, whether measured or not. So with Duration. Admit the distinction between it and the measurement of it, it nevertheless flows on whether measured or not. But as there is a manifest correspondence between the surface of the ocean and the leagues by which it is measured, so, there is also a manifest correspondence between Duration and its measurement, so far as it can be measured.

If the Supreme Being does not foreknow events as future before they occur, but regards them as actually existing from all eternity before they do exist, then with him they never had a commencement, but have actually existed from all eternity, which flatly contradicts his revelation to Moses, and which we consequently know to be absolutely false.

Again, if with him there is no past and future, then in his mind all events that have ever occurred, and all that ever will occur, took place instantaneously, which we also know to be positively false.

All who believe in a supernatural creation will, I presume, admit that in the first place there must have been the purpose upon the part of God to create our globe, together with all its vegetable and animal tribes, before he did actually create them, and that these—the purpose and the act—must have stood to each other in the relation of cause and effect, and consequently the act of creation was subsequent to the Divine purpose to create. This necessarily involves the idea of succession in the mind and acts of the Creator.

Besides, as most events have occurred with various intervals between them, it is clear that if God does not understand them as successive in time and order, as they have actually occurred, then he does not understand some things in this respect as well as we do, nor does he understand any of them as they really and truly are in a historical point of view. As this necessarily implies and proves a very great defect in the Divine character, which cannot, for a moment, be admitted, we are inevitably driven to the conclusion, that the above theory

is radically and positively false. That as events have occurred in succession, God's knowledge of them as actual events, or occurrences, must have been successive also. Nor does this foreknowledge and after-knowledge argue an imperfection in his character, any more than does the fact that he changes occasionally in his operations, working at one time and resting at another, or creating at one time and destroying at another, argue imperfection.

A further objection to this theory, that with God there is no past or future, that he does not understand any distinction in the time of different events, is that it not only makes his knowledge about some things, or rather the relation of some events to each other, less perfect than even our own, but it makes it actually false, for it implies that the Divine Being had a knowledge of them as actually existing at a time when they did not actually exist, which involves a manifest falsehood. For instance, it implies that with God, our globe was created and destroyed in the same instant of time; which we know to be absolutely false, for we know that these are two distinct and separate events, not only in themselves, but especially in regard to time, one of which is already past, and the other is yet in the future. As these absurdities can never be admitted, we are compelled to reject the theory, that with Jehovah, in his knowledge of actual events, there is no past, and no future, as unscriptural, unreasonable and absurd.

PATERSON, N. J.

THE PHILOSOPHY OF SECTARIANISM.

BY REV. W. C. FOWLER.

Sectarianism is an attempt to force upon the world a philosophy of those solemn facts of history, viz., Sin, Redemption, and Immortality. To define further would be to encroach on time and patience.

As all things are seen to the best advantage in the light of history, let us look at this subject from a historical standpoint first. Sectarianism is not the outcome of an unwritten past. In all its growths and phases it is within the scope of authentic history.

It became clearly defined at the Council of Nice, A. D. 325, for the first time in history. As it cannot exist save where there is a plurality of beliefs, it had no existence before that time, for there was but one creed in existence, viz., the Apostolic, which was a statement of the simple facts of New Testament history, with no attempt at a philosophy of them.

Indeed, during the first three centuries of Christian history, men believed on the strength of testimony; that of those who lived in the time of Christ and the Apostles, and had seen and talked with them. In the first part of the third century men began to seek a new basis for their faith, such as is found in a philosophy of the facts of Christianity. As those facts were so rooted in mystery as to preclude an exact philosophy of them, there arose myriads of explanations; and as the result of a universal egotism, each one was brought forward in the form of a creed, and the one most popular would carry an ecumenical council by a handsome majority, and invoke the wrath of a superstitious government against those of the minority. The Athanasian philosophy of Christianity carried the council at Nice, and sought

through the civil power the suppression of all dissent, as did other philosophies at the succeeding councils. Thus arose sectarianism, or devotion to a philosophical creed. In view of these facts, none of us will trace it to any inspired source.

If any of the Apostles had favored it Paul would have done it, as he was of a philosophical turn; but he seems to have been remarkably free from such a tendency. We have a portrait of his feelings on this subject in his "First Epistle to the Corinthians." It had been reported to him that the church at Corinth was divided into clans; one party claiming him, another Apollos, and still another Cephas, as leader, on the ground that they had been baptized by him. Does Paul write to those who claimed him (the one through whom they had been baptized) as leader, after the fashion of the ecclesiasts of to-day: Make a careful canvass of Corinth, and if you find enough of your way of thinking to justify it, I will take measures to organize you into a church by yourselves? On the contrary, he indites the following words, fit to be written on the front of the nineteenth century of Christian history: "I beseech you, brethren, by the name of the Lord Jesus, that you all speak the same thing, and that there be no division among you; but that ye be perfectly joined together in the same mind, and in the same judgment." He proceeds further to remind them that his previous teachings had been to the effect that they should glory in none but "Christ, and him crucified;" and seeing how they were glorying in those by whom they had been baptized, he thanks God he baptized but two of them. Then comes the summary of the whole matter, in words the scholarship of the ages can no more exhaust with its interpretation than you can ladle the Atlantic: "Therefore let no man glory in men, for all things are yours; whether Paul, or Apollos, or Cephas, or the world, or life, or death, or things present, or things to come; all are yours, and ye are Christ's, and Christ's is God's."

The Corinthians on reading these words may have said, They sound well, but is it not true that if we have separate organizations in our rivalry in making converts we will spread Christianity in Greece, as we will not if we maintain unity as Paul wishes? The rise of this stock argument of sectarianism is not known to me; but Paul, being inspired, knew its weight, and certainly desired an extension of Christianity more than the Corinthians, or any Christians since. In view of these facts, his exhortation to unity shows that to him there was nothing in this logic of the sects. History shows it to be false. When did Christianity overrun the world, save during the first three centuries, when there was but one creed and church organization, viz., the apostolic? Then it was that all nations heard the truth, and had an apostle with them in life and death; that the altars and fanes of the continents were moved out of their places by the testimony of Jesus; that heathenism fell like lightning, from the thrones, schools and sanctuaries of the earth; that the oracles of old grew dumb, that "no voice or hideous hum" ran any more through "the arched roof at Delphi in words deceiving;" and the fires died on the holy hearths of Rome. Oh, for such zeal as flamed up along the path of history during those non-sectarian centuries! At the beginning of the present century, when Sectarianism began to weaken, "the spirit of missions" was revived

in the church, and dominates therein more and more as the idea of Christian unity orbs itself in the horizon of the world of faith.

To-day in our missionary work we succeed only as we are unsectarian. The missionary says nothing about isms in the foreign field. A divided Christianity failed long ago, in India, China, and Africa, to accomplish anything. Shall we retain at home that which the heathen will not receive? It is the same also with the Home Missionary. In this great West, we succeed only as we preach "Christ and him crucified." So essential is this to our success, that "The Home Board" requires that it shall be our only theme. As we pass with the tide of emigration toward "The Golden Gate," we find no denominational lines that are not easily crossed and recrossed. What we learn in the missionary work we can rest assured is truth. He who doeth the will of God respecting the evangelization of the world will be instructed in the divinest sense.

And will efforts for the conversion of men, that spring from a desire to outdo other denominations in enrolling members, command the Divine blessing?

If you were a native by the burning seas of the East, and a missionary should give as the reason for his zeal, that his sect wished to make the largest report for the year as to conversions, you would be utterly indifferent; but if he told you that though he was of a certain theological persuasion, he came not in the interest of a sect, but to tell you out of love, that the shadow of God's wrath lay down across your years, and that Christ, "the Lamb of God, who taketh away the sin of the world," alone could save you from an undone eternity, his preaching would be to you "the power of God" unto your salvation. No; be not deceived: missionary zeal, that is generated by a love of souls only, will command Divine favor. All other forms of it are outside of the Divine plan.

Sectarianism never saved a man. Those great truths, accepted by all Christians—and by which they are distinguished from the Heterodox, and are known as Evangelicals—save men. They are preached to the exclusion of all else in revival times, when the aim is what it ought to be at all times, to save souls. As we should never preach to any other end; as the mission of the Church in this world is this and nothing else, the preaching of sectarian ideas is always out of place.

Sectarianism clashes with the commission which the Christian minister has received out of the clouds; which is, to "Go and disciple all nations." It says to him, thou shalt not preach in any pulpit but that under the control of those with whom you agree as to baptism, decrees, or church government, unless it be by courtesy.

How infidelity fattens on the quarrels of the sects! Ingersoll makes \$500 a night telling of them. Doubt dies for want of something to talk about, when there is unity among Christians. Renan, though a doubter, when he read that the infant church at Jerusalem had all things in common, said, "This is the first association of individuals, because of an exalted sense of self-abnegation, that has appeared in history." Doubt is always resolved into admiration by Christian unity. Lord Bacon has well said that "Schisms are the greatest scandals;" and that nothing so destroys the respect of men as a multitude of voices in the church speaking

differently; one, saying of Christ, "He is in the secret chamber;" and another, "He is in the desert;" that, as Paul, in his day, said, "It hath the appearance of madness."

Religion is the largest factor in the history of the world. Art is mostly a portraiture of religious ideas and experiences. Science is subject to its influence more or less. Most every volume in the libraries of earth is a presentation of some religious idea or conclusion. Law is but a carrying out in detail of its requirements. Civilization is saturated with it. Most all the sanguinary periods of history might have an introduction like that of Schiller's "Thirty Years' War," in the first chapter of which we find these words, "All the events of this period, if they did not originate in, soon became mixed up with the question of Religion." How sad that such a sentiment, one that is so universal in its influence, should breed dissensions; as it has under the influence of sectarianism!

How shall it be eradicated from the world? Not by any sudden violent movement. Coming into the world through centuries, like all ideas of long growth, it will go out by a long path. Ages will pass ere its shibboleths shall cease. Our course of procedure must be that of Moses, who did not attack polygamy or slavery directly, but indirectly, by establishing influences that tended to counteract and undermine these giant vices. The best method is the slowest. Let us not rush upon it with the fury of iconoclasts, but check its growth with wholesome truth, and leave its overthrow to the spirit of progress that is operating in the hearts of men, as fast as opportunity will allow.

I know of no better cure of this disease, that has preyed upon the Church so long to its disintegration, than the preaching of "Jesus Christ, and him crucified," which truth, in all ages, has tended to solidify the Christian world, the only enduring bond of unity as yet known. Let all else but that which is the direct outcome of this truth be carefully excluded from the pulpit. As the sages of antiquity stood by the altars of their day, wrapt in meditation on the essential truths of religion, while the multitudes came to practice some vain rite, and had their Orphic and Pythagorean Brotherhoods, in which these truths were inculcated to the exclusion of all superstitions, so let us cleave to this great central truth of Christianity, the religion of our day, and leave to natural death isms and distinguishing beliefs, that have nothing to do with the question as to the salvation of man. Let planters of churches enter into no rivalries in places already occupied, but push on to those districts that are destitute of Gospel privileges. Let there be the same magnanimity as was shown by Abraham, that grim old prophet of the Invisible, who, when he stood with Lot at the head of the great valley of the Jordan, said, "Let there be no strife, I pray thee. Is not the whole land before thee? If thou wilt take the left hand, then I will go to the right; or if thou depart to the right hand, then I will go to the left;" and gave as his reason, "for we be brethren." Let evangelical alliances be encouraged, also union services of all kinds, and multiply such literature as will tend to create longings for unity in Christian hearts; and above all, let the spirit of charity brood over them more and more, in response to earnest prayer to Him from whom cometh every good gift—"the Father of lights."

Never have we been fitted for this work as now. The nations are drawing together.

The spirit of unity is abroad in the world in the largest measure. Walls of separation, in the form of caste regulations and national pride, are being thrown down. We have the wisdom and experience of all the past to help us. Yonder in the great yesterday of the world's history, for our helping, are the battle-fields on which the web of wisdom was woven of scarlet threads. There are the ways and means of life, picked up by the bleeding fingers of experiment through sixty centuries. And above all, Christ on his knees, praying that we may be one, as he and his Father are one. And how encouraging the outlook! What hath been already accomplished! It is with shamefacedness that sectarianism appears in the pulpit of to-day. On every side are vague outlines of something better, shafts of unutterable splendor are in the horizon, that tell of the pomp of the coming day. Soon, very soon, righteousness alone shall be exalted in the earth; and with hearts beating in loving responses, and hand clasped in hand, men shall stand about the cross, the grand center-piece in the temple of the world's history. Oh, thou predicted age, may our eyes see more fully thy forming glories!

CARRINGTON, Dakota.

THIRTY OBJECTIONS TO DARWINISM.

BY REV. M. STONE, D. D.

The theory of Evolution by Darwin and others is, that "*organized forms have been evolved from jelly-like matter, in the sea, simple, homogeneous, without organism, without parts, without life.*"

Objection 1st—This theory fails to account for life, either animal or vegetable. No fact has been adduced to show that life has ever been produced from dead matter spontaneously or by any scientific process, but on the other hand it has been seen that decomposition and disorganization begin at once after life departs. Earnest efforts of scientists to produce life have never been rewarded with success. It has been claimed that life, instinct, mind, and moral nature are the result of the motion of brain corpuscles, but no evidence to support this hypothesis has been produced, nor has there been any evidence produced that there is any motion of brain corpuscles, or anything to cause motion in the absence of life.

Objection 2d—If evolution has been going on for ages, it is very surprising that no specimen of a being in a state of transition from one species to another has been found in earth, air, or water, nor any fossil to convey even a hint in support of the theory. If any such evolution ever existed, and has been suspended, it is unaccountable that some remains should not be found to show the fact, and it is very strange that it should be withdrawn before there was an intelligent being on earth to be a witness of the change, since it is claimed that man is the crowning work of this evolution. During the thousands of years of recorded history, men, beasts, birds, fishes, reptiles, insects, and vegetables have continued their forms and functions.

Not a shade of difference in the mind or instinct has been noted. Men are men everywhere and always, in every clime, mode of life, government, and social condition. Beasts are

beasts everywhere without change except where they have been brought under the molding influence of men.

Objection 3d—Evolutionists claim that a power called *Natural Selection* exists, that changes are going on toward a higher condition, by the abortion of useless or worthless matter particles, and the accretion of such as will improve the condition. These changes always improving the form and adding new uses. They call this the *survival of the fittest*. They have selection but no selector. They have discrimination perpetuated through ages, millions of years, removing just the right particles at just the right place, and just the right quantity, not to disturb the organization, and then choosing out other particles, just the right ones, in just the right quantity, and finding just the right place for them not to incommode the organization, but to carry it on toward the completion of the new form. All this is done without mind or plan. It is a wonderful chance that has happened for millions of years to prevail so that such uniformity has been preserved that scientific classification is possible, and that results may be confidently anticipated.

This natural selection must be nearly as good as a god. He must have at least the natural attributes of the God of the Bible, wisdom, knowledge, power, ubiquity, immensity, and immutability. If he lacks anything it can only be the moral attributes, and even these are at least hinted at, in the adjustments of the world indicating goodness and mercy, and the benefits that are seen to follow some courses of conduct, and the terrible evils that are seen to follow other courses. The evolutionists have not, however, seemed inclined to find the moral attributes. They did not invent their little deity with any such design. These great philosophers seem not to think of the necessity for mind, skill and wisdom in the abortion of matter that is useless, and the selection of just what would be suitable for the new end aimed at for some remote future, and the location of it, just where and just so much as will serve a new purpose, if it can be proper to talk of an end aimed at, and a purpose without an intelligent purposer.

Objection 4th—If living beings began from a fleck of albumen floating on the sea, as some of these philosophers say, it will puzzle them to find a way to introduce them to air and land life. For so far as is known all propagation of living beings on land and in air, is by sex, and none of the inhabitants of the sea are known to have any proper sexual organs like land animals, and therefore there could be no transition from aquatic to land and air breathing animals by any mode of propagation known to us.

Objection 5th—The sexual organs are almost infinitely diversified, and usually suited only to the same species except in a few rare cases. In a very few cases races mix once, but never propagate the hybrid. If hybrids were fertile, scientific classification would be forever barred, and science would be impossible in biology and botany.

Objection 6th—Sexual instincts are as diverse as the organs, and so is the sex call. Attractions of sex would be wholly unintelligible across the line of species, and in most cases wholly offensive in others.

Among fishes there is no known commerce of sexes. The female chooses shallow water, or some place where her natural enemies are not likely to come, and deposits her spawn,

and the male comes at a different time and fertilizes them. These philosophers surely ought to tell us how other species whose modes of procreation bear no resemblance to this can have evolved from fishes, or how they lived during the last few thousands of years that they were in a forming state partly fish and partly bird, reptile, quadruped, cumbered with organs a mass of matter useless in water, and with nothing suited to the appetite of anything but fish.

Objection 7th—Evolution from aquatic to air breathing animals would require a complete revolution of the *Pulmonary Apparatus*. How could fish live for ages in water losing aquatic organs and taking air breathing organs?

Objection 8th—The whole *circulating apparatus* must be reconstructed.

Objection 9th—The *appetite* must be reconstructed.

Objection 10th—The *masticatory apparatus* must be reconstructed.

Objection 11th—The *digestive apparatus* must be reconstructed.

Objection 12th—The whole *osseous system* must be reconstructed.

Objection 13th—The *defensive apparatus* must be reconstructed.

Objection 14th—All the *instincts* must be reconstructed.

Objection 15th—Evolution from *oviparous* animals to *mammals* would require a whole *lactal apparatus* for which there are no germs in aquatic animals except the *cetacea*.

Objection 16th—These reconstructions could not possibly be going on for thousands of years. It would involve many impossibilities found in the last ten objections.

Objection 17th—The *locomotive apparatus* must be supplied at once or encumber the creature in water a few thousand or a million of years with rudimentary wings, legs, hair, feathers, to say nothing of the tormenting hunger for which the water could offer no supply.

Objection 18th—The whole system of *muscles, tendons, and nerves* must be reconstructed. We have already encountered more miracles than the Christian religion claims as its credentials.

Objection 19th—If evolution requires millions of years it is so much worse for the theory, for its advocates would need to explain how such unfinished creatures could live in such a state of betweenness as to vital organs, circulatory, masticatory, digestive, sexual, locomotive, maternal apparatus, instincts, organs and appetites.

There seems no alternative but starvation, at least unless the process can be hurried up.

Objection 20th—By a freak of nature *monsters* sometimes appear, but they never propagate. They are universally sterile.

Objection 21st—If hybrids in the vegetable kingdom were fertile we should never know whether we were eating food or poison.

Objection 22d—If different species of animals could interbreed, it would require at least an evolutionist to estimate the ruin that would ensue upon the world in the destruction of values, the confusion of natures and uses.

Objection 23d—A species may be improved by *careful breeding* in the line of its own instincts and habits, but never across the line into another species. These improvements are never effected by natural selection. They are always the effect of human care and skill guided by experience and observation. Domestic ani-

mals everywhere find their highest perfection in the hands of intelligent men, and are to be found only among the most advanced nations. If evolution were true we should look for the highest perfection among wild animals in the oldest countries. Instead of finding the tendency upward in our flocks and herds, the tendency to deterioration is the very thing that farmers and breeders have to fight continually. The finest stock in the hands of a careless or unskillful breeder will always run down.

Objection 24th—The finest specimens of natural wealth are found only in countries where the highest civilization prevails, where the intellect of man is most cultivated as a rule.

Objection 25th—Races coeval with man have come down from the earliest date unchanged except by human skill. The little god Natural Selection seems to have abdicated.

Objection 26th—"Instinct is a faculty prior to experience, and independent of instruction." It is not capable of being expanded into intellect or moral faculties.

It has been improved nowhere within the historic period, nor has it been brought into use in more than about four directions—nourishment, defense, propagation, and migration. It has nowhere shown a tendency to become rational or moral in its operations, nor has it been susceptible of change permanently. If a change has been made by pressure, it always reverts as soon as the pressure has been taken off. The farmer, the breeder, and the hunter all rely upon the uniformity of instincts in their several departments, and the cultivation of brute natures must always be carried on in the direction of their own.

Objection 27th—Man has been progressive from age to age, and man only of all the living beings that inhabit this planet, while the brute has never lifted himself one grain in the scale of being since man was placed upon earth.

Objection 28th—If man was evolved from a moneron (a flock of albumen) without parts, without organization, without life, throughout all the intermediate orders of being, taking on somewhere in the course instinct, intellect and moral sense without his choice, it must follow that he is totally irresponsible, and there can be no such thing as virtue or vice. Man would be no more to blame for killing his fellow with strychnine than the strychnine is for being poison. It is quite likely that the evolutionist philosophers have aimed at this conclusion in putting forth this hypothesis.

Objection 29th—This conclusion contradicts our every-day consciousness.

We feel guilty and deserving of punishment whenever we have done wrong, whether any one knows it or not. We cannot escape those judicial inflictions of conscience unless it has been hardened by long practice in wrong-doing, and all about us join in this condemnation.

Objection 30th—The credulity of the Christian believer bears no comparison with that of the believer of evolution, for we live in a world full of evidence of infinite foresight and wise contrivance and adaptations that somehow perpetuate themselves in a uniform line for thousands of years, so as to make science possible, and assure us of results of our plans, all of which compels the conclusion that there were thought, plan, wisdom, power, and ubiquity at the origin of this system of things.

The writer does not pretend that these thirty

objections reach the bottom of the subject, but are specimens of plenty more of the same sort.
OMAHA, Neb.

A CAMPING TOUR TO THE YO-SEMITE VALLEY AND CALAVERAS BIG TREES.—No. 8.

Visit to Mirror Lake and Vernal and Nevada Falls.

BY PROF. I. L. KEPHART, A. M., D. D.

Sabbath evening we called on the family of Mr. Harris, the man who pays the state \$500 annually for the rent of a small meadow and the privilege of running a livery stable and selling hay, milk, butter and bread to campers. His domicile was within sixty rods of our camp, and although he was not at home that evening, we were very handsomely entertained by his matronly wife and eight children. The parents are Germans by birth, and speak English imperfectly; but they are intelligent, and we were interested by their exhibiting to us some fine photographic views of the valley, and explaining many points of interest; and by their narrating to us some of the incidents of their several years' residence in this place, and their descriptions of the deep snows and long winters that obtain here.

Monday morning we were around and breakfasted at an early hour, for the purpose of going to Mirror Lake in time to witness the rising sun as it rides up over Clouds' Rest. Taking our team, we drove up the canyon about a mile, and a little after seven o'clock were all standing on the shore of that wonderful lake in whose placid crystal waters we could see reflected as in a perfect monster French mirror awe-inspiring peaks, most prominent among which is Clouds' Rest. Here we lingered for some time, admiring the transcendently beautiful pictures, mirrored in the water,—the peaks, the ledges, the cliffs, the trees, the shrubbery, the ferns—all painted in nature's choicest colors, and executed with a degree of beauty and perfection quite beyond the ability of even a Raphael to approach.

While thus held spell-bound with admiration we suddenly saw mirrored in the water, and as if almost under our feet, what had the appearance of a great fiery ball, gradually creeping out from behind the enormous rock that constitutes the summit of Clouds' Rest. O, what a magnificent sight! At first it had the appearance of a great ball of fire crawling out from under the huge rock, but in a few minutes more it seemed to detach itself from the peak, and then it hung out in grand relief, as if suspended in the water! Of course, during the passing of this grand natural panoramic view, we were alternately glancing from the picture in the water to the real performance as seen in the sun's mounting up over the top of the huge mountain, and the two sights combined, and viewed so early in the morning, and amid such romantic surroundings, left an impression upon our mind that time can never efface. Nor can words express our feelings! We all agreed that the privilege of viewing such a sunrise was alone more than a thrice-told remuneration for all the toils and expense of a journey to this wonderful valley. A number of tourists from the hotels, in company with Mr. Hutchinson, the state superintendent of the valley, had joined us, and their expres-

sions of admiration were all that tongue could give utterance to. It was while here that Mr. H. told us of the feat of Mr. Ferguson's placing a rope up to the summit of South Dome.

Having gazed to our hearts' content on this scenery, our party went aboard the large skiff, kept there for the accommodation of tourists, and rowed across the lake and back again, drank of its ice-cold waters, and feasted our eyes upon the bright pebbles upon the bottom of the lake, and the beautiful speckled trout that sported in the crystal liquid, all of which could be distinctly seen even at a depth of twenty feet. After anchoring the boat in its little harbor and taking one more admiring farewell look at this beautiful little water gem of the mountains, we went around to the cascades, where the river leading from the lake plunges down through the canyon to the valley below. Here the dashing, foaming, roaring, surging waters, all apparently engaged in an angry contest to be first to descend the cliffs (remining one of hungry politicians endeavoring to elbow their way into office) were in marked contrast with the serene, quiet lake we had just left. Here in little whirlpools we picked up pieces of pine wood and bark that, by being constantly whirled around and pitted against the rocks, were as neatly and deftly rounded up and smoothed off into oval shapes as if the work had been done by a skillful hand, aided by a jack-knife and sand-paper.

Having made a collection of these, together with specimens of granite, ferns, flowers and mosses, we returned to our wagon, and drove down to the head of the valley, and crossing to the east side of this branch of the Merced, we followed the wagon-road until we crossed to the south side of the south fork of the river. Here we halted, and it being nearly noon we watered and fed our horses, ate a hearty lunch, and took a refreshing rest preparatory to our going up to see the Illilouette, the Vernal, and the Nevada Falls. This point marks the entrance to what is called Tissaac Avenue, and it being the terminus of the wagon-road, we were obliged to leave our team and "take the trail afoot." The ascent is mostly rugged and steep, and after crossing Illilouette Creek we had some fine views of the roaring, thundering cascades that come down from the Vernal Falls. Between these and the Nevada Falls, on a little plateau, is situated Snow's Hotel, at which tourists, on their way to Cloud's Rest, stop overnight. Slowly we "tugged" along up this rocky trail until, within half a mile of the Vernal Falls, when Mrs. Kephart's strength failed her and we halted. Professor and Mrs. Klinefelter continued on, and made the remainder of the journey right up to the foot of the falls, while Mrs. K., Lizzie and I rested. In about an hour they returned and gave to us a most graphic description of the falls and the wonderful sensations experienced while standing right under the descending watery sheet, lashed into a white foam by its contact with the air. The path leading to these falls winds along the mountain side to the foot of the cliff, from the top of which the waters leap, and the ascent to the top is made by the aid of a series of ladders. Formerly this was the only route leading to Snow's Hotel and was not passable for horses; but now a good trail leads along the canyon wall over which the tourist, mounted on a horse, passes with comparative ease and safety. Returning to the wagon, Mrs. Kephart remained there to rest, while the Professor and wife,

Lizzie and I crossed the bridge, and taking the new trail that leads up to the left of the south fork of the river, and around the south base of South Dome, we ascended a distance of a mile and a half, to the end of this trail, and to a point where we had a most magnificent, though distant, view of the Vernal and the Nevada Falls. These are both on the south fork of the Merced, and distant from each other about a mile. In the Vernal Falls the river (here about 60 feet wide), after rushing down a cascade, makes a perpendicular leap of 850 feet, while in the Nevada Falls it makes a perpendicular leap of 700 feet. Reader, stop for a moment and think of the sublime grandeur of these figures! Imagine yourself seated, as it were, in mid air, upon the edge of a huge granite cliff, gazing out in blank amaze on those grand, thundering falls, apparently near enough for you to touch them with a good-sized fishing-pole!

Beneath your seat, a thousand feet below, is playing the noisy, boiling, foaming cascades; all around you are the shining, naked granite ledges, glittering in the sun, their bare outlines only broken here and there with clumps of *manzanita*, and groups of stunted pines; and towering above you are the mighty, snow-capped peaks, previously named:—think of your being thus seated, panting for breath, in the glare of an afternoon's July sun—and then you may have a faint idea of our situation at this time. Here the scenery already referred to so captivates us, that we forget to look in other directions, until, admonished by time and anxiety for Mrs. Kephart's safety, we turn to descend, when lo and behold! we gain a view of the North and the South Domes, capped with snow and glittering in the sun, and apparently so near—a view the like of which we have never seen before! But we weary of attempting to describe this matchless scenery. Our feeble attempts only overwhelm us with a sense of the inadequacy of language to express what the soul can feel! Over yonder to the west, sparkle and leap the sprightly little Illilouette Falls, descending in one perpendicular bound of six hundred feet into a kind of semi-circular basin, whose rocky sides tower almost vertically! All around the spectacle is sublime, imposing, exquisitely beautiful! Those shining, foaming, shifting waters, so in contrast with the towering granite walls in which they are set like gems, together with the clumps of shrubbery and stunted pines, and the snow-capped peaks, towering above them all and glittering in the sun, render the picture absolutely indescribable.

Returning to our wagon, we found Mrs. K. well rested, having enjoyed a good nap; and in a short time we drove to camp, where, having procured a good beefsteak, we prepared and enjoyed a hearty supper. This over, we lighted a large camp-fire, and spent the evening in pleasant social chat with other campers, who favored us with an "informal call."

WOODBIDGE, Cal.

A GREAT REVIEW OF THE "PROBLEM." NO. 2.

(From the Scientific Reporter of Oct., 1878.)

How consistent is this substantial view with the well-known fact, as he points out, that the soldier who has lost a leg actually feels distinct sensations in the absent foot and toes,

even for months after the amputation has taken place; while the dog, also, that has been accidentally deprived of a leg, has often been observed to make attempts to lick the lost foot! No hypothesis, the author insists, save that of the existence of a substantial dual organism in every living animal, can offer any kind of an explanation of such facts as these, or throw any light upon them.

There is not, perhaps, on record a better fortified or more ingeniously constructed scientific argument than the one here but barely glanced at. Facts always known to science, but never before utilized in any way, are here massed in support and confirmation of this central hypothesis that without an invisible vital organism—the duplicate of the corporeal and tangible structure—the body would be but lifeless and insensuous matter, as it really is whenever this vital organism makes its exit.

The healing of wounds, such as cuts, could only take place, as the writer shows, by the vital structure which animates the mutilated surface remaining intact, and thus acting as the guide to the new deposition of flesh; while the varying facility with which wounds heal in different subjects, instead of resulting from the different degrees of purity of the blood, as generally supposed, depends upon the different degrees of the density or rarity, so to speak, of the vital substance of the interior organism which forms the conducting or guiding medium for the new physical formation. Thus, the flesh of aged persons heals with difficulty, not because their blood is less pure, but because the vital substance of the internal organism, like that of the physical, has lost its solidity or textural density, on account of which it forms an imperfect guide or a weak support for the corporeal atoms as they essay to climb into place and repair the damaged part by the molecular action of the circulating fluids.

He further shows that it is the action of this same law of duality in all organic beings by which polyps and certain worms—the *nais*, for example—can be cut up into many sections, each separate division of which will in time reproduce by growth a perfect animal in all respects like the original. This he explains on the principle that the vital substance, constituting the interior organism of such a creature, is so dense that it is capable of expanding, the same as air will expand, and, in a rarefied form, fill a vacuum, and that each segmentation of the *nais* thus continues to retain the entire life-form as the guide for the deposition of corporeal atoms, thus enabling the circulation to build out the complete physical organism.

All this, it is but just to say, is new to physiology, and deserves a place at once among the great scientific discoveries or solutions of the age, equaling, if not surpassing, Harvey's discovery of the circulation of the blood; for, while that discovery revealed the *modus operandi* of a visible and tangible process, the psycho-physiological discovery here announced is, by pure inductive logic and scientific necessity, based on an invisible and intangible substance beyond the ken of human grasp; yet without whose absolute and demonstrated existence the circulation of the blood would be completely inoperative for growth or reproduction.

No one, it may be safely asserted, can read the arguments advanced on this subject, with an unbiassed mind, and not be convinced that, without the admission of such a dual organism

as the author assumes, no solution whatever can be given or even imagined for the problems he has introduced and discussed, or for any of the phenomena relating in general to embryonic development or inherited transmissions. Mr. Darwin himself frankly admits, as quoted by the author, that these processes and observed phenomena of Nature are an absolute enigma on any known principles of physiological science, and adds that "an answer to these questions, however imperfect, will be satisfactory." The author responds that this greatest of living naturalists has here (instead of an "imperfect" answer, which is all he ventured to ask) a complete solution of every physiological problem relied on in support of modern evolution.

The author holds that the mission of true science is to see the invisible and grasp the intangible in Nature;—that the real scientist makes his best and most interesting discoveries with the eyes of his mind, handles incorporeal substances with the fingers of his intellect, and hears the voice of reason and the mandates of the physical laws as truly and literally with the tympanum of his soul as he listens to the ticking of his watch by means of his physical auditory apparatus. He insists that the world around us is full of actual substances unrecognizable by our physical senses, though as really substantial as are the corporeal bodies which we see with our physical eyes or handle with our fleshly hands; and that while there is a sliding scale of gradation in the density and tenuity of corporeal substances, from platinum, the densest of all bodies, up through gold, quicksilver, iron, stone, water, wood, air, hydrogen gas, and odor (the most tenuous of all substances ranked as physical), there must also be a corresponding gradation in tenuity from odor up through the higher or incorporeal substances, such as heat, electricity, magnetism, sound, light, gravitation, life, instinct, and spirit, till at last we reach the central and primordial essence of all substances, the Deity Himself, from whom all things, including all mind and all life, have proceeded.

With such views of substantive existence and entitative being, he naturally holds that there is no necessity for the impossible assumption that all things were originally made out of nothing. God being Himself substantial and the essence of all substance, it would be but a rational conclusion that of Him and through Him do all things subsist that are and were created. It can be no more marvelous or incomprehensible, then, that the omnipresent and substantial Deity should concentrate a portion of His own substance into physical bodies, such as constitute the animal, vegetable, and mineral kingdoms, and thus involve worlds and suns out of His own intangible essence, than that the invisible atmospheric air should be concentrated by modern chemists and physicists into actual liquid of the density of water, as has been done through the agencies of cold and mechanical pressure. When weak man can effect such results by means of his limited chemical knowledge, and his trifling mechanical appliances, it seems but impious presumption to assume that the power which must have ordained these laws of Nature should not be able to condensate planets and systems of worlds out of His own all-prevailing entity, even though such a substance might elude the recognition of any of our gross senses, and even defy the profoundest efforts of human imagi-

nation to form a conception of its constituent elements.

The arguments commonly used to maintain the theory of evolution, as well as the current application of scientific facts so strongly urged by Mr. Darwin in its support, melt away like ice under the direct rays of a tropical sun as soon as this pivotal hypothesis—the substantial nature of life and the mental powers—is brought to bear upon them. The author declares that the sole reason why opponents of Darwin, Huxley, Tyndall, Haeckel, and their collaborators in science, have failed to explain and neutralize the problems which seem to favor evolution, is the fact that no writer has hitherto recognized this elementary scientific principle in physiology of intangible vital and mental substance and of the duality of every organic being,—that within each physical structure, while living, there exists its complete counterpart in form and outline, and of which the corporeal organism is but the outward and visible expression. Till this underlying, all-prevailing, and paramount fact of psychologic physiology is recognized as a scientific proposition by the opponents of evolution, and made an essential factor in the discussion, he insists that the theory of descent, as propounded by Mr. Darwin and now advocated by an overwhelming majority of the scientists of Europe and America, cannot be successfully assailed. Their patent scientific facts collected from natural history, such as those of embryology, reversionary action, rudimentary organs, comparative anatomy, geologic strata, and palæontologic remains, no one pretends to question; and, admitting these facts of science, it seems clearly evident that no solution save that of the transmutation of species and the development of our race from lower animals can offer a satisfactory explanation till this additional scientific fact of the substantial dual existence of every living creature is brought to bear on the problem, which, without doubt, is here for the first time treated and maintained as a strictly scientific proposition.

In thus assuming broadly that the lower animal, as well as man, possesses a dual substantial being, the author does not by any means commit himself to the supposition, as would seem at first sight, that the brute creation must necessarily and individually share immortality equally with the crowning work of infinite wisdom and goodness. One of the most original and beautiful disquisitions in the whole book is the scientific explanation given of the true difference between the rational mental endowments of the human race and the instinctive mental powers of all lower orders of the animal kingdom. Equally beautiful and original is the scientific line of demarkation which he draws between man and the lower animal in relation to adaptability to a state of conscious existence after death, including the reasons why immortality necessarily attaches to the former alone. This difficult and absorbing problem has perhaps never before been attacked from a strictly scientific standpoint, though every man who thinks and reasons has no doubt some time in his life wondered to himself, even if the thought has not found expression in outspoken words, why it is, if I am to live in another state of being, that my faithful horse and my confiding dog should not be permitted to enjoy that life with me! This problem of all problems is here, for the first time, solved on scientific principles, and the true reason

given without reference to the theological aspect of the question.

It would be impossible to give this carefully prepared analysis of the true distinction between instinct and reason, and between the claims of man and those of lower animals to immortality, with anything like sufficient accuracy, without transferring to our columns the entire argument, covering many pages. The reader is referred to the work itself on this important question as sufficiently (but not too much) condensed.

Leaving this highly philosophical course of reasoning, which shows such an exhaustive research into all the questions sprung upon the world by evolution-writers, the author unflinchingly attacks the strong facts and observed phenomena in natural history on which the entire theory rests, and clearly shows them to be opposed to the doctrine they are advanced to support. Improbable as it may sound to believers in evolution, yet it is nevertheless true that the very facts of embryology, reversionary action, rudimentary organs, comparative anatomy, the facts of paleontology and the geologic record, as well as the exploits of the breeder and the fancier, are all turned against the doctrine of transmutation, and made to favor the idea of separate and intelligent acts of creation for each species. In fact, one of the most raking and convincing reviews in this part of the book is the author's exposition of Prof. Huxley's course of lectures in New York, in which he presented his so-called "demonstrative evidence of evolution," based on the geologic history of the horse. No synopsis of this scathing criticism can begin to do justice to the replication. Every fact adduced by the professor is turned against the theory of descent by adaptation, and made to teach the opposite doctrine. If the author of those lectures should ever chance to read these animadversions on his orohippus, pliohippus, protohippus, etc., he would no doubt be glad, if he were able, to prove by living witnesses that he had never been in New York city.

The remainder of this portion of the work ("Evolution Evolved") is devoted to what the author designates the inconsistencies and self-contradictions of Darwinism, a style of argumentation for which he has few equals and no superior. Quotations are collected from all parts of Mr. Darwin's and Haeckel's voluminous writings and brought into direct self-contradiction in so many different ways that one is inclined to half doubt the correctness of the citations, or the possibilities that scientific men could ever have penned the different statements, until a reference to the pages is made to demonstrate their correctness. It would seem that the author had quite deliberately laid himself out to the work of demolishing the transmutation theory, judging by the scores of contradictory passages collected, showing that he must have devoted years to the analysis of the subject.

(To be Continued.)

WHENCE COMES THE IDEA OF GOD?

BY J. M. WASHBURN, ESQ.

The Substantial Philosophy is destined to command the choicest thought of the age and of the world. An essential departure from the Sensuous Philosophy of the past, whether it

shall or shall not demand the homage of confidence for the future ages, it must for the present and immediate future demand the examination of the best philosophical thinkers.

Being an essential departure from the accepted philosophy, its axioms, intuitions and necessary inferences are unique and peculiar to itself. Largely, it introverts examination and criticism. Much of its teaching lies in intuition and that mental perception which exclude doubt, because, passing from the uncertainty of that which is sensuous and so phenomenal, it attains to that which is non-sensuous, causal and so *substantial*. And only in that which is perceived to be substantial, can philosophical thought finally rest.

The base of human knowledge is the soul itself, and in no respect is the base the phenomenal physical body. The new philosophy regards the soul as a substantial entity—an organ of thought and intelligence, operated, in most perfect freedom, by that substantial essence called *life*. And life it regards as the only substance in which there resides inherent activity; yet it is a substance lying beyond cognizance by means of the senses, addressing itself alone to philosophical intuition—in the elevated region of consciousness. Consequently, before a critical examination is made of what is external to mind, there should be a rigid examination of the critical mind itself.

The mental intuitives (aided by experience) suggest that there is a fixed and exact relation between the perceiving mind and the external things perceived. Then the same intuition teaches that the mind, as a whole, is an organ composed of less organs; and the whole organ and the less organs are possessed of certain potencies and functions. While each organ has its distinct function, the mind as a whole has its distinct function. Groups of organs have also distinct functions answering to their aggregated activity. But we must illustrate:

The ear is an organ. Its function is to give knowledge of the substance known as sound. This is its office by virtue of its constitution. To distinguish the kinds and qualities of sound, belongs to culture, an incidental function of the organ of hearing. The eye is also an organ. Its function is to give knowledge of the substance known as light. To distinguish the colors in light, and to admire their beauties, belong to culture or education.

Now by virtue of the very nature of these organs they have their legitimate functions. Or, the function is inherent in the constitution of the organ. The normal, healthy ear must give knowledge of sound; and the normal, healthy eye must give knowledge of light.

The eye and ear are single organs, having fixed and certain functions, as the logically and naturally resulting facts of being eye and ear. And the mind, as a whole, is an organ having a fixed and certain function, resulting from the fact of its being mind. If it is normal and healthy, the function results from that inherent constitution which makes it to be mind.

A specific function of the organ of mind is to perceive, without argument or ratiocination, that all effects must have an adequate cause. This is the simple, uncultured function of mind. Then the necessary reflex function of mind is to perceive that the Cause of all things must itself be uncaused. The reflex function of the mind (aided by experience) perceives also that all effects are finite and in some mode made

known to us as facts, through the senses; while the Cause is perceived by the mind to be differentiated from the senses, non-create and made known to us, not through the senses, but through the perceptive office of the mind. That is, the mind, by virtue of its own nature, perceives that there must be a Cause for all things that *exist*, and that the Cause is itself uncaused. This is the natural and necessary normal and healthy function of the organ of mind.

Whatever *exists* comes, as the mind perceives, from something else. But the Cause of existence does not itself exist. It is in itself—and not from itself. And to be in itself and not from itself, is the essential idea of the Infinite. And the mind perceives that this must be true. How it is true, it may not perceive. How it is true, is not the primary function of the mind to perceive. That rather belongs to culture, and may belong also to the future, the incidental function of mind not being sufficiently cultured to take that in clearly.

The uncaused Cause is *the being* of all *existence* and existence is the outgoing of being. The name we give to uncaused being is God. Then reason, uniting with perception, teaches us that God must be *something* as distinguished from *no-thing*; and that this something must be *substance* as distinguished from *non-substance*.

And thus, through perception and reason, the mind, by virtue of its constitution, reaches the idea of God as being and substance. Thence, by the necessity of reason, we infer that whatever comes from God is substance, since God is himself substance. But it is substance, not matter—a wholly different thing—an existence, not being; while substance is not *created* by God but *flows* from him. But from substance matter is made, or exists. How it is made is not the subject of the present inquiry, the sole object being the consideration. How does mind arrive at the distinct idea of God as the Cause of existence, and the substance of all created things? And to generalize all the foregoing, we reach the idea in this manner: God has so constituted the finite mind, that, by virtue of its own activity, in a normal and healthy state, it perceives that there is a Cause of all existing things, and that such a Cause is itself uncaused. The perception is the simple perception that there is a Cause, itself uncaused. The nature and qualities of the Cause, it is not the primal function of mind to perceive. The nature and qualities of the Cause will be apprehended according to *the state* of mind and its culture. This is an incidental function.

And it must be carefully noted, that the faculty or function of mind to perceive a Cause itself uncaused, is only dimmed and lost by the perceptive functions being impaired by the relatively undue development of the senses. The senses and the logical reason deal with matter and things which exist. These are effects—not causes. The pure mind is intuitive, and deals with substance—not effects. And the mind much trained to deal with effects, through the senses, loses the power of intuition and the perception of substance, or cause. From the starting-point of God perceived as Cause and substance, all true philosophy must be perceived and inferred. Accordingly, all philosophy based on the senses or inferred through them must be true only in appearance, or must be merely phenomenal.

PHILADELPHIA, Pa.

AN OLD IDEA RECONSIDERED.

BY REV. E. MATHERS.

It is strange with what tenacity we sometimes cling to the most absurd and unreasonable statements, simply because they are old: whereas the fact that they originated at a time when many things were very imperfectly understood, and many of the sciences of modern days had not been dreamed of, should be sufficient reason that all such ancient theories should undergo a thorough revision, that the grains of valuable truth, which no doubt may be found in them, can be sifted from the mass of chaff in which they are enveloped.

Such, for example, as the theory of some of the old philosophers that the human body undergoes a change of all its elements once in seven years. Why the magic number *seven* should have been selected we leave antiquarians to decide; our present purpose is to inquire how much or how little truth is involved in the theory.

The human body, the corporeal part of the man, is composed of just such matter as exists all around us. Of this matter, as to its nature or essence, we know absolutely nothing. All that we can know are some of the properties or qualities which our senses are capable of apprehending. One of the most obvious properties of matter is inertia, the tendency to remain at rest. Matter under no circumstances can move itself. If moved at all, it must be moved by some external force. This is true whether we find it in masses or molecules.

An average healthy man weighs about one hundred and fifty pounds. One hundred and ten of this weight is water; the remaining forty pounds constitute the solid part. So the human body consists of about three pails-full of water holding in suspension less than half a cubic foot of carbon, lime, phosphorus, soda, potash, nitrogen, silica, some iron, and some other matters in smaller quantities, amounting in all to about forty pounds. This aqueous pulp, through the agency of vital force, is made to assume consistency in the shape of flesh, bones, blood, and the various tissues and organs of the body.

We assume as an average that every healthy man engaged in active exercise consumes about four pounds of fluid and about nine ounces of solid food in twenty-four hours. Of course, there is great diversity in this respect. Some are so constituted as to require less food than others. Climate and acquired habits have great influence. If we can trust ancient chronicles, the old anchorites of the Syrian deserts were able to subsist on a handful of dates and a draught of water daily, even to extreme old age. A German beer-drinker will consume twenty pounds of fluid and three pounds of solid food daily. An Esquimaux under the arctic circle will consume as much as fifteen pounds of seal-blubber and drink a quart of train-oil in twenty-four hours. These, however, are extreme cases. We take the ordinary healthy, temperate man, and we give the most moderate estimate. In one year, however, this amounts to about seventeen hundred pounds; and if life be prolonged to the proverbial three-score and ten, it amounts to one hundred and nineteen thousand (119,000) pounds of matter that has actually passed through the system of every man who has arrived at the age of seventy years; enough to build seven hundred

and ninety-three (798) bodies of one hundred and fifty pounds each, with a fraction over for good measure.

The inhabitant of this exceedingly fragile structure has actually selected, assimilated, used and ejected this enormous amount of inert matter. In other words, it has constituted the *living* body of the man, first and last, during the seventy years of his life.

It must not be forgotten, however, that the expenditure of the various elements composing the body is by no means uniform. Those that are most necessary are furnished in greatest abundance, and consumed as rapidly.

Thus the carbon in the form of hydro-carbon, constituting the fuel that is to maintain the normal temperature of the body by union with the oxygen of the atmosphere in the lungs, and the partial decomposition of the water in the capillaries, is much more rapidly consumed and renewed than the lime which forms the foundation of the bones. The nitrogen which makes up so much of the muscular fiber, is expended by the constant use of those muscles more rapidly than the phosphorus which enters into the nervous system, or the iron in the red corpuscles of the blood.

The avocation of the individual has a very great deal to do with this waste of tissue. During Dr. Tanner's forty days' fast, he lost in weight perhaps forty pounds. During that time he consumed about twenty pounds of water; hence his actual loss was about sixty pounds.

A stalwart workman weighing one hundred and fifty pounds, was engaged laboring every day making iron in an iron-mill during the forty days in which the doctor was fasting. This workman consumed daily as much as eight pounds of fluid and twenty ounces of solid food, making in all three hundred and seventy (370) pounds expended, as he only weighed one hundred and fifty pounds at the expiration of the forty days, making a difference of three hundred and ten pounds between the doctor and the workman of actual loss.

Thus the workman's body underwent at least one entire change, if not two, in less than seven weeks, instead of seven years; while Dr. Tanner only lost sixty pounds.

Of course this expenditure differs most materially at different periods of life. So in youth the growth of the body to full development must be provided for. To produce this result it is evident that nutrition must exceed excretion. In extreme old age, the desire for food decreases; as the functions become languid, and the body becomes inert, the expenditure of material becomes proportionately lessened. But during every period of animal existence the change of particles and elements is continually going on in a greater or less degree. Some of these elements waste more rapidly than others.

To a mind capable of putting three ideas together, the conclusion would seem to be well nigh irresistible, that there must be some substantial entity, some being who is capable of combining and controlling this ceaseless stream of merely corporeal molecules that is so constantly passing through the system, so as to produce definite results.

Our materialistic philosophers do not dare to teach definitely that the water, carbon, lime, phosphorus, etc., while mingled with the general mass around us, are capable of thought or contrivance, or that after they have been used

in the living organism, and been ejected, again to take their places in air, earth, or ocean, they are any more susceptible of mental operation than before. Hence, if matter thinks at all, it must be during the exceedingly brief space of time during which it made a part of the rickety concern which we call the human body.

Will we be content any longer to permit such imbeciles as assume to be leaders in the modern school of infidelity to teach us science, who are incapable of apprehending the simplest facts in physiology or acoustics, or who deliberately ignore those facts for a purpose?

It is matter of profound gratitude to God to know that the Substantial Philosophy is uprooting all such puerilities as the doctrines of evolution, modes of motion, wave-theory of sound, spontaneous generation, and all the other absurdities of agnosticism.

Let the good work go on, and let every independent thinker fearlessly attack every error he may discover either in old or new theories, and help hold up the hands of such faithful workers in the cause of truth as Wilford Hall and his corps of laborers.

ELLENBORO, W. Va.

FREEDOM OF WILL.

BY CALVIN RANKIN.

That man, with comparatively few exceptions, is possessed of the power of voluntary choice, that he is a being capable of reasoning with himself, and weighing up in his own mind the *pros* and *cons* in reference to any line of action, seems to be so self-evident, one would think no one could be found to even hint the opposite. Yet there are many who, calling themselves scientists, and laying claim to be considered as among the advanced thinkers of the age, calmly tell us man is not a volitional being, that he is a mere automaton actuated by circumstances, and has no more control over the disposition of his life than has the wind-tossed thistle over the direction it takes when in the whirl of the gale;—in a word, they claim *will-power* to be a delusion and a snare, a mere fallacy, and that, when we imagine to be acting in accordance with the dictates of our will and better judgment, we are really deceiving ourselves, having no choice in the matter, simply and solely being at the mercy of controlling circumstances. That such men as Robert Owen should take this stand is not so much to be wondered at, for they are willing to support their pet theories of atheism, etc., by the promulgation of even greater absurdities; but that men who believe in the existence of a Supreme Power—men who understandingly read and believe the word of Him who has said, "By their *fruits* ye shall know them"—should calmly and concisely tell us that we are not free agents, our power of choice being a mental delusion, and that we are swayed from side to side, and made to do right or wrong, by a force of circumstances over which our will-power has not the slightest control, is so childish and ridiculous as almost to deserve being treated with silent contempt.

To the mind of every properly balanced person who will think for the space of ten minutes on this subject, their theory will appear to have about as much solidity as has the confectioner's fairy fabric of spun sugar. Were their theory universally believed in and practiced, then

to punish the thief and murderer were evidently a gross injustice, because he who committed the theft and he who did the murder could not be held responsible for their crimes, being merely the automatic agents operated on by circumstances over which they had no control. And following out the same line of reasoning, it would manifestly be a waste of breath and time to praise and reward the doer of any good and noble deed, because he would be undeserving of it, the credit going to "force of circumstances," he merely being the *tool*. No one ever thought of giving any praise to the *chisels* which cut Powers' Greek slave, or the *brushes* with which Raphael painted his masterpieces; then why, according to these radical thinkers, should we give credit to the poor piece of mechanism who, under the "force of circumstances," throws himself into the surging waters to rescue a fellow-creature, or rushes into the burning building to save property, when he was forced to do so without any volition of his own, and without any choice in the matter? Will these great "liberal" thinkers tell us that Robert Odium, who recently sprung to his death from the East River Bridge, had no choice in the matter—that he was *compelled* to do so by a combination of existing circumstances? If so (and their hypothesis surely and distinctly does tell us so) was it "force of circumstances" which compelled him to *think* and *reason* out a way and means to avoid the vigilance of the police who had beforehand been cautioned to prevent the act? Then it must also have been the same controlling force that caused his friends to aid and second him in his enterprise, both those on the bridge and those in boats on the river beneath. Surely in this case the coroner's verdict should have been, "Died from too much force of circumstances." But when the last trump shall sound, and Robert Odium stands to be judged before the Giver of all life, will he be held guiltless for throwing that life away on the ground that he was only the victim of a combination of events over which he had no control?

That circumstances will often cause us to adopt a certain line of action *against* our will no one will for a moment dispute; but this does not help the doctrine of radicalism one iota, for the consciousness remains that we would have adopted the opposite course did circumstances permit; as also, when we have committed a wrong or unjust act, does our conscience accuse us of it, thus controverting the theory that when a person thinks he is acting in accordance with his will he is simply self-deceived. It is a most fortunate thing for society at large that this pernicious doctrine is neither generally practiced nor believed in, but that man is held to account both here and hereafter for his actions, which are only the outcome of a reasoning, dominant, substantial will-power, given by Him who intended it to be *used* to work out his everlasting redemption.

BROOKLYN, N. Y.

EXAMINATION OF THE PRESENT THEORY OF FORCE AND ENERGY—No. 4.

BY HENRY A. MOTT, PH. D., F. C. S.

As the various theories of heat, light, electricity, magnetism and gravitation have already been considered—it will be necessary in

this paper to consider COHESION, ADHESION and CHEMISM.

Cohesion is the force by which particles of one and the same body or homogeneous particles in general are held together. When a solid body, as a piece of wood or stone, is broken, the pieces cannot be made to cohere again by merely pressing them together, because the surface, being uneven, can only come into contact at a few points; and the cohesive force is imperceptible; but if the bodies touch each other by large, flat surfaces, as when two well polished plates of glass or metal are pressed together, they cohere with great force.*

"Cohesion or molecular attraction is the form of energy," says Arnott,† "exhibited in springs and elastic substances—such as india-rubber. The bow, the boy's catapult, the mainspring of a watch exemplify the work-power of this nature. The apparently passive exhibition of power to resist separation of the particles of a body is really this form of energy, and a most valuable one it is; rigidity entering as an essential element or factor into all pieces of machinery."

"Cohesive attraction is not, in most cases, the same all round a molecule, but like the poles of a magnet, it seems to lodge nearer certain sides or ends of the molecule."

"As a general rule *increase of heat expands bodies and lessens their internal cohesion.*"

"Cohesion and heat or heat-motion, then, are the two antagonists in nature, on whose relations the physical condition of all bodies depends, and whose relative changes determine the most obvious distinction of substances—the distinction, namely, into *solids, liquids, and gases.*"

In solids we may say that the cohesion entirely overpowers the opposing heat-vibration.

In liquids—"the particles are just on the border of the territory of cohesive attraction."

In gas—"motion is here predominant, and the power of cohesion altogether in abeyance."

"The separation of molecules within the limit of cohesion resembles the lifting of a weight, and is the transformation of actual or kinetic energy of some sort into *potential energy in virtue of molecular position.*"

If, "there is any correspondence between the attractions of gravitation and of cohesion,§ the appreciable range of the latter will be very much less than the breadth of a molecule, which we have seen is so small as almost to defy calculation. . . . "When two masses are made to cohere, it is merely the upper or surface molecules that are brought into play." . . . "Differences of cohesive power, coinciding with differences of molecular structure, and probably of the shape of molecules, occasion the various properties in solids known as *porous, dense, crystalline, hard, brittle, elastic, pliant, malleable, ductile, tenacious.*"

Miller | says:

"Two methods have been generally used to determine the cohesion of solids; the first consists in estimating the tension required to stretch rods of a given diameter of the substance under examination until they give way; the second, in finding the amount of pressure required to crush a cube of the substance of given dimensions."

* See Watt's Dic. of Chemistry. Cohesion.

† El. of Phys., Arnott, p. 13.

‡ Ibid., p. 96.

§ Arnott, pp. 10 and 11.

| Miller's Chemistry, p. 69, vol. i.

The strength of materials, all important as it is to the engineer and to the architect, has little to do with chemistry, although variations in cohesion and aggregation of the same substance exercise a marked influence on the rapidity of many chemical actions. Gunpowder, for example, is reduced to grains in order that each portion may ignite quickly, and contribute its pressure to act upon the bullet, compact masses burning like a fuse.

A very appreciable amount of cohesion still exists in liquids and is displayed in the rounded form assumed by every detached drop. The same form of cohesion is also shown in the case of two liquids which do not dissolve each other, but which have precisely the same density, as in the case with oil and spirits of wine of a certain degree of dilution; if a little oil be poured into such diluted spirits it remains suspended within it in the form of a perfectly spherical mass.

A curious illustration of the struggle between the forces of cohesion and adhesion is exhibited in the phenomena of *cohesion figures* to which attention has been drawn by Tomlinson.*

The phenomena are best examined by allowing some liquid sparingly soluble in water, such as creosote or one of the essential oils, to be deposited gently on the surface of *clean* water in a wide glass vessel *perfectly free* from grease; the adhesion of the drop to the surface of the water will cause it to spread out in a film, but the cohesion of the particles composing the drop immediately produces a reaction; if oil of lavender be used, the film opens in a number of places, producing a worm-eating pattern. The arms of this figure tend to gather themselves up into separate smaller drops, the adhesion of the water spreads them out again, then the cohesion of the oil reacts against this, and soon prevails; the consequence being the speedy formation of the original drop into a number of disks, with sharp, well-defined outlines and convex surfaces. Every liquid has its own peculiar figure. The figures are usually *more or less* permanent, according as the liquid under trial is *less or more* soluble in water. The figure of creosote will last for five minutes; that of ether or alcohol but the fraction of a second. The figures are often extremely beautiful.

Sperm oil, colza oil, and in fact all oils have their own cohesion figure, and Tomlinson considers it would be easy to detect adulteration in this way.

Pyncheon,† speaking of cohesion, says that it “acts only at insensible distances, the closest proximity of the particles being required in order to admit of its exercise. When this proximity has once been destroyed its restoration is a matter of great difficulty.”

Adhesion is analogous to cohesion. It is the force exerted between the particles of dissimilar kinds of matter. It gives rise, says Miller,‡ “to a variety of important phenomena, being mainly concerned in the production of capillary action, of solution, and of the diffusion of liquids; it is also exerted in osmosis, and less directly in the process of the intermixture and diffusion of gases. . . . Adhesion is the more especially worthy of attentive study by the chemist, because in its manifestations it is more nearly allied than any other force to chemical attraction.” Adhesion is exerted between

bodies of all kinds, and when it occurs between solids it is the principal cause of that resistance to motion which is termed *friction*. As a general rule, friction is greater between similar kinds of matter, less between those which differ in nature. Adhesion not unfrequently rises high enough to destroy cohesion, as when sugar or salt becomes dissolved in water.”

If a solid is wet by being plunged into water, a certain preponderance of the adhesion over the cohesion of the particles is obviously necessary; for if the cohesion exceeds the adhesion, as when glass or iron is plunged into mercury, the solid does not become wet.

The boiling point of water is raised by the adhesion of the liquid to the surface of the vessel, especially if shellaced, the boiling will often not occur till a temperature of 105° C. (221° F.) is reached, and then will take place in bursts, the temperature falling to 100° C. at each gust of vapor. By long boiling of water the air becomes nearly all expelled; in such cases the temperature has been observed to rise even as high as 360° F. (182° C.), in an open glass vessel, which was then shattered with a loud report, by a sudden explosive burst of vapor. In such circumstances the cohesion retains the particles of the liquid throughout the mass in contact with each other, in a species of unstable equilibrium; and when this equilibrium is overturned at any one point the repulsion of the excess of heat stored up in the mass suddenly exerts itself, and the result is an explosion with the instantaneous dispersion of the liquid.*

The adhesion between the particles of dissimilar bodies is determined under precisely similar conditions as those considered under cohesion. “Plates of lead and tin, or of copper and silver, may be almost inseparably united by strong pressure between rollers. Adhesion takes place with peculiar facility when one or both of the bodies is in the liquid state, because the particles being free to move, can easily adapt themselves to each other. All liquids, like oil and water, which do not mix, adhere with more or less force by their surfaces, and adhesion shows itself in most cases when a liquid comes in contact with a solid body, the liquid being then said to wet the solid. A glass plate suspended from the arm of a balance and made to touch the surface of water, requires considerable force to separate it. If the liquid which adheres to the surface of the solid afterward solidifies, the adhesion becomes still stronger; this is the principle of cementing. When two glass plates are joined together with sealing-wax, the adhesion is sometimes so strong, that in attempting to part them particles of the glass separate from each other rather than from the wax.”†

“Notwithstanding the great difference which appears to exist between these molecular forces, and that of gravitation, the former acting only at insensible, while the latter acts at all distances, it is not difficult to show that both kinds of attraction may be merely different modifications of the same power. Let it be assumed that all ultimate atoms attract one another with forces varying directly as their masses, and inversely as the squares of the distances between them, and that the aggregates of atoms constituting the physical molecules are not spherical, at least not in all cases. The law of molecular attraction will then depend

* Phil. Mag., 1861 [4] xxii. 249, and 1862 [4] xxiii. 186.

† Introd. to Chem. Phys., 1877, 2d ed., p. 2.

‡ Miller's El. of Chem., Part I., p. 73.

* Miller, El. Chem., Part I., p. 379.

† See Watt's Dic. of Chem. Article, Cohesion.

in great part on the forms and dimensions of these molecules. The attraction between spheres, composed of particles which attract one another, according to the law of the inverse squares, is the same as if the whole matter of each sphere were concentrated in its center, that is to say, the spheres attract one another inversely as the square of the distance between centers. But in bodies of any other shape, the attraction may be regarded as consisting of two parts, one following the law of the inverse squares, just as if the bodies were spherical, the other dependent on the shape of the bodies, and varying inversely as the cube of the distance between their centers of gravity. Such is the case with the attraction of the earth and moon. The equatorial protuberance of the earth produces certain perturbations in the relative movement of the two bodies, which vary in magnitude, according to the law last stated, and would become much more perceptible if the earth and moon were nearer to each other, but would vanish if the distance between them were much greater than it is, for example, if the distance were diminished to one-tenth of its present amount, the principal part of the attractive force, which determines the elliptical motion, would be increased one hundred times, but the disturbing force depending on the figure would be increased one thousand times. If the law of attraction between the molecules of bodies be affected in like manner by their figures, it will follow that at the extremely small distances existing between the particles of a solid body or of two bodies pressed closely together, the molecular force, which determines the phenomena of cohesion and adhesion, may become almost immeasurably greater than when they are separated by any appreciable distance, for the molecules are so minute that the smallest distance appreciable to our senses may be regarded as infinitely great compared with their dimensions, so that it is only at insensible distances that the influence of their form makes itself felt.*

Quincke has made experiments to determine the greatest distance at which the effect of cohesion and adhesion is sensible, and he found for various substances distances varying between one-thousandth and the twenty-thousandth of a millimeter.

According to Poggendorff*—Leonardo da Vinci† must be considered the discoverer of capillary phenomena.

When a capillary tube, open at both ends, has one end immersed in water, the water in the tube is seen to be at a higher level than the water outside. The action between the capillary tube and the water has been called capillary action, and the name has been extended to many other phenomena which have been found to depend on properties of liquids and solids similar to those which cause water to rise in capillary tubes.

The forces which are concerned in these phenomena are those of cohesion and adhesion.

According to Maxwell,‡ in the year 1802, Leslie§ gave the first correct explanation of the rise of a liquid in a tube by considering the effect of the attraction of the solid on the very thin stratum of the liquid in contact with it. He does not, like the earlier speculators, suppose this attraction to act in an upward direc-

tion so as to support the fluid directly. He shows that the attraction is everywhere normal to the surface of the solid.

The direct effect of the attraction is to increase the pressure of the stratum of the fluid in contact with the solid, so as to make it greater than the pressure in the interior of the fluid. The result of this pressure, if unopposed, is to cause this stratum to spread itself over the surface of the solid as a drop of water is observed to do when placed on a clean horizontal glass plate, and this even when gravity opposes the action, as when the drop is placed on the under surface of the plate.

Hence, a glass tube plunged into water would become wet all over were it not that the ascending liquid film carries up a quantity of other liquid which coheres to it, so that when it has ascended to a certain height the weight of the column balances the force by which the film spreads itself over the glass.

So much for the forces of cohesion and adhesion. We will now proceed to consider the force of chemical attraction or chemism.

The force of cohesion we have stated is what binds molecules of bodies together, the force of chemism is the force which binds the atoms of matter together within the molecule. This assumes that matter is composed of molecules and that molecules are composed of atoms. It is the present accepted theory of the constitution of matter.

Remsen* says: "Substances which are held together by cohesion or adhesion can be separated by mechanical means. But we have here evidence of the co-existence of some force which holds substances together and which cannot be overcome by mechanical means. To this force the name chemical affinity or chemism has been given. The object of the science of chemistry is the study of this force in its relations to matter, or the study of the action of matter upon matter as far as it is influenced by this force."

Just as a gas loses its ordinary elasticity when dissolved in water, so a solid loses the cohesion which before held its particles together. Two liquids combined in this way lose some of their original properties and receive new ones that represent a mean between the lost ones. In all these instances some force must be imagined as acting between the particles of the dissolved bodies and the particles of the solvents, which is greater in its effect than the cohesion that originally held together the particles of the solid or liquid, or the repulsion that was exerted between the particles of the gas.

Alloys present all the appearance of perfectly homogeneous bodies, but nevertheless possess most of the properties of the constituents. Here, too, some force must be considered as acting between the unlike particles which differs from the ordinary force of cohesion.

On examining the above-mentioned cases more carefully, we find there is, in almost all cases, a limit to the action of the force. Substances which are soluble in water are not usually soluble to an unlimited extent; on the contrary, for any given temperature the proportion of the substance that can be dissolved is fixed. But between this fixed amount and the smallest possible quantity of the substance all proportions are equally well dissolved. Some liquids mix with each other in all proportions, a perfectly homogeneous liquid being the result. Others dissolve each other to only a limited

* Pogg. Ann. cl., p. 551.

† Phil. Trans., 1711 and 1712.

‡ Ency. Brit., Article, Capillary Action.

§ Phil. Mag., 1802, vol. xiv., p. 192.

* Theoretical Chemistry, Remsen, p. 14.

extent, the limits being, as in the case of solids and liquids, fixed for any given temperature.

Remsen says—"Whatever the force may be that is supposed to be the essential agent in the formation of these compounds in variable proportions, it is certain that the law or laws of its action have not been discovered up to the present. Some have looked upon it as identical with chemism, yet it appears that very distinct differences between the two can be pointed out."

The first feature of these compounds that indicates a radical difference in the two forces is the retaining of the chief original properties of the constituents—this is not true of chemical compounds proper. Again, whenever chemical compounds are formed the constituents combine in *fixed* proportions—in the case of mixtures, solutions, alloys, the constituents may combine in all possible proportions up to a certain fixed limit.

Whether it would be expedient, then, to consider chemism and the force that is the cause of the formation of solutions, etc., as identical, but differing in degree, is a question that has not yet been decided.

According to Miller:* "The cause which unites the various chemical elements—such as the carbon, hydrogen, and oxygen of sugar—to form a new compound, endowed with properties entirely different from those of any of its constituents, is of a different nature from cohesion and of a more subtle kind. *Chemical attraction* (or *affinity*, as it is often, but not very philosophically, termed), is the cause which unites the elements into compound bodies. It is exerted between the smallest or ultimate particles of one element, and the corresponding particles of the other elements with which it is associated in the particular compound under examination." . . . "We may, in fact, contrast the effects of chemical attraction with those of cohesion, by stating that the molecules of a body are formed by the union of the atoms under the influence of chemical attraction, whilst the mass is formed by the union of molecules under the influence of cohesion."

It must be observed, says Roscoe and Schorlemmer,† that the actions "of chemical union in the first place do not occur when the component materials are situated at a distance from each other, close contact being necessary in order that such changes should take place; whilst secondly, we almost invariably notice that such a combination is attended with an evolution of heat, and sometimes of light."

Naquet‡ says: "When combination is produced, the observer perceives it by certain phenomena; there is always disengagement of heat and development of electricity; sometimes the production of light and often contraction of mass.

"Combination is favored by heat, light, electricity, the nascent state, attractive force, bulk, and a certain elective property, in virtue of which a given body combines more readily with a second than it will with any other."

When two bodies combine the compound can be reduced to its elements by the influence of an electric current. In this case one of the constituent principles goes to the positive, the other to the negative pole. All simple bodies can be arranged in a series so that each of them

will be electro-positive toward those which precede it, and electro-negative toward all those which follow. And experience has shown that the tendency which any two bodies have to combine with one another is in direct proportion to the distance which separates them in the electric series.

Chemical attraction exerted between different kinds of matter, says Fownes,* "is to be distinguished from other modifications of attractive force which are exerted indiscriminately between all descriptions of substances, sometimes at enormous distances, sometimes at intervals quite inappreciable We might define affinity to be a force by which new substances are generated."

"Chemical combination graduates so imperceptibly into mere mechanical mixture, that it is often impossible to mark the limit. Solution is the result of a weak kind of affinity existing between the substances dissolved and the solvent—an affinity so feeble as completely to lose one of its most prominent features when in a more exalted condition—namely, power of causing elevation of temperature; for in the act of mere solution the temperature falls, the heat of combination being lost and overpowered by the effects of change of state.

"The force of chemical attraction thus varies greatly with the nature of the substances between which it is exerted; it is influenced, moreover, to a very large extent, by external or adventitious circumstances. An idea formerly prevailed that the relations of affinity were fixed and constant between the same substances, and great pains were taken in the preparation of tables exhibiting what was called the precedence of affinities. The order pointed out in these lists is now acknowledged to represent the order of precedence *for the circumstances* under which the experiments were made, but nothing more; so soon as these circumstances become changed, the order is disturbed. The ultimate effect, indeed, is not the result of the exercise of one single force, but rather the joint effect of a number, so complicated and so variable in intensity, that it is out seldom possible to predict the consequences of any yet untried experiment."

"Whatever may be the real nature," says Fownes,† "of chemical affinity, one most important fact is clearly established with regard to it; namely, that its manifestations are always accompanied by the production or annihilation of heat. Change of composition, or chemical action, and heat are mutually convertible; a given amount of chemical action will give rise to a certain definite amount of heat, which quantity of heat must be directly or indirectly expended, in order to reverse or undo the chemical action that has produced it."

It is highly probable that the thermal effect of the reversal of a given chemical action is in all cases equal and opposite to the thermal effect of that action itself. A direct consequence of this proposition is that the *separation of any two bodies is attended with the absorption of a quantity of heat equal to that which is evolved in their combination*. The truth of this deduction has been experimentally established in various cases by Wood,‡ Joule § and Favre, and Silbermann.

"Chemical affinity (as it is usually, though

* El. of Chem., Part I., p. 5.

† Treatise on Chem., vol. i., p. 44.

‡ Prin. of Chem., Naquet (Cortes & Stevenson) p. 3.

* Man. El. Chem., 1878, p. 258.

† Ibid., p. 268.

‡ Phil. Mag. [4] ii., 368; iv., 370.

§ Ibid., iii., 481.

not quite correctly, designated) between atoms," says Arnott.* "does not appear in any way to correspond to their gravity, but exhibits the most singular and unexpected variations of degree."

Secondly, it differs widely from cohesion or adhesion, inasmuch as these are more powerful between similar than between altogether dissimilar kinds of matter, while chemical attraction is stronger the more unlike the natures of the atoms. Between some atoms there seems to be absolutely no attraction at all; between others it is so violent that they appear eager to rush together.

Atomic action in no way interferes with the weights of the elements; the weight of any compound is just the sum of the weights of its constituent particles—on this simple hypothesis is built the whole structure of modern chemistry.

There is no accidental or indifferent mixture of constituents in a chemical compound, with corresponding gradations of properties.

Sometimes two elements will combine in different ways, under different circumstances, but they invariably follow definite proportions. A single measure of one combines with one, two or more of the other, or two measures of the first combine with one, three, or five of the second, and so on. There is never a complicated numerical relation between the combining measures.

Attraction pervades creation from center to circumference.†

"As gravitation, it is the muscle and tendon of the universe by which its mass is held together, and its huge limbs are wielded.

"As cohesion and adhesion, it determines the multitude of physical features of its different parts; as interatomic action, it is the final source to which we trace all material changes.

"Some would attempt to ascribe the three varieties of attraction to one common origin, or to reduce them to different forms of the same force, as there are some who would have the different kinds of substances to be but variations of one fundamental material. But these generalizations are yet far from being established."

ADDITIONAL THOUGHTS ON THE FIRST RESURRECTION.

BY REV. J. I. SWANDER, A. M.

It is our intention in this paper to offer some thoughts supplemental to our article in the April number of *THE MICROSCOPIC* on the "Resurrection of the Dead;" and also to comment in a friendly way upon the contents of sundry communications sent us by parties who give abundant evidence that they critically peruse the pages of this magazine. When the April paper was given to the public we knew well enough that any discussion of its topic was only the launching of another frail bark upon the stormy sea of controversy; and we were therefore prepared to receive expressions of opinion from as many sources as there are points in the polemical mariner's compass. Upon the whole, the compliments received surpass the merits of the article. A number of our friends, however, have criticised the paper adversely. They are not pleased with it. And yet we venture to assert that the author was

* *El. of Phys.*, p. 35.

† *Arnott, El. of Phys.*, p. 40.

more dissatisfied with the article than many who had either the pleasure or displeasure of reading and noting its contents. We are not proud of our treatment of the mooted question, and yet we are fully satisfied and firmly convinced that the position taken, as to its fundamental features, is the correct one, and that the general tendency of our argument is on a line not quite parallel with that of the truth because of a slight convergency toward a common point.

We are pleased with the excellent spirit manifested by a majority of our correspondents and critics, and hereby express our regrets at not being able to answer them more directly than through the columns of this public journal. Neither is this article penned as an answer to the many learned and amusing questions called forth by our treatment of a subject which, to our knowledge, had never yet been discussed from the same philosophic standpoint. We are willing to be placed upon the stool of interrogation, but with the distinct understanding that we lay no claims to the wisdom of an unerring oracle. Other men are just as much in duty bound as we are to furnish a satisfactory solution of the question under consideration. Christendom is at present in possession of no theory of the resurrection in harmony with recent discoveries of science. Christians are satisfied that God, as his own interpreter, will, in his own time, make the mystery plain; and that the resurrection of the body will eventually be comprehended by reason, even as it is now accepted by faith. But are we in the meantime to shut our eyes and suck our thumbs like babies who lull themselves to sleep on imaginary milk? True, we should not be wise above what is written in the infallible Word of God. Neither should we be content to remain ignorant below what is written in the volume of Nature, which, when not perverted by the element of sin, is equally infallible in its own proper sphere of instruction. And, further, we assert that there is no presumption in an ardent desire and legitimate effort to be wise above those conclusions drawn from the unscientific and contradictory apprehensions of that twofold revelation of harmonious truth which is everywhere given under the autograph seal of the great Jehovah himself, and which should never be considered as correctly understood until each part is seen to corroborate the other, and both are glorified together.

We have but little patience with the men who spend their lives in constant efforts to disturb the tranquillity of the Church by publishing their pessimistic vagaries; and yet we are fully satisfied that the present prevailing methods of drawing out the distorted meaning of God's Word must soon give way to a system of hermeneutics as radically different in its basic principle as the substantial theory of sound is different from the current notions and teachings upon that subject. The mind of the Spirit cannot be ascertained through any amount of mere learning; neither can the doctrinal teachings of the Bible be correctly apprehended and formulated through any process now taught in the common school of inductive reasoning. Spiritual things must be spiritually discerned. Spiritual things! And what are they? Something more than "matter attenuated into sheer nihilation." There is no unsubstantial realm of the Spirit. Neither is there any unsubstantial entity in the spiritual

realm of being. Revealed truth has its inner essence. The Word of God is the indwelling essence or substantial soul of the Bible. Philosophy and religion must come to recognize that substance, as the spirit which maketh alive, before the letter will cease to kill one theological theory by thrusting into its mechanical viscera the contradictory javelin of another. Doctors of divinity go round about the Bible, tell its towers, mark its bulwarks, and consider its palaces, but how little they know of its inner power and glory. Interpreting Scripture by Scripture will do very well when the exegete enters the inner court of the canonical sanctuary. The proper standpoint of sacred hermeneutics is "between the cherubim." It is not enough for the Church to have faith in an unseen Saviour—there must be a corresponding faith in an intangible kingdom which cometh not by outward observation, but none the less real in its veritable and present entities of substantial power and glory. Neither religion nor science can endure without seeing these invisible entities. It is the mission of the Substantial Philosophy to demonstrate this great fact to a semi-skeptical Church. Otherwise the tendency of religion, in the future as in the past, will be either toward Saduceean materialism on the one hand, or over into Gnostic emptiness on the other, according to the power of the world's prevailing philosophy. In either case the Bible will continue to be a ball of wax, susceptible of being molded into a nasal adornment for any theory that can possibly be originated in the brain of the world's bewilderment. We judge of the future by the past; and what is there in the past to justify judgment according to any other rule? Platonism, the Scholastic Philosophy, Cartesianism, Bacon's theory of induction, the sensational teachings of Locke and Hobbes, the modern dominancy of materialism, all have molded the theology of their respective ages. Even the pope has not been free from the influence of the prevailing philosophy of his time. One pope interpreted the Bible *ex cathedra*, to be followed by another, whose *ex cathedra* authority was used to damn the infallibility of his predecessor. The private individual, whose piety consists largely in cursing the man who is a larger pope than himself, proceeds to draw the meaning from the Bible through the little pipe stem of his own private and pietistic judgment. Then each sect produces a theory of Bible Christianity entirely satisfactory to itself until its increasing heterogeneity makes inevitable the spawning of another sect. So with denominations which in conservatism take a more permanent character in history. They allow themselves to be unconsciously molded by false systems of philosophy while they suppose themselves led by the true teachings of God's Word. Thus the Bible is changed into a kaleidoscope and Christendom becomes a Babel.

Our recent paper on the resurrection has had the effect of bringing out a polyglot edition of Babylonish Exegesis. Never before have we been so painfully impressed with the evil of our reigning sectarian hermeneutics, and made so impatiently anxious for something better. No wonder that Dr. J. Williamson Nevin pronounces it a wild bull of Bashan let loose into the garden of the Lord's house. Judging from the number and diversified contents of the letters received, setting forth as many individual opinions as to what the Bible is supposed to teach upon the subject of the

resurrection, we have concluded that either the garden of the Lord's house is full of bulls, or that that which is supposed to be the garden is really a wilderness of conflicting opinions. The most of these communications we have filed away for the future amusement and edification of those who shall continue to read THE MICROCOSM in the interesting volumes to come. A few samples of the budget have been selected for present use, and are now about to be mercifully incorporated in the following paragraphs.

Some one has been kind enough to send us the interesting book of Uriah Smith, published at Battle Creek, Mich., on "Man's Nature and Destiny." The treatise speaks well for the author's head and heart, and indicates his possession of ability and skill worthy of being employed in defense of something better than the theory upon which his arguments are strung. He charges Christendom with being a Babylon in its possession of 599 creeds, and then makes it more Babylonish than ever by adding thereto the creed of unconsciousness for the souls of the departed saints, and utter annihilation for both the bodies and souls of the wicked. His rendering of Scripture and familiarity with other authors show scholarly research and extensive reading. He also exhibits commendable Christian fairness in his examination of the passages thought to bear upon the subject treated. What fault, then, can be found with the author's work? Simply this. He tried to see the sacred entities of the most holy place from the outer court of the sanctuary; and therefore distance lent nothing but enchantment to his view. Besides, his standpoint, philosophically, was wrong. Whether his soul will retain or lose its consciousness after death, one thing is a fixed fact, that it was already here unconscious of the most substantial and sublime realities around it and within it. We therefore do not blame Uriah for allowing himself to be pushed, like his namesake, to the front of the battle, and for writing as he did upon the destiny of man. For the same reason the mantle of charity should be thrown over the narrow and naked shoulders of other theories concerning the nature of the soul. For many years the prevailing tendency of the world's philosophy was materialistic. The universe was fast coming to be regarded as full of matter with no room for anything else. As a consequence this monstrous heresy disgusted the nobler yearnings of the human heart, and caused the current of human inquiry to flow in the opposite direction. The result was a nest of full-fledged vagaries, such as the mentality of molecular motion, spiritualisticism of dancing furniture, a state of utter unconsciousness for the pious who have pitched their tents upon the Hadean plains, and a state of eternal annihilation for the wicked. These conclusions of Smith and others were not altogether unnatural. False philosophy was a prevailing power in the world. It delivered its lectures in the halls of learning; it flew abroad upon the wings of plausible literature, and seduced many of the most powerful and polished pulpits of Christendom. The Problem of Human Life had not yet been written. But now it is different. A new era has dawned. Conscious immortality of the soul has been brought to view from a better standpoint. Hereafter, this will be the condemnation of unscientific vagaries that substantial scientific light has been brought into the world. Had Substantialism not come and

spoken as no other system of mere philosophy ever did, the present generation had not had such sin, but now they have no cloak for their sin. Let the soul-sleepers arouse from their present drowsiness, and view themselves as possessed of substantial and organized entities, and they will have neither fear, desire, nor argument for that suspension and annihilation of human existence, which, according to Battle Creek theology, is the natural destiny of man.

No. 2 is an anonymous communication from some one at Millersburg, Pa., whose gender and morals are equally doubtful. The unknown writer raised two points of objection to our April paper, viz.: 1. That our treatise on the resurrection "is as clear as mud." While modest candor requires us to express our sincere regrets that our articles in *THE MICROCOSM* are not bright with the radiance of intellect, we hope to make this paragraph sufficiently lucid to be understood by that unprincipled scribbler of anonymous letters. We also believe that even the obscurity of scientific "mud" is preferable to that exceedingly transparent theology according to which an essential part of man's being is to hold its existence in ten thousand years of "dust." 2. That we have departed from the teaching of the Scriptures in not holding to the resurrection of every particle of material of which the grave is made the repository; and that without the resurrection of all such particles, the body will not be the same. What a crushing criticism! Under its ponderous load we bow the suppliant knee of recantation. While we still believe in the resurrection of the dead in the full sense of personal and bodily identity, we are now ready to acknowledge one exception to the general rule. Since receiving the above said communication, our faith has undergone a slight modification. At present we are not able to understand how any man who is too cowardly to make his identity known before death can hope to have it preserved through the trying ordeal of that last great change. Neither will we be disposed to consider it any great loss to the sacramental host of God when, at the resurrection reveille, the angelic adjutant of all the armies shall announce that the little individual of Millersburg, Pa., who was too contemptible in moral cowardice to make known his identity in time, is to be reckoned as insignificantly missing to all eternity.

No. 3 is an adverse criticism by Rev. —, of the M. E. Church, —, Ka., whom having not seen we love and admire because he dares to say just what he has been taught to believe upon the subject. He is an avowed substantialist, is struggling hard to become an independent thinker, and is evidently a gentleman of quite extensive reading. His communication was not what it might have been in the way of high-toned Christian courtesy; and yet we should not complain of his cutting sarcasm, because, in opening up correspondence with a stranger, he did not entertain an angel unawares. If we ever meet our good Methodist brother, we shall offer him the right hand of fellowship and tender him a most hearty greeting.

He complains that we did not furnish a complete and satisfactory solution of the question treated, and in the same connection expresses the fear that we have unconsciously fallen into modern rationalism—that we have "taken issue with the Teacher and teachings of John v. 28-29," and that our article teaches "the cremation or evaporation of the human form

divine." instead of a genuine resurrection. The gentle brother then throws the mantle of charity over our heretical "form divine" by expressing the belief that we are a "young man" and of "immature scholarship." To the last count in the foregoing indictment we plead guilty; and while we are asking the mercy of the court we take pleasure in calling the attention of the learned bench to the utterance of one who had the well-deserved reputation for mature scholarship. We introduce our Kansas critic to Bishop Foster of the M. E. Church, and call the former's attention to what has been left on record by that pious, learned, and eloquent man. In his course of lectures delivered before the Chautauqua Assembly in 1878, and afterward published in his "Beyond the Grave," p. 162, the scholarly divine says: "The word resurrection is strained when it is insisted that it is equivalent to the statement that the exact body is to be restored. It may even be doubted whether it is an assertion concerning any part of the body. Its utmost meaning is, that the *MAN who is cut down by death shall live and flourish again*" (italics and capitals ours). Also on p. 161: "There is no particle of it [the body] that it [the soul] particularly cares for. If it should lose atom by atom, as in fact it does daily, it would not go into mourning. Its mold in the grave will have no special charm for the soul. Let us cease to be the sport of dreams and slaves of prejudice." Our Kansas brother will please give attention to the above admonition. His bishop is speaking. Let judgment begin in his corner of God's house, and after he has cleared the docket at home he will probably meet with more success in his efforts to convict and correct other heretics of like precious faith.

The fourth and last communication we shall notice in this paper is from a minister of the Reformed Church in the United States. We meet, therefore, upon liberal ground. The "Heidelberg Confession" was never intended as a strait-jacket for any man's reserved rights and opinions. We know of nothing in its teachings in conflict with our expressed view of the first resurrection as seen in the light of the Substantial Philosophy. If, however, it should become manifest in the future that that venerable and amiable little book, or for that matter any other confession in Christendom, is evidently at variance with the obvious teachings of true science, the symbol must be made to undergo any such change and modification as may be necessary to bring it into harmony with the truth. We consider the foregoing assertion as neither very original nor radical, but a proposition which must be regarded as fundamentally correct as long as progress is the watch-word of science, and perfection the pole-star of human history. And we remark further that science is not under bonds to appear before the bar of the Bible, when the latter is considered as a mere volume of valuable archives to be ransacked at random by the vandalism of materialistic induction. Both the teachings of science and the Bible as now constituted, and as it now incorporates not only divine, but also human elements—which, it is reasonably presumed, may, notwithstanding its recent revision, possess at least some slight possibility of further defects—must finally appear for judgment at the bar of *God's Word*, which is "forever settled in the heavens." This substantial Word of God is the *Truth*, whose goings forth are from of old, from everlasting, and from whose de-

isions in all matters of conflicting theories there can be no appeal.

But to the letter of Bro. S. His first difficulty is that our article on the "First Resurrection" "implies that as regards those who die unsaved there is no resurrection at all." To which we reply that his inference has no legitimate existence. It is one he had no right to draw from our silence upon that side of a general subject which we had undertaken to treat only in part. He seems not to know that the term *first* implies a second, either in numerical order, or in kind, sometimes in both order and kind. Suppose that Rev. Mr. S. were to write an essay on sheep and remain silent concerning goats, would it be reasonable for any one to infer that his paper teaches by implication that there are no goats? Or suppose the brother were to come out in the columns of *THE MICROCOSM* with an article on the moral beauty of Jesus, and in the same treatise say nothing whatever concerning the ugliness of the devil, would such silence imply that he did not believe in the existence of such a being? If Bro. S. is satisfied with his theology upon the subject of the resurrection, we do hope that he will proceed to pick an uncompromising quarrel with his logic as applied in the case represented by the above quotation.

The second difficulty of our Reformed brother is one which has perplexed every theologian who has ever tried to think upon the subject in a scientific way. "With what body do they come?" The argument of Bro. S. is as follows: "Christ's resurrection is the pattern of the resurrection of all others who shall arise; the material body of Christ was raised from the grave; therefore it follows that the same will take place as to the material of the bodies of others." First, we deny the truth of the major proposition as held in the questionable light of our current theology. Christ's resurrection is the pattern in the sense that he is the substance and root-principle of the concrete and glorious mystery. To make Christ a mere outward pattern, in a mechanical sense, of any fact, or act, or achievement in the history of the individual Christian, or in the history of his kingdom from grace to glory, betrays the wretchedness of abstract thinking, and the leanness of our most popular theological literature. Away with such mince-pie divinity! Christ indulged in no rhetorical flourish when he said: "I *am* the resurrection." His is therefore the pattern of the saint's resurrection, not in the sense of something to be copied after, but as the principle of resurrection fruit. Paul so understood the subject treated in Cor. xv. Otherwise, the whole chapter would be a miserable mess of jargon. The core of his masterly argument is in substance: "If you do not admit the flowing of the stream, you deny the existence of the fountain; but the fountain is a fact—Christ *is* the resurrection, and he is risen from the dead, and, therefore, the stream must flow as a necessary and legitimate result, viz.: All who are substantially and organically in him are already risen with him, and the process must complete itself in the resurrection of their bodies."

But it does not follow that the material of their bodies will arise as Christ arose in his material body. That sort of reasoning would lead us to conclude that St. Peter's resurrection will show the nail-prints which the Apostle received in his crucifixion, and a continuance thereof would lead us into absurdity, world without

end. Paul said that he was crucified with Christ, and by the cross of Christ. Are we therefore to conclude that his material body hung upon the material cross on which the Redeemer died? Even Catholicism in the doctrine of the mass, does not teach anything more objectionable than some of the materialistic inferences of such Protestant theology. It is in this way that violence is done to the Bible, science and common sense. And it will never be otherwise, indeed, until a general and hearty recognition of the invisible and organic entities of being becomes the guiding star of both faith and reason. It must ultimately come to this. Science must endure as seeing the invisible, or perish utterly from the earth.

We believe in a full salvation, and in a full resurrection; but our faith has neither room nor relish for the many monstrous deductions of materialistic philosophy now pester the Church as severely as the frogs did the inhabitants of Egypt. If this is rationalism, we are proud to plead guilty of the charge. The practice that once filled the Church on earth with relics is bad enough; the theology that tries to carry them into the Church triumphant is worse. It may appeal to the resurrection of the Second Adam, but will find no justification in that principle and formative period of a process in which all saints have a consequential part. Christ was without sin, and as there is no merit in physical decay there was no reason why God's holy One should see corruption. As pure water leaves no sediment, so the immaculate Redeemer left no "remains" in his death. The saint leaves a sediment behind, because every principle and particle of his essential personal being is filtered through the Rock of Ages. Publish it through *THE MICROCOSM*, and keep it before the people, that in the light of the more Substantial Philosophy of the dawning future it will be seen and acknowledged that the sedimental deposits of the grave are no more necessary to constitute the saint's complete identical being in the glorified state of the just made perfect than the settlements of impure water are essential to the water as such after God has taken it up and clothed it upon in the clouds of heaven, to reflect the beauty of the sunbeams, and give back the rays of his supernal glory.

FREMONT, Ohio.

THE WORLD SAVED THROUGH A NATION. No. 1.

BY REV. S. A. TAFT, D. D.

Facts are facts, and fact is not fiction. Let us therefore look at some of the following facts, for facts they are, and contemplate them in their bearing on that great truth, so lately enunciated in the columns of *THE MICROCOSM*, by the able pen of Prof. M. Dozier, namely, "*The salvation of the world in, and through, and by the salvation of a specific nation.*"

The redemption of the Bible is national, and not racial, except it may be indirectly. It was the redemption of man in his social relations, as under government and law, and not as a *soul* simply. It was the redemption of the state, or of man in his aggregate capacity and as constituting the state, and not as an individual or an immaterial entity alone. Hence the facts. And,

1. It is a fact that in A. M. 2463, in the Penin-

sula of Sinai, and under the leadership of his chosen servant Moses, the God of the Bible did then and there *organize* for himself a terrestrial kingdom, commonwealth, or polity.

2. It is a fact that this commonwealth, or polity, was organized *of the people or descendants* of Abraham, in the line of Isaac, Jacob, and his twelve sons.

3. It is a fact that this same commonwealth was *established* A. M. 2508-8, under the leadership of Joshua, in the land of Canaan, or what is now known as the "Holy Land."

4. It is a fact that the constitution or fundamental law of this Holy Polity was twofold, (a) the "old covenant," and (b) the "new covenant."

5. It is a fact that the old covenant was "added" (Gal. iii. 19) to the new. Hence (a) these two covenants sustained to each other the relation of codicil or supplement to principal or chief, of shadow to substance, of sign to the thing signified, or of type to anti-type; for that which is added is codicil, or supplementary to that to which the addition is made. And every substance casts its own shadow. It cannot cast the shadow of something else. Every shadow, therefore, is an exact outline of the substance which cast it. It cannot be the outline of any other substance. It follows, therefore, that between shadow and substance this law must hold, *the law of perfect and complete correspondence*. If the shadow is that of a man, the substance must be a man. It cannot be any other substance. And so, if the shadow is that of a people, organized under government, and in possession of a country or dominion, the substance must be the same thing, except it must be infinitely superior. Hence the old covenant, and the things under it, was the shadow of the new covenant and the things under it, I mean the essential and necessary things. (b) The new covenant was really older than the old covenant by all the time that intervened between the gift of the one and the addition of the other. And this, from Gal. iii. 17, we learn was a period of four hundred and thirty years. It follows, therefore, that the precise date of the new or substantial covenant was A. M. 2038; for the date of the old or shadow covenant was the date of the shadow organization of the holy commonwealth; and this we have seen was A. M. 2468. And, if from this latter date, we subtract the 430 years, we have left A. M. 2038 as the date of the new covenant. And it is a fact that in that identical year, Jehovah did make a covenant, and confirm the same to his servant Abraham, Gen. 15. And it is a fact also that that covenant guaranteed a nation, and hence a government, for a nation is impossible without a government. It guaranteed also a country or place for the same reason. And more, it guaranteed the mightiness and ultimate universality of this nation; and hence its ultimate, universal prevalence over all men and the world. And we know that this nation was commenced as noted in fact 2. And further, we know that to this nation, as the base and groundword of its organization, the old shadow covenant was given. It follows therefore that the old covenant was added to the covenant made with Abraham, and became the codicil or supplement to that covenant. But the covenant made, given, and confirmed to Abraham was the covenant to which Paul alludes in Gal. iii. 17, and which he says, was "the covenant before confirmed of God." And

it is a fact that Jesus was the mediator of this covenant. "Of which," says Paul, "he [Moses] was not the mediator." But, from Heb. viii. 6 and ix. 15, we learn that Jesus was the mediator of the new covenant. And this is styled also the "better" covenant. The new covenant, therefore, was the covenant made and confirmed to Abraham. And it is called the new covenant, not because it was the later given, but because it was the later executed, or brought into force. The new covenant, therefore, being itself the covenant before confirmed of God, and this in turn being the covenant made to Abraham, was the old, original, foundation covenant or compact of the holy commonwealth. And everything said and done, of a governmental nature or character, was said and done with direct reference to this instrument. It became the Alpha and the Omega of every substantial movement of the nation. It was the needle of the nation's destiny.

6. It is a fact that the new covenant was confirmed, *but not dedicated*, an important omission, right at the time of its gift or bestowment. Gen. x.v. Biblically considered, there is an essential difference between the confirmation of an instrument and its dedication. The one, for a time at least, may exist without the other, or they may exist in conjunction. Confirmation may exist without dedication; but dedication cannot exist without previous confirmation. Each is a distinct action, and has a distinct purpose. The one is assurance; the other is execution, or putting into force. An instrument must first be confirmed, however, before it can be dedicated. Assurance must precede execution. Assured, the article of agreement may lay for a long time, as was the case in the instance of the new covenant, before it is executed. And in all this time the compact is said to be wanting in force, or is legally inoperative.

In the confirmation of an instrument, there is (a) "a cutting" and then (b) there is a passing between the parts cut. And this passing between the parts cut is performed by one or both the parties to the compact, according as it is made to a person or *with* a person. If made to a person, then the party making the covenant passes between the parts single-handed and alone, but in full view of the party to whom the compact is made. If made with a person, that is if the covenant is mutual, and imposes mutual obligations, then both parties to the agreement pass between the parts cut. There is no instance, however, where God and man has ever jointly confirmed an agreement. But there is evidence where each has done it to the other. Genesis xv. 17 is in evidence that God confirmed an agreement to Abraham. And Jer. xxxiv. 18, 19 is in evidence that Israel confirmed an agreement to God. In the former case the agreement is always sure to be verified, in the latter it is extremely doubtful. But this passing between the parts cut was confirmation. Dedication, however, is another thing entirely. It consisted in sprinkling both the article of agreement and the parties involved with blood. Heb. ix. 19, 20; Ex. xxiv. 5-8. But the new covenant was not thus sprinkled at the time it was made, nor until long years afterward. There was simply a passing between the parts. This was confirmation, but not dedication. The covenant therefore was as yet inoperative; nor could it come into force until dedicated; for dedication, and not confirmation, made the in-

strument dedicated legally active. It gave it vitality and made it immediately effective for the purpose contemplated. But the time had not yet come to give force to the new covenant. Things essential to its execution were not yet in existence. The nation even that was guaranteed by this covenant, and to whom it was one day to be a fundamental law, had not yet been born. Hence confirmation was all that was necessary; and the dedication could be put over indefinitely, or until a time appointed. And this is just what was done. The dedication was delayed for centuries, or from A. M. 2093 to A. M. 4123, or A. D. 84. And yet, in all this long period, the new covenant lay there in the archives of the nation, not altogether a dead letter, though legally inoperative, but as a mighty lodestone, governing and controlling the nation's marvelous destiny.

7. It is a fact that the old covenant was confirmed and partially dedicated, right at or very near the time it was made. Jer. xxxiv. 18, 19; Ex. xxiv. 5-8; Heb. ix. 19, 20. I say it was partially dedicated, not fully so, for it could not be fully dedicated without the death of its testator; but for reasons, this could not be quite yet; and therefore in the outset the dedication was only partial. It is true, Moses, the testator of the old covenant, died by proxy in the death of the victims whose blood was employed for the purposes of dedication; but the law required the actual death of the actual testator, before the testament could come into full force. Heb. ix. 17. The practical dedication therefore of the old covenant could make it only partially effective. It made it effective for the purpose of organization, and such other purposes as were then pending, *but not for inheritance*. Moses must actually die before the old will could come into full force, so that the servant or minor heir could obtain a minor's possession. And this did not occur until some forty years after the particular dedication. He died, however, and immediately after the nation acquired their temporary, lease-hold possession.

Moses was the testator of the old covenant just as Jesus is the testator of the new covenant, and by precisely the same law, viz., divine appointment and designation. It was necessary, therefore, that the servant testator should die, before the servant will, or the will in the interest of the servant or minor heir, could come into full force. I use these terms, "servant nation," "servant testator," "servant will," "servant inheritance," etc., to distinguish the old from the new order of things, or things as they will be under the new covenant, when the kingdom and all its affairs will pass out of the hands of the son minor into the hands of the son major.

8. It is a fact that God's nation was originally organized under the codicil or supplementary law, and not under the old original compact of the nation. It follows therefore that the organization thus effected was *provisional and temporary*, and not permanent. This is a most important fact. The organization thus effected was not designed nor intended to hold forever, but only for a season, or until permanent results could be reached. A codicil condition of things is always provisional. It is with a view of present benefits, and to prepare the way and lay the foundations of that which is to come after, namely, the permanent and abiding.

And I trust this fact may have its full weight with any who may be following the argument in hand, and in confirmation of that great truth, viz., "The salvation of the world in, and through, and by the salvation of a specific nation." A temporary arrangement implies a permanent one. And since the divine commonwealth, in its original organization or founding, was only provisionally organized, the natural inference is that a permanent organization was contemplated. And since no permanent organization has ever yet been attempted, it follows that such an organization is still an event of the future, and remains to be executed. And such is the fact. Nevertheless it is sure to come in its appointed time. Let no one deceive himself with the idea, that because the time has been long, and is not even yet, that therefore it will never be. For as God lives, and live he does, it certainly will be. Nothing can stay it. God has appointed the time for every specific event in history, and the moment any of those times comes around, and they are recurring every day, the thing determined for that particular time is sure to occur. It will come, and will not tarry. And so all the great purposes of God are sure to be verified and made good, each in its appointed season. And so, too, it will be in this matter of the divine polity. In the time appointed it will be permanently organized and established in its own country or dominion. And thence on, its career will be swift and glorious. It will become great and mighty, and nothing can stay it. But no more now. Hold in mind the facts thus far given, and see my next.

SANTA ROSA, Cal.

A SPECIMEN INDORSEMENT.

The following is a specimen of many of the kind notices we are now receiving from those who have taken advantage of our unparalleled offer of Appleton's New American Encyclopedia, and will show how it is appreciated:

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Hydetown, Pa.

WILFORD'S MICROCOSM.

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A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of *THE MICROCOSM*. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE FINAL ARGUMENT FOR THE WAVE-THEORY.

THE CRISIS REACHED AT LAST.

As the reader will no doubt remember, we intimated last month, in speaking of Dr. Swander's great paper reviewing the sound controversy, that the battle, in all probability, was not yet ended, and that new assailants, with new weapons, might be expected, whose assaults would have to be met and repelled before Substantialism could rest peacefully upon its laurels. True enough, the prophecy was at that very time being fulfilled, and we have a new argument for the wave-theory right at the very extremity of its existence, which on first sight seemed to give it a new lease of life. Before, however, introducing this novel and startling argument we will give a brief history of the way in which it all came about.

Dr. Henry A. Mott, our excellent contributor, and the prospective managing editor of this magazine, in consequence of his recently published book on Sound in opposition to the wave-theory, has become involved in a spicy controversy on the merits of that discussion, with perhaps the most ingeniously critical and persistent of all the professors of physics in this country who adhere to the wave-theory of sound. This professor, we are pleased to say, we have known well and long, and have always entertained a high appreciation of his ingenuity and prowess, not to say audacity, in scientific criticism, having frequently tested his capability in that direction. But as the controversy is private, Dr. Mott requests that the name of his opponent shall not be divulged, though he is willing that our readers shall have the benefit of the most advanced argument for the wave-theory yet discovered—an argument which, by the way, we may justly term the *last ditch* of that beleaguered hypothesis.

It seems that early in the progress of the controversy, the argument naturally drifted into the now admitted enormously slow motion of the prong of a tuning-fork while still sounding audibly, and upon which the doctor had in his book properly risked the whole controversy. Of course it became his distinguished critic's duty to attack and demolish this citadel of Substantialism, or else frankly to abandon all further efforts to defend the old theory. He gave up at the start, though quite reluctantly, all pretense to the "swiftly advancing" motion of the prong as claimed by Tyndall, Helmholtz, and all the old standard writers on acoustics. He admitted that all such claims had to be abandoned on account of their exposure by the "finishing demonstration," and by Capt. Carter's experiment, more than confirming the same. After this admission there seemed noth-

ing left for the theory except a resort to Prof. Stokes' rapid alternations of the prong while thus moving such short distances as to make their motion almost infinitely slow, as Capt. Carter had proved. But this rapid alternation argument did not of itself look very promising, since just about the time the professor struck it, the April MICROCOSM appeared with the review of Prof. Stokes' admission, in which it was shown that if one slow motion would not produce a condensation of the air any number of similar motions no swifter would do no better. Hence the doctor's critic saw at a glance, in direct contradiction of Prof. Stokes, that any one single motion, however slow, must somehow or other be shown to produce a condensation of the air, or the game was up with the wave-theory.

Just about that time we can imagine one of the most terrific mental struggles agitating that professor's brain that has probably ever taken possession of a great head in this country. The drift of that mental agitation was this: how was it possible for a single slow swing of a tuning-fork's prong—moving 25,000 times slower than the outer end of the hour-band of a regulator clock—to condense the air, which is perfectly mobile and free to slip aside, when the motion of one's hand at a velocity of a foot in a second, or millions of times swifter, as Prof. Stokes conceded, would only displace the air-particles, causing them to slip aside and thus restore equilibrium just as it would in an incompressible fluid like water? No wonder, with such a tremendous mechanical and philosophical difficulty confronting him, that his mind must have undergone a fearful excitement, as we have supposed. But the professor is a veritable giant in his way, and was equal to the emergency, at least so far as to strike a solution, which for the time being seemed to put his mind at rest. That solution is as follows: although it is true, as Prof. Stokes declares, that a slow motion, like that of the hand, will not compress the air after the moving body starts and the air gets into motion, yet "the first instant" of any motion of a body, however slow, will and must compress the air. Reader, this is no burlesque or travesty on science falsely so-called, as the sequel will soon show. This resort to the absolute "first instant" of motion, as the only part of it which can produce a condensation, may, therefore, be properly styled the *last ditch* of the wave-theory.

When Dr. Mott received the letter containing this final solution of the problem, he showed it to us, and asked how we would answer it. We proposed then and there to take the job off his hands and write a reply which he could adopt if he felt so disposed, or use as much of

it as he liked. We made the offer, because we felt sure that this same "first-instant" logic would come up, in all probability, in the future to vex Substantialism, and that it would be well for readers of THE MICROCOSM to have the answer, in all its fullness, recorded in its pages ready for use when it should be needed, as we propose (and we might as well honestly confess it here) that no critic, whatever be his genius or audacity, shall put any difficulty in the way of the Substantial Philosophy that shall not be wiped out in these pages, if God spares our life long enough to have the said difficulty presented.

By permission of Dr. Mott we copy the salient paragraphs of the professor's argument below, after which we print our answer verbatim as we dashed it off and handed it to Dr. Mott. If the "first instant" dodge can live after the analysis thus made, it surely has a right to life. Here, first, are the distinguished critic's essential points:

"THE MAIN POINT NOW.

"I am here brought to the one main point before us now, viz.:—*The difference of pulse effect between the first instant and the succeeding instants of unchanged motion.* This you seem to know nothing about; and I want your keenest attention while I try to bring it before you.

"At page 48 you quote Tyndall as saying: 'When a common pendulum oscillates it tends to form a condensation in front and a rarefaction behind. But it is only a tendency, the motion is so slow, and the air is so elastic that it moves away in front before it is sensibly condensed and fills the space behind before it can become sensibly dilated. Hence waves or pulses are not generated by the pendulum.'

"You understand Tyndall as here teaching, that there is no condensation of the air by the motion of the pendulum; and all your reasoning for twenty pages is based on this idea. You split up the time and the motion; and you well argue, that if there is no condensation by one foot of motion in one second, then there can be no condensation by one inch of motion in one-twelfth of a second. Thus argues Hall; thus goes your book; and thus all your letter to me. And of course if you understand Tyndall and acoustical science rightly, you have it all your own way. But I do not so understand the case.

"To my apprehension it is the *first instant of forward motion that does the condensing of the air*, and the following motion adds little if anything to it. For in the *first instant* the air next against the prong in front has not time to get out of the way through the air's mobility; but when longer time is given (by continued forward motion) the farther air reached has time to move aside mostly before being pressed or condensed further.

"I illustrate by a box dragged through light snow. For the first yard, the snow is pressed forward and condensed in front of the box; but now the full capacity of the box-front to carry snow with it is reached, and thenceforward the snow will be thrown to each side, and if mobile enough would flow around to fill up the path made behind. If the environment be thus mobile, as when the box is dragged in water,

there will be a certain amount of heaping up in front, in proportion to velocity; and after that is reached, *there is no further heaping up or condensation ahead however far the box may be dragged.*

"Thus we say of the swinging pendulum. One inch of its motion can condense the air ahead of it just as much as the whole foot of its swing can do. With the box in snow or water, and with the pendulum or prong in air, each particular velocity has its particular capacity for heaping up or condensation of the environment ahead; and when that capacity is reached, no further continuance of that velocity produces any more condensation; while the very continuance (as in case of the pendulum) prevents that rapid alternation which alone would create waves or pulses. . . . The *very first instant* of pendulum swing (but the slightest fraction of an inch) would produce an air-pulse, if that instant reversed in rapid alternation; but its last instant dies into no motion at all. And the whole swing gives no more 'tendency' to air vibration than would come from the average rate of it from the smallest fraction of the distance.

"The reason why rapid alternation produces air waves (and sound) is, because by this means a *great number of first instants both forward and backward are secured*; whereas by longer continued onward motion, little if anything is effected after the *one first instant*, and there is *no more condensation in a mile than in the eighth of an inch.*

"This view of scientific acoustics ought to answer all the arguments and questions of your book and of your letter. You say, 'Surely, the 256th of an inch of air gets out of the way in the 256th of a second, just as the whole inch of air gets out of the way (without being condensed) during the full second.' I answer (1) The whole inch of air does *not* get out of the way during the full second; for there is a small condensation *at the start*, which is kept up without increase to the end; but it is *so small* for so much time, and without *alternation*, that it produces no sensible effect. (2) Therefore, the *first 256th* of an inch of air does *not* have time to get out of the way in its 256th of a second of time, though the after fractions *do* have time to escape in their longer periods of probation.

"I give a homely illustration: Ten geese are standing in a row one yard apart, and you stand with a club one yard from the first. Now, because you can hit the first goose in one second, does it follow that you can go on, and hit all the ten geese in ten seconds? I trow not. You may say, 'Ahl but the farther geese found out you were coming, and made off; while the farther air-particles have no such information.' Don't be too fast: I reply. The farther air does get word; the air pulse starts off almost like lightning, the instant the first particle (or goose!) is touched. And before the moving body has got the whole inch, the warning pulse has gone through the air a long way off, condensing every particle along its path, and thus warning it to push out of the way, if it gets time before an alternation of motion occurs."

REPLY TO THE FOREGOING.

(As handed to Dr. Mott by the Editor.)

As all other portions of your communication are comparatively trivial in importance, I come

directly to your Gibraltar—what you call your "one main point." With a flourish of trumpets you present it as an invincible argument in defense of the wave-theory. In fact you virtually make it the "last ditch" of that theory, and intrench yourself within it as if you had come to stay. You state it as "the difference of pulse-effect between the *first instant* and the succeeding *instants* of unchanged motion;" and you kindly add:—"This you *seem to know nothing about!*" Possibly you may find yourself badly mistaken, and that you are the one who has yet to learn the A B C's of the real problem you have sprung. Instead of knowing nothing about it, I have long known that it was destined to be the final resort, as the forlorn hope of wave-theorists, when everything else had failed them, which you now virtually concede. You surrender the idea that the "swiftly advancing" prong, as held by all the old authorities, is necessary to produce sound. That, you now admit to have been exploded. And now I will show that your "one main point" is a clear and unequivocal admission of the correctness of my central proposition against the wave-theory, namely, that, whether the motion be long or short, whether there be one or many motions, it is the *velocity of contact* alone which does or does not condense the free and mobile air, and that without sufficient velocity no condensation can occur either at the "first instant" or anywhere else. You have flatly denied this position of mine in a previous letter, and here, unconsciously, you admit its truth. This I will so completely demonstrate at the very beginning of my reply that you will not have an inch of ground to stand on.

Plainly, the only advantage you can claim for the "first instant" of contact, while the air-particles are at rest, over contact with them after they have commenced moving, must be the *greater velocity of contact when at rest*, and you ought to have seen it. It makes not the slightest difference whether the struck body is at rest or moving in the same direction as the striking body, except the simple difference which occurs in the velocity of contact. It is only velocity of contact in both cases which produces the impression. Had you possessed the least rudimentary knowledge of the laws of inertia in relation to bodies at rest and in motion, you could not have so fatally conceded my whole argument after having denied it. You would have known that a cannon ball, moving 1000 feet a second, and striking a target at rest, would produce no more compression than it would if the target were moving 500 feet a second in the same direction and the cannon ball should overtake it with a velocity of 1500 feet a second. Or to make the cases nearer parallel: suppose two equal targets, one some distance in front of the other (representing two shells of air), so connected that when the ball strikes and passes through the first target at 1000 feet a second, it will set the other target in motion at a velocity of 500 feet a second. Now it is plain that *when the ball shall overtake and strike the second target thus in motion it will make the same impression upon it exactly that it would have made upon the first target (at rest) if striking it at a velocity of 500 feet a second*; and if it will make no indentation in the second target when thus overtaking and striking it, but merely move it aside, *it is perfectly clear that it would*

produce no greater effect upon the first target at rest, should it strike it with the same velocity of 500 feet a second! It is simply and solely, as before remarked, a matter of velocity of contact, and not the slightest difference will result whether the struck body is at rest or in motion, or whether it is the "first instant" of contact or any other instant, *so the velocity of contact is the same.* Your entire mistake in this "first-instant" assumption results from a most unaccountable neglect of the well-known principles of inertia, for no man who is acquainted with those principles can fail to see that all the advantage you can gain by the "first instant" of contact is simply the difference of velocity between hitting the air-particles when at rest and hitting them when moving in the same direction a little slower than the striking body which follows them.

But this exposure of the fatal weakness of your "one main point," at the very start of my reply, is only preliminary to the regular argument which I have framed against your "first-instant" assumption, that when the air-particles are at rest no mobility is nimble enough to get them out of the way of the "first instant" of contact, however slow, and thus save them from condensation. I have longed for some one to make this issue distinctly, so that it might be answered and set aside once and forever. You have risked the final battle upon this single picked field of your own, and upon it shall the truth or fallacy of the wave-theory now be determined.

Having thus premised, let us in all seriousness come directly to the merits of the discussion, and see if this controversy cannot be ended. Now I assert, as a scientific proposition, that the motion of a body *below a certain velocity* in a mobile fluid *can produce no compression or condensation whatever, either at the commencement of the motion or at any part of its continuance.* In other words, I undertake to show that *mobility alone* is abundantly sufficient to provide the facilities for restoring equilibrium in the disturbance of every mobile fluid, and thus to prevent any possible condensation of its particles *if the velocity of motion causing the disturbance is below a certain rate*, which rate I will approximately assign as the discussion advances. But as the reasoning and proofs leading to these important conclusions necessarily involve laws and principles of physics never before presented, and not of course to be found in any scientific book, I will be compelled to be somewhat prolix in their introduction, so that one addicted to the old grooves of science like yourself may comprehend their force and bearing; though I confess at the start I lack hope with one who can seriously introduce a snow-bank and a flock of geese as appropriate illustrations of the mobility and compressibility of a fluid.

In the first place allow me to state that *mobility* and *compressibility* in a given fluid, such as air or water, are two separate and distinct properties of matter; but they necessarily co-operate in the phenomena of condensations, rarefactions, pulses, etc., such as we are here discussing. Now let me state a law before attempting to go farther. That law is this, that in a given fluid the properties of *mobility* and *compressibility* have a point of union-limit as to velocity for co-operation: below this limit no velocity of a moving body can produce compression either at its start or anywhere else. That is to say, the *mobility* of the fluid has such

effect as to restore equilibrium or equalize the displacement of particles before and behind the displacing body without any compression whatever taking place until the velocity of motion has reached this point of union-limit between the two properties, when compression first begins, and then increases more and more in the exact ratio as the velocity of motion is augmented. Thus we begin to see light shining upon a problem which your bare assertions about the commencement or the "first instant" of a motion exceeding the limits of mobility, would leave forever in the dark. But the light is only beginning to shine. Wait a little, and it will flash out with blinding intensity. To assert so positively as you have done, that the "first instant" of the moving prong must necessarily exceed the reach of mobility and cause condensation, thus abruptly limiting this property, should have been well matured. You should have tried to analyze these two properties very carefully and note their correlation in natural phenomena. But let us proceed with our analysis:

If the compressibility of a fluid be very low, that is, if it requires very little force to compress it, as in the case of air, then the union-limit of the two properties in that fluid is correspondingly low, and the velocity of motion required to compress is low in the same ratio; that is to say, it requires but a very moderate velocity to reach this compression point or limit and begin condensation. But if the compressibility of a fluid be high, that is, if it require great force to compress it, as in the case of water or quicksilver, then the union-limit in that fluid, as well as the velocity of motion needed to begin compression, must be correspondingly high. Hence a condensation in such a fluid (nearly incompressible like water) requires manifold greater velocity in the moving body than in air.

Now, I propose to startle you by an assertion which, if correct, upsets all you have written or ever can write on this subject, but which assertion will be borne out by facts and reason, namely, that *there is absolutely no limit to the property of mobility in a mobile fluid like air or water, and that no motion of a body, however high its velocity, could overcome the effect of mobility to restore equilibrium without condensation even in air if this property were alone involved.* But *compressibility* comes in as a correlated property of fluids, and as soon as the restoring effect of *mobility* has reached their union-limit of velocity, *compressibility* joins in the effect, and then part of the effect which *mobility*, if alone, would easily have accomplished in producing restoration of equilibrium is converted into condensation and a consequent pulse through this co-operating property of *compressibility*. Let me now demonstrate this law and general statement to be true in science. Air is known to be 10,000 times as compressible as water, yet the mobility of water is the same exactly as that of air, so far as any difference can be detected by science. Now, as water is almost wholly incompressible, it is reasonable to believe if it were reduced to absolute *incompressibility* that it would still be just as mobile as it is now, since no lessening of mobility occurs in 10,000 reductions of compressibility from that of air. The grand scientific result and conclusion follow, and which annihilate your pivotal argument, and with it of course the wave-theory, that in such an incompressible fluid *the mobility of the particles*

alone would allow any and all displacements to be restored, whatever the velocity or size of the moving body, since, as a matter of course, no condensation or pulse could occur, under whatever velocity, in an incompressible fluid! Hence mobility, *per se*, is absolutely without limit in its capacity for allowing, when necessary, the restoration of displaced particles in a mobile fluid.

Thus our new scientific law is sustained, and your supposed overwhelming argument, to save the wave-theory, and upon which you have fatally staked the whole controversy, has been logically turned against you, since you must see how easy it is for our position to be correct, that mobility is all-sufficient to permit the restoration of equilibrium among air-particles, *under very low velocity*, without touching the union-limit of compressibility, and without the slightest condensation or pulse resulting either at the commencement of the motion or at any other part of it, *since this same mobility would defy the highest possible velocity in air, and alone adjust all disturbances but for the mere contingency of the presence of the correlated property of compressibility!* When mobility alone, in an incompressible fluid, would be all-sufficient to restore any possible displacement without a condensation, as you now find yourself forced to admit, have you any logical right to deny our velocity-limit in air, up to which mobility alone suffices for restoring equilibrium without calling to its aid the other property of compressibility?

Let me, however, before leaving this revolutionary point, tighten up the cords a little about the neck of the now already strangled theory of "condensations and rarefactions" as constituting sound, by asking a few questions: Would you pretend to believe that a fish now moves its fins any easier owing to the present inappreciable fraction of compressibility remaining in water? Do you seriously believe that a tadpole swims by actually compressing the water and by sending off condensations and rarefactions as it waggles its tail? Or do you take the common-sense view, as I have just presented it, that the mobility alone of this almost incompressible fluid is all-sufficient for the needs of the tadpole in its displacing operations? Do you really hold to your "one main point" in water also, and believe that the tadpole comes any nearer sending off a condensation at the "first instant" of a waggle than at the middle of it? Did you ever think of the fact that the "first instant" of this waggle, as also of a prong's motion in air, is incalculably *slower* than the middle of it, as shown by the conical pendulum, and vastly more than enough to compensate for the difference which you claim between the "first instant" over the progress of a simple harmonic motion? Yet you do not seem to be aware that this single well-known fact does not leave a grease-spot of your goose-argument. But finally—I put the question in all candor: Suppose the remainder of the water's small fraction of compressibility were removed, would not a fish displace the water with its fins just as easily as it does now? and would it not make its usual headway by using the *mobility of the water alone for displacement, just as at present?* Thus, one by one, do we break the necks of your royal row of elastic "geese" with our incompressible "club" of Substantialism. The truth is, you have had your own way so long, in imagining all sorts of things about the invisible, elastic, and easily compressible air,

that you entirely forget that sound travels with greater facility, with greater intensity, to a greater distance, and by means of less agitating force in water than in air. You also forget that it travels in water by the very same law and method of production and conduction that it travels in air. If one is by condensations and rarefactions so is the other; but it seems to suit your purpose better to confine your whole intangible process of reasoning to the highly compressible, elastic, invisible, and almost intangible air than to come down to the visible, tangible, almost inelastic and incompressible water, where practical and definite mechanical results can easily be reached and verified. You don't seem to like water because it lets too much practical common sense into this undulatory nonsense which the invisible air does not expose. I do not propose to leave you floating in the air above, but intend to take you down into the water and baptize you into the true faith of Substantialism, and let you there see new scientific light that you have never yet seen by living wholly in the atmosphere. I deny that Lord Raleigh could ever have written his two immense volumes, with their immensely elaborate algebraical calculations, as to the operations of air-particles in sound-waves, had he been forced to confine himself to the visible, almost incompressible and inelastic water; yet it is a patent and fatal fact to the wave-theory that sound travels through water on the same acoustical principle that it does through air. Why not then, gentlemen, try your undulatory and algebraical skill upon water and let the air have a rest? We want something we can see. I have already given you a hint in the case of the fish and tadpole.

You drag a box through water, and note the piling of the water up in front as the actual "condensation" of the water, and as entirely analogous to the condensations caused by a tuning-fork in air. But are you not aware, *first*, that this box is dragged through the *surface* of the water, and that the reason it piles the water up in front is because it is easier for the dense water to project itself into the less dense air than to adjust itself by mobility below the surface? Are you not yet aware of the fact, *second*, that all disturbances of the air by the prong or musical chord take place in the midst of the aerial ocean, and not at its surface? Suppose you drag the box through the water in the midst of the Atlantic Ocean, miles below its surface, would there be any piling up in front such as you describe? Would not mobility alone have to adjust the displacement as in the case of a fish? and would there be any condensation, especially if you should drag the box vastly slower than the movement of the hour-hand of a clock? Do you not know, *third*, that the "piling up" of water in front of a box dragged at the surface is not *condensation* of the water in any sense, as you falsely assume? And are you not smart enough to see, *fourth*, that by using it as an exact illustration of the displacement of the air by the prong you have innocently given away the wave-theory, and thus admitted no more condensation in air than in the water? This very want of proper scientific discrimination, and this slipshod jumbling of things together which have no relation, is exactly what the wave theory depends upon for its existence. Yet the ablest critics seem to be totally oblivious to the fact.

But I have not yet reached the culmination

of the overturn which awaits your fatal argument, nor have I done with my new law. Listen for a moment and you will begin to hear the crash in the distance, and then take warning and stand from under. In Capt. Carter's famous experiment, in which the prongs of the fork sounded audibly in air when moving at a velocity of only an inch and a half in four years, the same effect was obtained by holding the point of the stem of the fork in water with the tympanum submerged. Now, before proceeding further with this destructive work, please look at two or three facts. This stem is much smaller than the prong, and being round avoids making compression as you yourself claim. Then the stem moves only one-fifth as far as does the prong, and, consequently, with only one-fifth of its velocity, as demonstrated by Prof. Spice in the *American Journal of Science*; yet this sound of the stem is more intense in water than the whole fork is in air, and travels to a greater distance, notwithstanding water is 10,000 times harder to compress than air, weighs 1800 times as much, and possesses only one 10,000th its elasticity! Do you not begin to hear it thunder? But now for the lightning-stroke which is to shiver your "one main point" to splinters.

If a body, however broad its surface, moving through water (supposing the water reduced only a mere shade in compressibility) at the velocity of a cannon-ball would not produce the slightest compression or pulse either at its start or during its progress, and if such vast displacement of particles under such tremendous velocity could be fully restored alone through the property of *mobility*, without any possible condensing and piling up in front at the start, like your mass of snow or flock of geese, then is it unscientific, I ask, or irrational to teach that the slender stem of a tuning-fork, moving vastly slower than the hour hand of a clock in this same almost incompressible fluid, will find this unlimited property of mobility all-sufficient to restore the trifling displacement it produces, thus avoiding all condensation and rarefaction of the water, and thus demonstrating the sound of the fork in water to be a *substantial force and not wave-motion*? Then when we add to this array the overwhelming fact, which your "one main point" utterly ignores, and which you modestly thought I "knew nothing about," that the "first instants" of these already enormously slow motions of the stem are *hundreds, yes, thousands of times slower than the middles of these swings*, you will begin to realize the wretched plight in which you have placed the wave-theory by your hot haste to volunteer as its champion and as the defender of its last ditch. There is no guess-work about this fatal oversight of yours as to the "first instant" of a simple harmonic motion being thousands of times slower than the center of such swing, however short. I have made an exact calculation for the benefit of one who "seems to know nothing about" the matter he is criticising. Here it is: Take the law of the conical pendulum as given in Prof. Mayer's book on Sound, page 82 (MICROCOSM, present volume, page 151), which shows the real proportion of velocity of the reciprocating pendulum (or prong) from the first instant of start to the middle of swing, and the following is the result: If you divide half of one such swing (from the start to the center) into four proportionate sections, according to the con-

ical pendulum, it will be found that the first section of travel will be only one-fourth as fast as the center section. If you divide it into eight sections, the first will be only one-eighth as fast as the center section; and if you divide it into one thousand sections, the "first instant" or section will be but one-thousandth part as fast as the center section. These are simple facts and figures which any one can verify by consulting Prof. Mayer's book. Yet this last division into one thousand sections does not begin to reach the absolute "first instant" of slowness, upon which you have unwittingly impaled the wave-theory. Indeed, you yourself unconsciously admit that the "first instant" of a pendulum or prong's swing is so inconceivably slow that it starts with "no motion at all." Here are your words: "But its last instant dies into no motion, at all;" and of course as "the first instant" starts no faster than the last instant dies out, it evidently starts by your own admission, with "no motion at all," which you are now driven to admit could not send off a condensation! This part of your labored criticism I accept as very near the actual truth, and hence, the "first instant" of the prong's contact with the air, being virtually "no motion at all," or at least almost infinitely slower than the middle of the swing which you admit can be fully adjusted by mobility alone, *why should not mobility alone also adjust the "no motion at all" at the "first instant"?*

But I have said enough. The mere statement of the foregoing facts and principles of science, of which you clearly knew nothing when you wrote, rings the death-knell of the wave-theory, and ought to show you not only its entire fallacy, but your own total incompetency to grapple with or even to grasp the intricate laws and principles of physical science with which Sound problems are so delicately interlaced, and which when untangled so thoroughly lay bare the hopeless condition of the wave-theory.

In conclusion, I am well aware that you can deny every law or principle or proposition I have here presented, as your capacity for denial or assertion without proof seems equal to almost any emergency. But remember, my dear sir, that reason and common sense have some claim upon us as candid investigators of science, while no man who cares for the unbiased approval of his fellows will dare to quibble over a great question of science merely to gratify his pride, or to gain a temporary victory.

THE NEW DEPARTURE IN ASTRONOMY.

£100 Offered to Prof. Young or Prof. Newcomb.

Up to the present time no astronomer seems to be willing to undertake the task of solving the real difficulty involved in the present theory of the relation of the earth and moon to their common center of gravity and their common center of motion as discussed in these columns. The whole difficulty can be here presented in a nutshell. Suppose the earth to be proceeding along its orbit around the sun, and that the moon is thrown into its orbit around the earth as we find it at present. All astronomers would agree with us that the moon's attraction would at once begin to pull the earth out, from its place on its annual orbit, toward the moon, while both earth and moon would in the meantime be swinging around the place on

the orbit where the earth's center was before the moon came into action. But the present system of astronomy, after this admission, goes on to teach that, by some means, the earth, after being pulled out toward the moon 8000 miles, more or less, then begins to fall back of the moon's pull, and that it continues to fall back of this line of attraction connecting the moon with the earth's old place on the orbit, till finally its center gets clear round 3000 miles on the opposite side of its original place, thus converting that place on the orbit into the common center of gravity around which both earth and moon continue to revolve.

Of course our claimed discovery denies *in toto* this falling back of the earth, after the moon has pulled it out from its orbit. We deny it as a self-evident impossibility, according to every known principle of mechanics, as we urged last month, and we claim, as the only possible result of reciprocal attraction, that the moon which can pull the earth out toward it one-eighth, or to the original common center of gravity 8000 miles, must of necessity be able to maintain the earth's center at this point between the moon and the original place on the orbit, which place continues to be the center of motion of moon and earth as they both swing around it and on the same side of it. We deny positively that any rational explanation can be given of this supposed falling back of the earth from the line of the moon's pull, as claimed, till it finally loses half of this local orbit, or one half a month, and finds itself as far on the opposite side of its old place as the moon had pulled it out the other way; or, in other words, till by some sort of astronomical hocus pocus the earth gets 6000 miles further away from the moon after it had been pulled out 8000 miles toward it!

We repeat what we said last month, that the displacement of the sun, under the combined attraction of all the large planets when they happen to come into line or on one side, is admitted by astronomers to be precisely parallel to this displacement of the earth by the moon, while it greatly tends to simplify the entire problem. Now Newton distinctly teaches ("Principia," page 581.) that when the large planets fall into line, on one side of the sun, their combined attraction removes the sun from its central or quiescent position, one diameter, or 860,000 miles, where it necessarily remains substantially, while the planets remain substantially in line. Astronomers, however, teach, according to the present theory of the moon and earth, that the sun, instead of being removed 860,000 miles, or one diameter nearer to this combined planetary mass, actually finds itself 860,000 miles on the other side of the place of its previous quiescent center, there revolving around that center of motion as the common center of gravity of sun and planets, the same precisely as claimed in the case of the moon and earth. Indeed, in a letter of Prof. Young of Princeton College to Dr. Henry A. Mott, he distinctly said that when the planets should come into line the sun would begin to go the other way, thus leaving the common center of gravity stationary!

Dr. Mott has had a long correspondence with Prof. Young, of Princeton College, Prof. Newcomb, of the U. S. Naval Observatory, and with several other prominent astronomers on this subject, with a view of satisfying his own mind in regard to the value of our discovery, and for the purpose of obtaining information.

He has urged them to explain how it is possible for the earth or sun to get on the far side of its normal place and directly away from the attracting mass, when such mass comes into action. They have simply told him that any elementary work on mechanics will give him the necessary information. Then when the doctor has politely asked them to name one such work, the correspondence has abruptly ended! The doctor is now firmly convinced that no rational explanation exists, and that astronomers are so totally bewildered by the new departure that they dare not go into a serious discussion of the subject. He therefore authorizes us to make the following proposition either to Prof. Young, of Princeton, N. J., or Prof. Newcomb, of Washington, D. C.

As there are different theories as to the manner in which the moon obtained its present position on its orbit, and as we know positively how the planets collect themselves together into line on one side of the sun, by regularly pursuing their orbits, it simplifies the solution to confine it to the sun and planets, and to Newton's "Principia." The proposition, therefore, is this: Dr. Mott will pay \$100 in cash to either of the above-named astronomers, as soon as he shall send him in writing a good and sufficient explanation of how the sun can get one diameter, or 860,000 miles, on the opposite side of its quiescent position from the planetary mass, when said planets chance to fall into line on one side. The doctor says he is willing to pay a fair price for scientific instruction, as he has always done, and that he considers the information he asks reasonable at that price. It will not take either of those astronomers one hour to make the explanation clear enough for a beginner in science to understand it, provided the thing is true, and provided they understand it themselves. The great trouble, however, in the opinion of this deponent, seems to be, that the thing is both inexplicable and false as a scientific proposition. Hence the deliberate refusal of these distinguished astronomers to respond to the most earnest and courteous inquiries of a fellow professor.

A BOOK OF GREAT MERIT AND VALUE.

We have before us a copy, sent us by the publishers, of Dr. John Kost's new text-book on "Medical Jurisprudence," just issued from the press of Wiltach, Baldwin & Co., Cincinnati, Ohio. The book is an octavo volume of nearly four hundred pages, and is perhaps the most thorough, comprehensive, and yet concise volume on the subject indicated by the title ever written or published. We have glanced through its thirty chapters fully enough to see that the author is wholly master of the most vital subjects treated, involving as they do every phase of the duties, obligations and liabilities both in college and in practice, both to his patients and the public, of the student of this most responsible branch of science. Dr. Kost, M. D., LL. D., is Chancellor of Florida University at Tallahassee, and late Professor of the Institutes of Medicine in its Medical Department, former Professor of Chemistry and Geology in Adrian College, Michigan. We have known the doctor personally and intimately for thirty-five years, and we can only express our admiration at the facility with which he puts together the most important medical in-

formation in his numerous works for the use of young men. We feel and know positively what we say, when we declare that this late work on "Medical Jurisprudence" is absolutely invaluable both to every practicing physician and to every medical student in this land. The price of the volume will be as nothing, compared to its value. Address the publishers, as above.

THE NEW ADMINISTRATION OF THE MICROCOSM.

After four years of service in the conduct of this magazine, with but a couple of months' rest during that time, and doing the whole business of editing its pages, even to its proof-reading, we look forward with no small degree of satisfaction to the commencement of Volume V., when new and younger men shall assume control of its pages as publishers and managing editor. This will lift a load of responsibility and care from our shoulders that will not only be of benefit to us individually, but which we trust will be of use to our subscribers, as it will give us the long-desired requisite time to study many works which we have unavoidably been compelled to neglect, and the information contained in which is quite necessary to make our own scientific and general editorials more effective in accomplishing their object. While relieved of all responsible care in the management of this magazine, we expect still to continue in our editorial capacity so long as our readers and the new management may consider our services of use to THE MICROCOSM. We have not founded, and succored, and watched over the fate of this journal, to lose interest in its perpetuity and destiny, now that new parties will soon control its pages.

No such love is possible in the bosom of a man as that which goes out to a journal which he has spent the best efforts of his life in founding, nurturing, and making a success. We realize this truth most fully as the present volume nears its close, and as our active management is about to cease. No words can describe the intensity of affection which now goes out and reaches far into the future, clinging around the destiny and fortunes in store for our loved MICROCOSM. Will it live, will it prosper, will its old friends stand by it, and will new friends come to its support, strengthening the hands of its publishers and cheering the hearts of its editors? We trust that all this may be realized.

The present volume will end with the September number, having omitted, as our readers know, the December and January numbers on account of our vacation and rest, thus leaving but two more numbers to be sent out after this one has gone to its readers. The new, enlarged,

and much improved Fifth Volume will start out with its initial number the first of October the price being unavoidably increased to meet its increased cost, and to keep pace with the increased advantages the enlarged and improved magazine will necessarily possess for every reader. Dr. Mott, the managing editor, and the publishers, will give their best energies to keep THE MICROCOSM up to, and even beyond its present standard, and, by bringing to its aid new writers of repute, increase its influence and usefulness. Our old contributors show every disposition to stay with us and lend the use of their versatile pens in filling the magazine, as of old, with more original matter of a choice character than any periodical, whatever its size, ever contained before, which truth is patent to the whole world.

Our own articles have been necessarily confined (too much, no doubt, for our average readers) to critical discussions of certain branches of physical science, including the various phases of the sound question, but all bearing directly or indirectly upon the great and revolutionary problems involved in the Substantial Philosophy. That philosophy being in its infancy, and its elementary principles resting wholly in the abstruse problems of physics, it was indispensable that, in laying its foundation stones for perpetual existence, no pains should be spared by its founder nor grudged by its adherents for making that base of the superstructure so strong and so thoroughly embedded in the cement of truth that the temple to be erected thereon might stand while time endures.

Most of our readers are believers in a future existence for humanity, and all of them know how difficult it is to avoid the shoals and quicksands of doubt, if not absolute skepticism, in navigating the dark waters of religious philosophy as now universally taught. Science, of the materialistic type, was rapidly making its inroads upon the church and, more rapidly than religionists were willing to believe, capturing the thoughtful among both clergy and laity. Such thinking men deserve more our sympathy than our censure, for it is the fault of the scholasticism of this age which has given to current theology its present materialistic bent, and thus demoralized the religious steadfastness of those who by thinking for themselves and reasoning logically but carried out their theological philosophy to its legitimate conclusion. Finding that this state of affairs in both the colleges and the churches had to be met, and believing as we did that there was but one possible way to meet it, the foundation of Substantialism was deliberately laid in the unalterable and incontrovertible truths of physical science. Our success in for-

tifying that foundation against the possibility of all successful assault, and in already demonstrating its invulnerable character by triumphantly repelling the strongest attacks that have yet been made, more than equals our expectations as well as those of our friends. Hence we do not regret the space consumed in this preliminary warfare, and we believe that future generations of religio-scientific investigators will thank us and bless the patience of our readers for the solid masonry of truth that has been permitted to be wrought in the pages of THE MICROCOSM as foundation-walls, and upon which the glorious superstructure of Substantialism is to receive its finishing touches in the future volumes of this magazine.

The next number (August) will contain the publishers' prospectus of the new and improved Fifth Volume of THE MICROCOSM. Let every subscriber read it with profound care, and be prepared to weigh and consider well whether or not he or she can afford to be without the instruction which this magazine will furnish during the twelve large numbers of the next volume, because of the additional sum which will unavoidably be required. We say this without one penny's pecuniary interest individually in the result, as to whether the magazine shall be liberally supported or not. We charge not one dollar for editing its pages, so long as we may live, and our only hope of compensation in that direction during our declining years is and will be the satisfaction of feeling that our dear MICROCOSM is prospering and doing good.

DENSITY AND ELASTICITY.

We have, already written (but crowded out of this number), an editorial on the above-named subject, extending our argument in the May MICROCOSM, tending to overturn Newton's great formula for theoretically determining the velocity of sound in any body by calculations based on its known density and elasticity. We are very sorry we could not have made room for that article in this number, as its importance, bearing on the truth and revolutionary nature of the Substantial Philosophy, is the most far-reaching of any single article on the subject yet published. We had no idea that the leading editorial in this number—The Final Argument for the Wave-theory—would have occupied so much room, but its importance, in rounding out the sound discussion in the present volume, was such that it could not be divided. Let no scientific reader fail to read and also study it, even if it is an extended argument. Its scientific points are of value to the student.

THE STRIDULATING LOCUST.

A NEW AND UNANSWERABLE PHASE OF THE ARGUMENT.

We have had a number of letters recently from subscribers, who have been attentive readers of the "Problem of Human Life," and especially of our discussion of the locust argument against the wave-theory of sound, and who deny that this wonderful insect, which can be heard more than a mile in all directions, produces its music by rasping its legs across the nervures of its wings, as we there intimated. Now we take pleasure in rectifying the mistake into which we were led by certain writers on natural history so speaking of this class of stridulating insects. At that time we had never had the opportunity of closely examining one of those intensely stridulating locusts, though we had often heard them when more than a mile distant, and had frequently seen them some distance off. Recently, however, we have had opportunities for critically examining them when stridulating at their loudest, even within a foot or so of their wonderful apparatus. We frankly admit that there is no rasping of legs across wings at all, as had been popularly supposed, but there is a mere tremor of the body caused by an evident vibratory motion of some delicate and wonderfully resonant instrument within. That error, therefore, with several others, will be carefully corrected, when the "Problem of Human Life" shall come to be revised for permanent use.

But this corrected state of facts only makes the enormous volume of sound which issues from that frail little structure, (only about an inch long and a quarter of an inch in diameter,) all the more marvelous, and all the more an overwhelming objection to the correctness of the wave-theory as now universally taught. According to that teaching, sound in air consists alone of the *air-pulses*—the condensations and rarefactions—which are sent off from a vibrating instrument, and hence, the greater the surface which acts on the air, with a given vibratory distance and rate of swing, the louder, of course, must be the tone, or else the theory is false on its face. Now it is a fact (and a terribly fatal fact to the wave-theory) that a tuning-fork of the largest size, when caused to vibrate at its best, cannot be heard, held in the open air, half-a-dozen feet away, while one of these locusts, having not a tenth part as much surface by which to act on the air, and not a tenth the vibratory action or distance of swing, can be distinctly heard more than a mile away, and so loud is its sound when within a few feet of it, that it is almost deafening! If, then, both this insect and the tuning-fork produce their

sound by the air-pulses sent off, and by nothing else, will some Prof. Mayer, Tyndall, Stokes, Rood, Helmholtz, Lord Raleigh, or Sir Wm. Thomson rise and explain why it is that the vastly larger and more powerful air-waves or condensations and rarefactions sent off from the tuning-fork make no sensible tone six feet away from their source, while the vastly less agitation of the air by the vastly less surface and less extent of swing of the locust is distinctly audible a mile in all directions? Come, gentlemen, this is a serious matter for your theory, and must be explained unless you intend to abandon it. You dare not ignore the difficulty, or pretend that it is of no consequence. It is of the greatest consequence, because of its great simplicity in reaching the popular mind. The smallest child in school and the most unscientific old lady in the land can see its force against the wave-theory, if they ever saw a tuning-fork or ever heard a locust stridulate. Were the problem involved as deep and abstruse as the density and elasticity formula with Laplace's generation of sonorous heat, or as the mobility and compressibility problems, discussed this month, then you might hope that its popular effect would be limited. But you have no such hope in this case. School-girls will soon begin to laugh at the wave-theory of sound as an absurdity, unless you explain how the diminutive locust, not one-thousandth part as heavy as the tuning-fork, with not one-hundredth part as much air-wave-producing effect, can be heard a mile away, while the fork cannot be heard six feet, and still sound be nothing but air-waves!

But leaving school-girls, old ladies, and little boys out, you should remember that the young students of physical science in our thousands of schools and colleges are beginning to get their eyes open, and have commenced to think for themselves, and, what is worse for the wave-theory, they are beginning to put ugly questions to their teachers in the class-rooms. You have inevitably, sooner or later, to meet this difficulty, as only one out of a hundred equally portentous, or abandon the present theory of acoustics, and you might as well, therefore, begin at once on this locust and tuning-fork problem as a simple test of your skill. We make it as easy for you as possible by giving you just this one problem as a starter. Now don't try to get away from it by concluding, if you can't answer it, that we are in the same fix, and that it is just as much of a difficulty on the substantial theory of sound as on your own mode of motion. Not too fast, gentlemen. The cases are not at all parallel, nor even analogous. Yours is confessedly nothing but the *mechanical blow of an air-wave against*

the tympanic membrane, and an air-wave is simply an air-wave, effective exactly and only according to its mechanical pulse, whether it is sent off by a prong, a string, a metal tongue, a human voice, or the vibratory apparatus of an insect. It is simply and solely the air-pulse sent off, which, as you teach, alone constitutes sound. Hence the intensity of the sound, as well as the distance it is heard, should be in the exact ratio of the strength of the air-pulse causing it. It is precisely the same as the effect on the barometer by a change in atmospheric pressure; as Sir Wm. Thomson taught (see November MICROCOSM, present volume, page 122), it makes no difference what causes the change of pressure, while the action, being simply mechanical, must effect the eardrum and the column of mercury exactly alike, and both precisely according to the force of the pulse or the pressure sent off. That is all there is of sound, according to Sir William, one of the highest authorities on the subject in the world. Then positively the tuning-fork should produce a hundred times more sound than the locust, and be heard a hundred times further, since it produces a hundred times more powerful air-waves. This alone kills the wave-theory, or there is no meaning in mechanics or scientific facts.

Not so, however, in the case of substantial sound-pulses, as laid down in the Substantial Philosophy, which are radiated from various sounding bodies, and which emit this immaterial sonorous substance in volume and intensity proportioned to the sonorous character and property of the body, just as some substances will emit vastly more intense and far-reaching substantial light-rays than others, and just as some batteries will generate and discharge vastly more substantial electricity than others, and that, too, without any reference to the amount of the chemical or mechanical energy and action expended in its generation. The electric substance simply depends for quantity upon the electric quality of the material substances constituting the battery, and not upon the various amounts of mechanical action attending the generation of the substantial discharges of the electric fluid. Do you grasp this point, gentlemen? The locust, for example, is a powerful arrangement and combination of sonorous substances by which to generate and radiate the substantial pulses of sound to a marvelous degree and extent, while the solid steel tuning-fork, producing probably a hundred times more mechanical effect in the way of air-pulses (which alone constitute sound according to your theory), is almost devoid of sonorous quality, and is therefore inaudible six feet away when sounding at its best, notwithstanding its manifold greater action and effect on the

air! Thus have we presented the problem in a nutshell, but a hard nutshell will it be found to crack by the eminent wave-theorists we have challenged to attack it. Come, gentlemen, as our Bob Ingersoll says, "honor bright." The eyes of all the students, and of all the professors (who have not hopelessly shut them), in all the colleges and universities in this land are upon you, and watching for what you will dare to say upon this problem. Many of them, remember, read *THE MICROCOSM*. Are you willing to trust your theory and your scientific reputations to the possible contingency that all these students and professors will be satisfied to accept the general proposition that "Wilford Hall is a scientific crank" not worthy of notice, and that you will thus be released from the responsibility of meeting this difficulty? Such a palladium for the safety of your scholarship and your genius has served its purpose very well in the recent past; but, remember, having played its part, it is about played out, and you are about to be forced to seek some other shield and buckler for defense against the rain of hot shot and shell that has now commenced to pour in earnest upon the cohorts of undulation from the fortress of Substantialism. Let each student of natural philosophy in this land, who feels an ambition to cope with his teacher, at once master this simple little argument and stand up like a man in the class-room, and in a duly respectful manner force his professor to acknowledge the wave-theory of sound a manifest absurdity. Not one such teacher can offer a word in its vindication after a child has uttered this argument. But we will not reiterate further. The test-case is before the great physicists of the country. Let them meet it if they can, any one of them, and we will gladly give it a place in these pages. Shall we hear from you, gentlemen?

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The following, from the Rev. Dr. McA. Pittman, speaks for itself:

DARLINGTON, S. C.

MESSRS. HALL & Co.—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the "Encyclopedia." I am more than satisfied with the books, and feel well paid for my labor. I would not take \$50 for the "Encyclopedia" alone. You have my thanks for your kindness.

A. MCA. PITTMAN.

PROF. VAIL'S GREAT BOOK.

We are very glad to learn that Prof. Isaac N. Vail's wonderful book, unfolding the Annular Theory of the earth (by which the flood of the Scriptures, the formation of coal, and a score of otherwise inexplicable mysteries are rationally and scientifically explained) is now in the publisher's hands, and will soon be issued. We predict for it a tremendous sale, if one quarter of the people buy it who ought to read it. Our present readers, at least many of them, no doubt remember with pleasure the professor's able and startling disclosures concerning the Annular System as unfolded in his series of articles during the previous volumes of *THE MICROCOSM*. Those articles were never surpassed for exciting interest, if they were equaled, in this magazine; and we doubt if a more original or surprising treatise was ever published on a scientific subject than this will prove to be when issued.

So marvelous are his facts, reasonings, and conclusions, that many of the profoundest thinkers of the country who have caught a glimpse of them through these pages, have expressed to us their astonishment at the remarkable and far-reaching disclosures which they foreshadow.

We have only time and space to say to the reader here, that it will cost you but *one cent* to drop Prof. Vail a postal-card asking him for a prospectus of his book, by which you can learn its price, and then be able to subscribe for it, as well as induce your neighbors to do the same. Address him at Barnesville, Ohio.

PLAINS, Pa., June 20, 1885.

DEAR DR. HALL,— Your answer to Capt. Carter in the May *MICROCOSM*, applying the principles of Substantialism in various ways, was alone worth five times the price of the entire volume.

W. D. OWENS.

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A FUTURE LIFE.

BY HENRY A. MOTT, PH. D., F. C. S.

The statement I am about to make may seem somewhat startling:

Any one who accepts as correct the teachings of the science of to-day must abandon all hope of a future existence.

The accuracy of this statement I propose to demonstrate.

Two questions will then remain. Are the present teachings of science reliable? and is there no hope for a future existence, based upon a different interpretation of the various phenomena and forces present in nature?

The answer to these questions will appear before the close of the present article.

To substantiate the above statement it will be necessary to consider what is taught as science.

Matter has been shown to be indestructible—when one form of matter disappears it does so only to reappear in some other form. Science has therefore nothing to do with the coming into existence of matter, only the coming into existence of the form of matter.

Matter is claimed to be composed of molecules and atoms. It is claimed that the atoms of matter are indestructible; that they cannot be divided; that they never exist in a free state except in and during a chemical change, the molecule being the smallest particle of matter that can exist and still retain the properties of any material substance. When molecules are divided, molecules of their constituents are produced in the case of compounds, whilst in the case of elementary substances the molecule remains the same. Chemistry does not deal directly with molecules, but with an aggregation of molecules or with a mass of a given substance—it must be borne in mind that the molecule has never been seen, and, in fact, Mr. Sorby, the microscopist, has stated that *light is too coarse a medium to enable us to see it, owing to its extreme minuteness.*

In neither the gas, liquid or solid, are the molecules supposed to touch one another—being further apart in the gas, nearer together in the liquid, and still nearer together in the solid, but still never touching. The molecules of matter are supposed to be in constant motion, each molecule having a mean path in which to travel unimpeded by the other molecules of a mass or volume of the substance. The velocity with which a molecule is supposed to travel is dependent upon the temperature of the medium in which the mass is found—the higher the temperature the greater the velocity, and *vice versa*. The temperature of a mass which resists a blow is increased by the same; that is, the molecules travel faster, and this is HEAT. A body is COLD in comparison to one which is hot, when the velocity of its molecules is less than the velocity of the hot body. There is another kind of heat called *radiant heat*, which is the kind that passes from one body to another, or from the sun to the earth. To account for this heat, the present science found it necessary to assume the existence of a highly

elastic medium, to which the name ether has been given. This medium is assumed to occupy all space, even between the molecules and atoms of bodies; by a certain defined wave-motion of this ether radiant heat is supposed to be transmitted.

Heat is therefore considered to be a *mode of motion*. As the heat of the human body is recognized by the same tests, can be applied to the same purposes as heat generated outside of the body—the idea of animal heat being distinctive is abandoned as having no foundation in fact.

Light and color, according to the present science, has no existence outside of the eye; light and color being purely sensations, the conditions necessary for exciting the sensations are pronounced to be wave-motions of the same ether, which accounts for radiant heat. The waves of ether which affect the sense of touch as heat are much longer than those which affect the eye as light and color. The length of a wave of mean red light is about 1-8900 of an inch, that of violet 1-57000 of an inch, and the number of oscillations of ether in a second necessary to produce the sensation of red are 47,700,000,000,000, all of which enter the eye in one second. For the sensation of violet, the eye must receive 699,000,000,000,000 oscillations in one second. *Hence light and color are a mode of motion.* Sound, according to the present theory, is also a sensation, there being no sound outside of the human ear. The conditions to produce sound, viz.: a wave motion of the air, exist, but sound is only produced, according to the present theory, when these waves strike against the tympanic membrane of the ear and set it into vibration. *Hence sound is a mode of motion.*

Sensations within the body are assumed to be propagated to the brain by molecular motion, where they are interpreted by the molecular motion of the particles of the brain. *Hence, sensation is the result of different modes of motion.*

In the case of the sense of taste, Veritschgau and Houghschmied have determined the length of time needed for reaction in sensation. In a person whose sense of taste was highly developed the reaction time was, for common salt, 0.159 second; for sugar, 0.1636 second; for acid, 0.167 second; and for quinine, 0.2351 second. Our sense of taste permits us to recognize one part of sulphuric acid in 1000 parts of water; one drop on the tongue of this would contain 1-2000th of a grain of the acid.

The sense of smell is very acute. Valentine has calculated that we can perceive about the three one-hundred-millionth of a grain of musk. The minute particles, if such they be, which we perceive by smell, no chemical reaction can detect, spectrum analysis being only able to recognize the two-hundred-millionth of a grain of soda. But this sense in man is far surpassed in animals.

With respect to muscular force exerted by an animal, it was at one time supposed to be created by the animal, but as Dr. Frankland *

* Source of Muscular Power. Proc. Roy Inst., June 8, 1866.

has said: "An animal can no more generate an amount of force capable of moving a grain of sand, than a stone can fall upward or a locomotive drive a train without fuel." As the amount of carbonic acid exhaled by the lungs is increased in the exact ratio of work done by the muscle, it cannot be doubted that the actual force of the muscle is due to the converted potential energy of the food. Since every exertion of a muscle and nerve involves the death and decay of those tissues to a certain extent, as shown by the excretions, Prof. Orton* has been induced to say: "An animal begins to die the moment it begins to live." A muscle, says Barker,† "is like a steam-engine, a machine for converting the potential energy of carbon into motion; but unlike a steam-engine, the muscle accomplishes this conversion directly, the energy not passing through the intermediate stage of heat. For this reason the muscle is the most economical producer of mechanical force known."

Barker, speaking of nerve-force, says: "In the nerve which stimulates a muscle to contract, this force is undeniably motion, since it is propagated along this nerve from one extremity to the other." Nerve-force has been likened unto electricity, the gray or cellular matter being the battery, the white or fibrous matter the conductors. In the opinion of Bence Jones, the propagation of a nervous impulse is a sort of successive molecular polarization like magnetism. That nerve-force is analogous to electricity, as is magnetism, is shown not only by the fact that the transmission of electricity along a nerve will cause the contraction of a muscle to which it leads, but also by the important fact discovered by Marshall,‡ that the contraction of a muscle is excited by diminishing its normal electrical current, a result which could take place only with a stimulus, says Barker, "closely allied to electricity. Nerve-force must therefore be transmitted potential energy."

Helmholtz found that the velocity of propagation of the nervous influence along a nerve, like that of electrical transmission, is only about 26 to 29 meters per second. It must be borne in mind, as Lovering has pointed out, that electricity has no velocity in any proper sense; that, since the appearance of an electrical disturbance at the end of a conductor depends upon the production of a charge, the time of this appearance will be a joint function of the electro-static capacity of the conductor and of its resistance. Since each of these values is directly proportional to length, it follows that the time of transmission will vary as the square of the length of the conductor.

While Wheatstone found that electricity required rather more than one-millionth of a second to pass through one-quarter of a mile of wire, it does not follow that it would traverse 268,000 miles in one second as he assumed, or 31,000 geographical miles as Dr. Siemens§ has deduced. Indeed, as Lovering has shown, its actual velocity would be only 268 miles in an entire second.

In the nerve itself, therefore, says Barker,‖ the velocity of transmission may be supposed to be less as its resistance is greater. Now Weter has shown that animal tissue in general

has a conductivity only one fifty-millionth of that of copper. And Radcliffe found that a single inch of the sciatic nerve of a frog measured 40,000 ohms, a resistance eight times that of the entire Atlantic cable.

In experimenting to confirm the above law of velocity, Gauguin measured the time of transmission of the electric current through a cotton thread 1.65 meters long and found it to be eleven seconds. "Hence," says Barker, "the fact that the energy of a nerve moves at the rate of only 28 meters per second is really no proof that it is not electricity."

"The double telegraph lines of nerve motor and sensor in their effect, but, as Vulpian has proved, precisely alike in function—are the avenues of ingress and egress. Every sensory impression is received by the *thalamus opticus*; every motor stimulus is sent out from the *corpora striata*. In the acts denominated reflex, the action goes from the spinal cord and is automatic and unconscious. Should the impressions ascend higher to the sensory ganglia, the action is now conscious, though none the less automatic. Finally, should deliberation be required before acting, the message is sent to the hemispheres by the sensory ganglia and will operate to produce the act. Based on principle," says Barker, "which can be established by investigation, a true psychology is coming into being, developed by Bain, Maudsley, Spencer and others. A physiological classification of mental operations is being formed which uses the term metaphysical psychology, but in a more clearly defined sense."

"Emotion, in this new science, is the sensibility of the vesicular neurine to ideas—memory, the registrations of stimuli by nutrition. Reflection is the reflex action of the cells in their relation to the cerebral ganglia. Attention is the arrest of the transformation of energy for a moment. Ratiocination is the balancing of one energy against another. Will is the reaction of impression outward, and so on through the list."

Science teaches, therefore, that nerve-force is electricity, or is analogous to electricity as is magnetism, and the present teaching of science relating to these two forms of energy is, that current electricity is due to a throb of or series of throbs in the supposed ether medium when released from stress. Electrical attraction and repulsion being explained by considering them as due to local stresses in such a medium. Magnetic phenomena being claimed to be due to local whirlpools set up in the ether. Through the ether light and heat waves are supposed to be constantly throbbing, the medium being constantly set in local strains and released from them, and being whirled in local vortices, thus producing the various phenomena of electricity and magnetism.

There remains yet to be considered thought-force. Barnard* has stated that "Thought cannot be a physical force, because thought admits of no measure." In the light of the rapid advances lately made in investigating mental action, in two directions at least, in its rate of action and of its relative energy, thought has been measured, as any other form of energy is measured, by the effects it produces.

The question whether the evolution of thought is entirely independent of the matter of the brain has been answered by experiment.

* Comparative Zoology, p. 45.

† Correlation of Vital and Phys. Forces, p. 54.

‡ Outline of Phil. Am. Ed. 1868, p. 227.

§ Sci. Am., Nov. 18, 1876, p. 328.

‖ Pop. Sci. Monthly, vol. xvii., p. 766.

* Address, Am. Ass. Adv. Sci., 1868. F. A. P. Barnard.

The experiments conducted by Lombard* deduced by preliminary trials that any change of temperature within the skull was soonest manifested externally in that depression which exists just above the occipital protuberance. A pair of bars made of bismuth and one of antimony and zinc were fastened to the head at this point, and to neutralize the results of a general rise of temperature over the whole body, a second pair reversed in direction was attached to the leg or arm, so that if a like increase of heat came to both, the electricity developed by one would be neutralized by the other, and no effect be produced upon the needle of a galvanometer unless only one was affected. By long practice it was ascertained that a state of mental torpor could be induced, lasting for hours, in which the needle remained stationary. But let a person knock on the door outside the room, or speak a single word, even though the experimenter remained absolutely passive, and the reception of the intelligence caused the needle to swing through 20 degrees.

"In explanation of this production of heat," says Barker,† "the analogy of the muscle at once suggests itself. No conversion of energy is complete; and as the heat of muscular action represents force which has escaped conversion into motion, so the heat evolved during the reception of an idea is energy which has escaped conversion into motion, as the heat evolved during the reception of an idea is energy which has escaped conversion into thought from precisely the same cause; moreover, these experiments have shown that ideas which affect the emotions produce most heat in their reception; a few minutes' recitation to one's self of emotional poetry producing more effect than several hours of deep thought."

"Chemistry teaches that thought-force like muscle-force comes from the food; and demonstrates that the force evolved by the brain, like that produced by the muscle, comes not from the disintegration of its own tissue, but is the converted energy of burning carbon."‡ Recent researches show that mental operations are not instantaneous, but require a distinct time for their performance. By accurate chronographic measurement, Hirsch has shown that an irritation on the head is answered by a signal with the hand only after one-seventh of a second; that a sound on the ear is indicated by the hand in one-sixth of a second; and that when light irritates the eye, one-fifth of a second elapses before the hand moves.

Donders devised an instrument called a noemotachograph, and also a modification of it called a noemotachometer, by means of which different points of the body can be irritated, different sounds can be produced, and different letters can be shown, all by the electric spark. By subtracting the simple physiological time from the time given in any experiment, the time necessary for recognition can be obtained. By means of the noemotachometer one twenty-fifth of a second is found necessary to enable a judgment to be formed about the priority of two impulses acting on the same sense. If they act on different senses, more time is necessary. So, also, more time is required to recognize a letter by seeing its form than by hearing its sound. A man of middle age, then, thinking not so very quickly, requires one

twenty-fifth of a second for a simple thought.*

Reviewing the ground we have just gone over, we have found that heat, light, electricity, magnetism, sound, nerve-force and thought-force, are all modes of motion.

In other words, that all the forces which are at work within the human body are at work without, and, as Tyndall† has said: "Abandoning all disguise, the confession that I feel bound to make before you is, that I prolong the vision backward across the boundary of experimental evidence, and discern in that matter which we in our ignorance, and notwithstanding our professed reverence for its Creator have hitherto covered with opprobrium, the promise and potency of every form and quality of life."

We have found that all sensation—yes, all human existence, is the result of molecular motion. Is not the consequence of such teachings plain? When the eye becomes decomposed in death the mode of motion called Light and Color cannot set up the necessary vibratory motion in the retina to produce the sensation of vision. Hence no light and no color. When the ear becomes decomposed no sound can be heard. When the nerves become decomposed, no nerve-force, as there can be no suitable molecular motion. And finally, when the brain becomes decomposed in death no suitable molecular motion can take place. Hence no thought—no individuality—no future existence. The materials which composed the body and which were necessary by the vibratory motion of their molecules to produce the phenomena (so-called) of life, become, by decomposition, converted into gas and into a solid known as adipocere, the molecules of which travel hither and thither within their own domain. *Plenty of molecular motion, but the molecular motion of dead matter. Life has disappeared.* Yet the science of to-day states that life is a phenomenon, a mode of motion, which can only exhibit itself when the elements are combined in certain proportions and in certain groups. Destroy the proportions or interfere with the molecular motion and the *final end has come. Life is no more—individuality is gone.* Without the material body, it is the teaching of the present science, no life can exist. All possibility of a future existence is therefore wiped away. As Carl Voght, Moleschott, Buchner, Schmidt, Haeckel, and others consider the phenomena of the soul to be functions of the brain and nerves.

Schmidt says: "The soul of the new-born infant is, in its manifestations, in no way different from that of the young animal. These are the functions of the infantine nervous system; with this they grow and are developed together with speech."

On the other hand, the doctrine of the immortality of the soul has been defended by Marheineke, Blasche, Weiss, Hinrichs, Fechem, Fichte and others.

The new philosophy or the philosophy of Substantialism founded by Wilford Hall, which has at the present time over 25,000 followers in this country comprising some of the ablest writers and thinkers, views the forces of nature as substantial entities, though necessarily immaterial—by this means the materialistic claim that the soul, life, mind and spirit are but modes of motion of the brain molecules is swept out of ex-

* N. Y. Med. Jour., vol. v., 1867.

† Correlation of Vital and Phys. Forces.

‡ Proc. Med. Soc., Conn., 1867, p. 197. L. H. Wood.

* Mod. Aspects of the Life Question. Geo. F. Barker.

† Inaugural address, Aug. 19, 1874.

istence. For, plainly, if magnetism, electricity, sound, light, heat, mind, soul and spirit, etc., are admitted "to be substantial existences, though not chained to material conditions, but freely permeating and passing through all material bodies as if they were not present, then, manifestly, the very foundation of materialistic science crumbles beneath the weight of such scientific truth, and its place is taken by the broad principle of *Substantialism* as a rational and satisfactory basis for man's future immortality."

Substantialism claims that the life and mental powers of all living creatures, including man, are demonstrably substantial entities—parts of an interior and invisible organism, consisting of real but immaterial substance—"the inner man"—and of which the outer or corporeal (material) structure is but the tangible or visible counterpart.

In the words of another writer:

"Whatever evidence religion and revelation may furnish as to the personal and conscious indestructibility of the human spirit, it has always and admittedly lacked the strong confirmatory testimony of science—no direct proof, properly coming within the scope of scientific evidence, having been previously adduced to show that the soul, or life, or intellect, of man, even exists as a substantial entity within the present physical structure. The Christian believer has now—thanks to this invaluable revelation of science—not only the evidence of the higher impulses and nobler intuitions of his nature, coupled with that of the sacred record, that substantial immortality attaches to the spiritual principle in man, but he can now grasp the long-sought-for scientific proof, confirmed by the physical and vital laws of our being, that the soul possesses a real organism as literal and substantial as that of flesh and blood, but vastly the more important entity of the two."*

The Substantial Philosophy clearly teaches that just as an image is sustained in a mirror by the constant succession of the rays of light, so nature is sustained by the constant forth-putting of the power of God, in whom we live and have our being, and which, if but for an instant withdrawn, the whole universe, in all its vastness and glory, and beauty, would sink in a moment into the simple condition out of which it was framed by the great Intelligence.

THE PHILOSOPHY OF POVERTY.—ITS CAUSE AND CURE.

BY PROF. H. S. SCHELL, A. M.

An ancient writer declared, with much truth, that the keenest pain possible is inflicted by extreme poverty. The poverty witnessed in all parts of the civilized world, especially in large cities, is not only degrading to the individual, but it embitters the mind and renders men brutal and reckless. It robs the hungry of food, the cold of warmth, the family of shelter. It fills grog-shops with men who have no comforts at home; makes tramps of tens of thousands of industrious men who can find no employment, is the main cause of robberies, forgeries and murders, and is now undermining every throne in Europe and so weakening our own government that unless a remedy is

found, it will eventually demoralize the people and insure the destruction of our civil institutions.

The main cause of the existence of this terrible foe to the happiness of the human race is to be found in the unequal distribution of the products of labor. All wealth is produced or brought into use by labor, but we see that the real producers of wealth have the least of it. They build our cities, but own neither brick nor stone in them! They construct great engines that perform vast labor, but neither wheel nor bolt is theirs. Steamers plow the ocean and navigate our rivers and lakes, but they who build them have no interest in them. This shows that the wealth which is the product of labor is diverted from the producers and finds its way into other hands.

The reason of all this is the fact that seven-eighths of the human race have been robbed of the most essential part of their birthright, and this robbery has enabled the other one-eighth to defraud their fellow men of most of the fruits of their labor and appropriate it to their own use, thus reducing them, virtually, to the worst form of slavery—a slavery far more oppressive than that of the negroes of the South ever was, for that gave the slave food, clothing, shelter, care in sickness and many other comforts, but this drives thousands upon thousands of families into streets and roads without food or shelter.

The Creator gave to man a grand world to live in, furnished in every respect to make him comfortable and happy—land to live upon from which, or on which, he could obtain all that was necessary—glorious sunlight, pure air, and clear water; all these were necessary, and all were given with unstinted generosity, and there is enough for the whole race, even if it were a hundred times as numerous as it is; but what would be the result if man were deprived of either one of these essential gifts? He could not exist without land and water, air and sunlight; and, therefore, these four elements are his by *right of birth*, and no laws made by man which deprive him of either of them are just, and if he be so deprived he is robbed of his birthright. Yet we know that in these United States, this land of liberty, this home of civilization and Christianity, there are more than forty-five millions of human beings, old and young, who have no legal right, save that which they purchase, even to *stand* upon a single square foot of the soil of the country in which most of them were born, except on the public highways or parks. They have been robbed of their birthright—land to live and earn their bread upon—and are, virtually, the slaves of those who hold the land and who sell them the right to live upon it. The purchase money is called rent, and the amount demanded by the landholder is based upon the necessities of the applicant and the competition that may exist at the time for the use of the land, but in all cases it is so graded as to take as near as possible all that the tenant earns except enough to keep him from starvation, nakedness, and too much cold. In some parts of the city of New York, where there is much competition for the use of land, the tenant pays \$10,000 per annum for the use of less than one-sixteenth of an acre, besides as much more for the use of a building which has been placed upon it. In other parts of the city much more is paid—in Wall Street, for instance—and in others much less. This system of oppression is carried on all over the

* See Review of the Problem of Human Life. From the *Scientific Reporter*, Oct., 1878.

country, and the sums demanded increase year by year as the country settles and the applicants become more numerous and require more and more land to live and work upon. Many of the lots in New York which now yield \$10,000 per annum each, eighty years ago could have been hired for \$400, and not a few of them bought for that sum; what their yield will be eighty years hence, if by that time poverty has left any to hire them, must be left for conjecture. It has been truly said that "he who owns the land owns those who live upon it," for he can drive them off if they refuse or neglect to pay what he demands for its use, and every day hundreds of families in this country are dispossessed and driven into the streets and roads. In Scotland, thousands of families, whose ancestry for several generations had lived upon land they recently occupied, were, a few years ago, driven from it to make room for sheep-ranges—their cabins burned, and they turned into the roads to starve, the husband with his wife and little ones. The same has been done in Ireland in countless instances, and yet it is only once in a long time that one of these land-robbers is shot. It has been estimated that in this country over one thousand millions of dollars is annually abstracted from the products of labor and put into the pockets of landlords for the rent of land alone, exclusive of the sums paid for rent of buildings and other improvements on the land. Now every dollar of this one thousand millions should have been put in the public treasury, where it rightfully belonged, and where it would benefit all in doing away with the necessity of all other taxation, whether by duties on imports, internal revenue taxes, or taxes of any kind. But such a sum drawn from the people would be unnecessary, as about one-half of it would be sufficient for all purposes of government, federal, state, and municipal. It may, however, be urged that this course would be unjust to landlords; but if landlords are found in possession of property which rightly belongs to the community at large, and of which the people composing that community have been defrauded, there is no just reason why they should not restore it. It is the people who give value to land, and the people should, therefore, reap the fruits of that value in receiving the rent for it. Take away the people from the city of New York, and the land would have little or no value, and so all over the country. Besides, there can be no title to the *absolute ownership* of land, for no one has ever been authorized by the maker and only owner of it to deed any portion of it away. It was given to each generation to live upon while that generation lived, and only as long as it lived, and when it had passed away, the next is entitled to it. The land of this country was obtained partly by conquest—viz., robbery—partly by purchase from France and Spain, who stole it, and partly by cheating the Indians. After it was obtained it belonged, as far as its use is concerned, to the people who lived upon it, and now has descended to us, or rather, to the landlords, and no legislatures had a right to deed away any of it in fee simple, for if they had such right they might have deeded it all to a syndicate, or even to a single individual, who could have driven all others off and forced them into the rivers, lakes, or oceans. Legislation, federal and state, has, however, deeded to railroad companies not less than *four hundred millions of acres*—yes, robbed the citizens of these United States of

400,000,000 of acres—land enough to afford 80 acres each to five millions of families, representing twenty-five millions of our population, who on it could have had comfortable homes and all the necessities and many of the luxuries of life; and these companies force every one who wishes a home on their land to pay for it any price they choose to set. Now, there are millions in this country who have a natural right to the use of land on which to live and earn their support, who have no money with which to purchase land, and consequently are forced to earn a living by selling their labor; their great number causes competition, and this reduces the price they can get for their labor to the lowest sum that will furnish them with the absolute necessities of life—that is, keep away death. If, on the contrary, land was open to them, competition would be greatly lessened and they could demand fair compensation for their labor and always get it. It clearly appears, therefore, that the main cause of the poverty—the extreme poverty—that is everywhere to be seen is the withholding from the people the land which God gave them to live upon and from the use of which must come their daily support—of this they have been robbed, and as a consequence, are forced to sacrifice their labor and their comfort in order to secure a bare existence. Hence they are poor, and as long as they are deprived of land, will be poor, and as population increases, so will poverty and its miseries, and not many years hence this nation will be divided into but two classes, the one (by far the smaller) owning most of the wealth of the country; the other, hard-working, miserable beings, slaves and toilers for the rest.

A similar state of society caused the downfall of Rome and Greece. As long as land was held in common those countries were great, and ruled the world, but when it was granted to the nobles, and the people became their tenants or serfs, the former grew rich and the latter poor—luxury enervated the ruling classes and poverty, with its degrading accessories, the serfs, and not many years had passed before the rude but *free* barbarians of the North swept down upon Rome and conquered the conquerors of the world. The conversion of the free and proud Roman citizens into serfs and tenants was, beyond question, the chief cause of the decay of the power of Rome and the fall of the empire, and one of the Gracchi, a tribune of the people, in addressing the populace on this robbery of their lands said: "Men of Rome, men of Rome, you are called the lords of the world, yet have no right to a square foot of its soil; the wild beasts have their dens, but the soldiers of Italy have only water and air." The Saviour himself sadly uttered words of similar import,

"Foxes have holes, and the birds of the air have nests,

But the Son of Man has not where to lay his head,"

and not less than thirty millions of the people of these United States whose fathers fought and bled for the free possession of its soil, but who have no right to a rod to it, can join in the same lament. How long the six millions of voters who represent these thirty millions will quietly submit to this robbery of their rights when they come to realize it, is a problem which I hope, for their sakes, will be solved in the near future. It may be asked, "What are you going to do about it?" How

can it be helped? What is the remedy? The answer is far from difficult—abolish taxes of every kind (duties on imports included) except the tax on land, but do not tax any improvements that may be on the land, for these are products of labor, and labor should be encouraged, not discouraged, as it is now, by taxation. No product of labor should be taxed. Tax land that is in use say 4 per cent. on its full value, and that not in use, but held for higher prices, 8 per cent. Disturb no landlord in his possessions, but give him the right to charge the tax of 4 per cent. to his tenant, and also to charge him 10 per cent. additional on the value of the houses, stores, barns, fences or other improvements that may be upon the land, and *limit* him to that percentage. This plan will put into the treasury all the money necessary for carrying on all the departments of the government, federal, state, or municipal; will restore hundreds of millions of acres now held by railroad companies and speculators for high prices to the people; cause tens of thousands of vacant lots in cities and villages, held only for higher prices, either to be built upon, sold for nominal sums, or abandoned to the people; demolish hundreds of thousands of shabby buildings which disfigure our cities and villages, and in their place cause to be erected handsome structures; will lower rents everywhere; reduce the cost of living thirty to fifty per cent.; open the way for profitable and constant employment to every one; give to all a fair return for their labor; benefit, eventually, every individual in the community from the capitalist to the beggar; treble the internal commerce of the country; treble our exports and imports, and soon abolish poverty and its evils, as a necessity, from the land. How all this will be accomplished I will endeavor to show in the August number of *THE MICROCOSM*.

872 WEST 82d STREET, NEW YORK.

THE SUBSTANTIAL PHILOSOPHY OUR ONLY RELIANCE.

NEW MADRID, MO., June 23d, 1885.

DR. A. WILFORD HALL:—

DEAR SIR,—I have been intending to write to you for some time, and although an entire stranger, I trust you will not think me too forward. One engaged in a warfare like yours naturally wants to know what his readers think of his work; and it certainly strengthens his hands to know that he has multitudes of adherents, and that they are daily increasing in numbers.

I was educated in one of our modern "mode-of-motion" colleges, and was taught to believe in the wave-theory of Sound. I have carefully read and studied the "Problem of Human Life," and I am neither afraid nor ashamed to say that I believe you have annihilated the undulatory theory, the weight of "respectability" to the contrary, notwithstanding. But this is not the greatest good to be accomplished by your labors, if successful. Your beautiful and consistent theory of the duality of man is, I think, perfectly rational and tenable. The overthrow of Evolution, which I regard as already thoroughly accomplished, and the advent of Substantialism, will mark a turning-point in the religious as well as the scientific thought of the world. Your crushing attack upon the wave-theory of sound will cause thinking men

to halt before they swallow everything for science which emanates from sources of "respectability." It will inspire a spirit of investigation and criticism that will not end in a generation.

Let us admit the mode-of-motion theories of modern scientists, which are all strongly materialistic in their tendency and make-up, and both animal and human vitality as well as mentality must follow in the train as a natural and logical consequence. Then truly does "death end all," and we pass from hence unknown and to the unknown and unknowable, into that dark and eternal nonentity of Herbert Spencer.

Inspiration cannot conflict with science, else one or the other must be false. One of the fundamental laws of nature is that "something cannot come from nothing." To teach that God created the universe from nothing, is to teach that he did an unscientific act, and thus violated one of his own chief laws. I therefore admire your attack upon that unnecessary religious tenet, and think it ought to be expunged from the creeds and abandoned by all religionists.

Man should have some rational idea what that immortal principle within him is, which he is trying to save from misery in futurity: but until the duality of man, with his interior vital and mental organism as so clearly taught in the Substantial Philosophy, was presented to my mind, I could not even give an idea of what the soul meant, save the old time-worn and evasive answer, "It is the immortal principle of man," which in fact answers nothing and satisfies nobody. But not so now. In the light of Substantialism and the doctrine of the duality of man, I can almost imagine by my mental vision the exact appearance of a human soul. I cannot now conceive that man has an immortal principle within him vested with intelligence, without recognizing such principle as a real objective and subjective entity. And if an entity, it must be composed of some grade of substance and must have shape, size, personality, etc. If this be not true, then it cannot be an entity, and if not an entity it is nothing, and the soul is a myth—yea, and "death ends all." Your philosophy cannot be overturned.

This view of the soul or spirit necessarily as you teach leads us into the different degrees of the density and tenuity of different substances, and that therefore "there are or may be invisible but real and substantial entities all around us." It gives a comprehensive meaning to the words, "God is a spirit," i. e., he does not exist essentially in the gross state of matter, but in the spirit-state of substance. Could the immortal spirit of man be freed from its present environment with the visible, ponderable, changing and material world, and take a flight on the wings of pure vitality and mentality through the invisible, imponderable, unchanging spirit world, what a scene would lie before it! It could spend untold ages in viewing new scenes of beauty and grandeur, in watching, for example, the substantial forces of magnetism, gravity, cohesion, electricity, etc., as they speed through space accomplishing the work whereunto they were created, and in seeing them emerging out of the force-element and changing one into another. Scenes forbidden to mortal eyes, would then hold them in an admiring and enraptured gaze. Sounds and music unheard by mortal ears would charm the soul, and sciences incomprehensible by mortal minds here would be the themes of

study, investigation and conversation, ever increasing the spirit's knowledge and causing it to approach nearer and nearer in intelligence and personality to the image of God himself. In contemplating these things one can almost wish to leave the earth and take a view of the substantial, invisible and celestial parts of creation. When we view death from this standpoint we appreciate the force of the inspired language: "O death! where is thy sting? O grave! where is thy victory?" But this view of the immortal spirit and of the future life can only be realized in the fullness of its beauty when viewed in the light of Substantialism and the doctrine of the duality of man.

I fully appreciate the reason why you have trained your heaviest guns against the undulatory fort of modern science. It is without doubt the very bulwark of materialism—the very citadel of atheistic infidelity; and may the solid red-hot shot from the guns of Substantialism now booming from 23 Park Row, New York City, never miss their fire nor miss their aim, nor their ammunition ever become exhausted until the undulatory castle shall be shattered like the windows at Erih, and its commanders be forced to haul down the flag of materialism and take the oath of allegiance to the Substantial Philosophy. May the time speedily come when mankind may become convinced that the *invisible* is the *real* of existence, and that the material world is only the smaller and less important part of creation. That beyond the material lies the immaterial, the imponderable, and the immortal realm—those invisible things of God—those things which are eternal—as vast as the eternal years of God are endless.

Then can we realize that the world does not exist by, nor consist of, some inscrutable "mode of molecular motion." Neither did it come into existence by chance, but that above all the suns, and planets, and stars, there is a ruling Intelligence by whom all things were created, and who from the beginning established the laws and limited the operations of the forces by which the order of Nature is preserved, and by which we live and move and have our being.

Very truly yours,

H. F. HAWKINS.

THE WORLD SAVED THROUGH A NATION. No. 2.

BY REV. S. A. TAFT, D. D.

9. It is a fact that the Kingdom of God, as originally organized and established, held for a period of nearly two thousand years. Exactly 1696 years, or from A. M. 2463 to A. M. 4159 or A. D. 70. And in general, during the time, a most checked condition of things attended the history of this wonderful commonwealth. Retrograde and advance movements were made almost without number, according as those who had been intrusted with the management of affairs were true and faithful to instructions and guidance, or were untrue and unfaithful. When the former, there were prosperity and success; when the latter, there were trouble and difficulty. And this fact demonstrated the wisdom of instructions, the wisdom of obedience, and the great folly of disobedience. Even revolutions were attempted; but these could not succeed, and never will. God is the Al-

mighty Sovereign of this nation. He is the author and maker of the government; and, therefore, only such changes in the government as he shall order and ordain can ever take place. The main drift of the nation, therefore, in all this long period, remained substantially the same; and all was overruled with the most persistent reference to what had been determined and decreed in the new covenant, the old, original foundation compact of the nation, and without which the nation had never been. But the new covenant was; and therefore the nation was, and is, and ever will be. It is immortal, and cannot die; a thing in *perpetuo* and must abide forever.

10. It is a fact that, in all these long years, the nation and people of Israel were in their *minority*; and therefore in a servant state or condition, and differed in nothing from a servant, but were under tutors and governors, until the time appointed by the Father, though they were prospectively lord of all. And this accounts in part for the condition of things as noted in the last fact. The truth is, Israel was yet in the flesh, and the flesh is ill qualified to manage and administer Divine affairs. He had not yet become a man, and therefore he could not do the manly thing, but all through was a stubborn, stiff-necked, rebellious son, and had to be punished again and again for truancy, disobedience, etc.

11. It is a fact also that in this time certain great questions of government, questions of the gravest possible consequence to the Holy Polity, were introduced, permanently adjusted and settled. And they were so settled, because they were made a part of the organic law of God's nation, and can never again come up for consideration and settlement, but must forever take their place among the things fixed and established of the holy commonwealth.

Among these questions were the following:— (1) The kingdom's true place, locality or country. Every kingdom must have a place. It must be somewhere; and its true place, the place it can have and hold for its own, is all important. None more so. True this question was originally settled in the original foundation compact of the nation, see Gen. xv. 18, 19, 20, 21. *et al.*, but it had to be practically settled. (2) Judah's supremacy over all the other tribes of the nation, 1 Chron. xxviii. 4. (3) The determination and settlement of the royal family of this tribe, 1 Chron. xxviii. 4. (4) The determination and settlement of the royal house of this royal family. (5) The transfer of the priesthood of the nation from the tribe of Levi, where the codicil law had placed it, to the tribe of Judah; its settlement in the royal house of that tribe: the determination of its superior rank over the old priesthood, making it Melchizedek instead of Aaronic as it had been. (6) The superior parentage and extraordinary character of the royal Heir of the royal House, the party or person who, in the time appointed, was to hold in *perpetuo* the royal and pontifical prerogatives of this royal and priestly nation. (7) And finally to settle and arrange the question of the nation's redemption; for as an element and a part of the divine programme, and in order that God's purpose concerning the nation and the world in and through and by the nation might be executed, it was found necessary to redeem the nation. It must be redeemed or some new arrangement must be adopted. For the world could not be saved by a nation cursed and under the ban of law. It

must therefore be bought off from this condition of things, and be ultimately delivered from all that the curse had entailed. All these great questions, and others, it may be, of equal importance to the divine polity, were adjusted and disposed of while as yet the nation was in its minority, or servant condition, and before it could ever take on the toga-virilis of early manhood and independent spiritual sonship. The nation's history under the old covenant was emphatically a period of preparation. A great deal had to be done before the nation could assume its majority. Full preparation, however, was made, and every emergency was met, and but for the last and final plunge of the nation into still deeper infamy, it might have been rescued immediately upon its redemption, and elevated at once to the plane and sphere of true nobility and greatness. But alas! and still it would not; and therefore nothing remained but to slay it, and bury it, and hold it, as against a day of national resurrection. And this is just what was done. But,

12. It is a fact also that in all this long period of the nation's minority, and especially in the last days of the same, and just when better things might have been, and were most reasonably expected of them, they acted most shamefully, and with the most unsurpassed recklessness. They were bitter, hateful, and mean. They had violated all their most sacred vows and obligations, cast off all restraint, and given themselves over to national infidelity, wickedness, and sin. Nothing seemed too infamous and bad for them to do. And what greatly aggravated the situation was, their conduct was wholly without excuse. There was absolutely no cause, reason, or ground for their infamy. Their Sovereign was absolutely holy, just, and good. His like had never been the sovereign of any other people on earth, and their government was the very best possible. And in return for all this benevolence and goodness, they were simply devilish. But God turned them over to the operation, influence, and effect of that awful anathema which he had said (Deut. 28) should come upon all the violators of his covenant and law. As a people they had sown the wind, and were now reaping the whirlwind. And this was the situation when the King's Son came among them. He found them an accursed people, and rapidly disappearing from off the face of the earth, and but for the oath's sake of their Almighty Sovereign, made to the fathers and founders of the nation, they must have utterly perished. Nothing could have prevented their national destruction. They could not have survived the ordeals of all the terribleness of that curse. But God has thoughts of mercy. He is a covenant-keeping God, and, therefore, he does not clean cast off forever that which he has sworn to protect and defend. He makes the wrath of man to praise him, and the residue he retracts. He turns their malice into an instrument for the execution of his own great purposes and ends. But for this, Israel must have gone down, like other nations, in the darkness of an eternal night. Nothing could have saved them. Hence,

13. It is a fact that God redeemed his nation and people. Whatever else he redeemed, if he redeemed anything else, it is certainly true he redeemed Israel. He bought them off from the fearful anathema or curse that was already out against them and upon them. It follows, therefore, that Israel must and will be saved. For what God redeems that he saves. In no

case does he redeem an object or thing, and then condition its salvation upon contingencies that may or may not be fulfilled. He makes the salvation absolute. This does not mean, however, that every constituent individual of the nation will be saved, but only that the nation, as a nation, will be saved. In the matter before us God redeemed a nation; and, therefore, a nation must and will be saved. Indeed it is saved or its salvation is made absolutely secure. It cannot now be lost. It cannot perish. It was saved from the moment it was redeemed. It may not be delivered immediately, but its salvation is sure and certain for all that. It is more intensely God's property now than before it was redeemed. It was his property before, but now doubly so, and it must come out of the hands of that into which it had sold itself. It cannot be lost or destroyed. Its deliverance may linger and the nation may be evil entreated for a season, and perhaps most wisely so, but it cannot perish, and its deliverance is only a question of time; and it is sure to come in its time. And with it, glorious truth! will come the salvation of all who are really and truly of the nation. Not one genuine, heartfelt, real, *bona fide* constituent of the nation can be lost. But all will be saved. Alas, alas! that so many are not Israel who are of Israel. These must all go to perdition, and there is no help for it. But all true, genuine Israelites will be saved. The mere accident of flesh-and-blood birth, however, does not constitute a genuine Israelite. He is deeper dyed than that. But the salvation of God's nation is a glorious fact. And it at once becomes the grand base whence proceeds the work of God in the salvation of the world. A nation redeemed and saved secures the salvation of all who, in deed and in truth, are of the nation. And the one great mission of Jehovah's nation is to absorb, take up into itself, and assimilate all that is assimilable of both Israel nominal and the world, repudiating and rejecting all unassimilating material. "In thee," says God, speaking of his nation, "in thee shall all nations be blessed." Note, it is *in thee*, and not out of thee, that this blessing is to be enjoyed. God has purposed that all the world shall be *Israelized*, and to this end, the world must be in and of Israel. It must be taken up into, and thoroughly assimilated by Israel. At present and for centuries this work has been going on, by Israel's laying hold of the individual, but the time will come when whole nations will give themselves up to God and his Christ, and thus become Israelites indeed. And this work will go on until the whole world will have been swallowed up and assimilated by the Divine commonwealth. Again, this does not involve, as it did not in the case of Israel, the salvation of every individual in the world. Would that it did. But it does not. As a nation may be saved, and thousands upon thousands of its constituency lost, so the world may be saved and yet myriads upon myriads of its units perish. All depends upon the relation which the individual sustains to the kingdom of God. If he is really and truly of that institution, and not such in name simply, his salvation is as certain as it is that God exists. For God will save his commonwealth, and to save that he must save somebody; for a commonwealth without anybody is no commonwealth at all. Some will not come to God's kingdom that they may live, and therefore their salvation is im-

possible; for God will save no one outside his kingdom. The kingdom of God was instituted to be the depository and medium of salvation to lost men. It follows, therefore, that in order to salvation, men must be in and of this institution. It is the ark of salvation to the lost. There is no Divine favor, mercy, or grace outside of it. God saves men by saving his commonwealth, and in no other way. An institution and a person, then, and these in inseparable union or oneness, are the indispensable *desiderata* to salvation. Given these, and the world will be saved. Without them, its salvation is impossible. But these have been given. They exist and are, and they exist in their almightiness. Hence, again, we have "the salvation of the world in and through and by the salvation of a specific nation." This is God's plan, and it most assuredly will prevail. But no more now. Hold on to what you have, and look ahead just once more.

SANTA ANA, Cal.

UNDULATORY RELIGION.—No. 1.

BY REV. J. I. SWANDER, A. M.

The intelligent Christian is in duty bound to criticise and, as far as possible, correct the false tendencies into which the Church is constantly liable to fall, in her present conflict with the allied powers of evil. Our false pride and neglect in this matter is the occasion for Providence to call such scavengers as Ingersoll and others, not only to cleanse the streets of Jerusalem, but also to show God's people their transgression, and the House of Jacob their sins. "If we would judge ourselves, we should not be judged." The common mistake in the attempt at self-judgment is for one denomination to judge another. It is one of the most difficult duties in the whole catalogue of Christian requirements to rise up and take our position upon the commanding summit of Mount Charity, and with unbiased minds expose and condemn those carnal practices which may have rooted themselves in the alluvial soil of our own respective denominations. The healthy growth of the militant church calls for a radical change in the matter. The ax must be laid at the roots of the upas nearest home before the Zion of God can be cleared of its present deleterious atmosphere. Denominations should vie with each other in the needful work. Each one should see that judgment begins in its own apartment of God's great house. Purification should be the watchword of our most laudable zeal. Let it be proclaimed from every denominational headquarters, read at every roll call, and shouted in every battle-cry, until every hilltop catches the sound and sends it back with holy provocation to all the other divisions of God's invincible army. The sooner the better. Self-criticism and self-crucifixion are reflective acts of merciful charity at home. The neglect thereof is the cruelty of false kindness. We owe it to our own respective denominations. We owe it to the Church as unto the Redeemer's bride, and we will continue under such obligations until she shall be presented without spot, or wrinkle, or any such thing. If we are the legitimate children of the heavenly bride-chamber, the Church is as much our mother as she is the "Lamb's Wife," and we should, therefore, seek to correct her false tendencies and practices with as much filial fidelity and rever-

ence as a well-bred son would display in the removal of freckles from the face of the venerable mother who gave him his honorable birth.

Modestly claiming such legitimacy and honor of spiritual birth, we proceed in this and possibly in a subsequent paper, to show some of the false tendencies and practices into which our more popular types of Protestantism have fallen, and from which they must be startled and delivered or see themselves sunk into the reproach of the devil. And that no man may wrongfully judge us as being moved by the unhallowed impulse of sectarian prejudice and pride, we freely admit that there is some sweeping to be done before our own denominational door. The writer also acknowledges for himself personally that he is not yet so fully sanctified as to bar the possibility of a mote in his own eye; and even if that possible mote should prove to be an actual beam, it would still not change the facts, to some of which he may have occasion to invite attention. These facts may appear as beyond the reach of logic, and as calling for treatment that can be supplied only through the syllogisms of the ridiculous. That which cannot be reasoned out of error must be laughed out of countenance. We have no fitness whatever for the work when it calls for the argument of laughter. The melancholy music of our being has been written in the facial lines and spaces of constitutional gravity. *Argumentum adjudicium* is our only weapon in such warfare. With the pebble of truth in our little sling we proceed to form an acquaintance with the enemy.

Carnality, in disguise, is the evil which now not only threatens the foundations of our holy religion, but also actually restricts the Church of God to a narrow channel of beneficent influence that should be as bounding and as boundless as the waves of the sea. There are normal elements in human nature which become a power for evil whenever they are substituted or mistaken for the invisible forces and substantial entities of Christ's Mediatorial Kingdom. So also are there forces and agencies in the world which the Church has a right to employ in the furtherance of her heavenly mission; but, whenever she attempts to make an unwarranted use of such means, she trails the standard of holiness in the dust of the earth, lowers the dignity of her high calling, and defeats the very purpose professedly had in view. This is now the very vulnerable point in the questionable workings of our most fashionable forms of religion. We freely admit that Christianity has been commissioned to enter every fiber of human being, secure the right of way in every avenue of human society, and march on to final victory through every department of legitimate human enterprise; yea, we claim for truth that favored sentiment in sacred song:

"Religion never was designed
To make our pleasures less,"

but we deny that all pleasure is piety, that all amusement is proper recreation, that all expediency is lawful, that gain is godliness, and that sociality is salvation from sin in which even respectable society so commonly revels. Educated nature is too generally substituted for Christianity. A constant effort is made to build the temple of God with untempered mud. The inconsistency of much modern church enterprise is enough to make Heaven blush with holy sorrow, and hell resound with jubulations of infernal joy. Notwithstanding the purity

of the Christian principle, the many genuine Christians of whom the world is not worthy, and the great amount of laudable Christian zeal which constantly seeks to check the rising tide of whitewashed carnality, there is, in our view, an increasing thirst for congregational and denominational aggrandizement, and, what is still worse, an unlawful striving for the mastery in the use of questionable expedients which can have no other direct effect than to ripen an epoch in the world's history when Jehovah will again speak in thunder tones similar to those which began to shake the European continent in the dawning of the Reformation.

What was the practical culmination of Rome's pre-Reformation iniquity? Was not the lucrative sale of indulgences the audacity of her crime? Was it not this authorized traffic in sin that fired the zeal of Luther in Germany, and Zwingli in Switzerland? And is not Protestantism now repeating the great crime which she once charged upon the alleged "mother of harlots?" What is the meaning of church-fairs, religious gambling, sanctimonious sensuality and pious trickery resorted to by many of our congregations and silently sanctioned by our denominational church courts? Our civil authorities have been trying to suppress the lottery system whose roots have taken such firm hold in the unsanctified soil of fallen human nature. Our municipal governments are seeking to break up the gambling dens in the leading metropolises of the land, while the Church is planting the seed of the same iniquity at the foot of her altars, and watering them with the hypocritical tears of pretended penitence for sin. Great God! is it not enough to place an indelible blush upon the cheek of every Christian? What though carnal methods be baptized in the Christian name, are they not carnal still? Now abideth these, lucrative devotions, devotional gratification and gratifying amusement, but the greatest of all is false charity. What sounding brass and tinkling cymbals! The divinely ordained order has been changed. We love God because we are fond of strawberries and dress-parade. Instead of crucifying selfishness, which is the very essence of hell, the Son of God is crucified afresh and put to an open shame before the more consistent scoffers of the community. No wonder that they laugh when such appeals are made to man's animal nature to stimulate the action of something falsely supposed to be a regenerated heart. Religious flirtation, necktie parties, bean jugglery, holy hocus-pocus, mum-socials, and all imaginable manner of lucrative buffoonery are too frequently the manifestations of that mock charity which seeketh its own, is easily puffed up and becometh itself unseemly. In view of this tendency, what is the outlook for the future? Does the reign of such a carnival planet aught of hope or joy foretell? Were it not for the Divine promise that the gates of hell shall not prevail against the inner and more substantial principles of the Church, Christians might reasonably be alarmed at the sulphurous odor which now threatens to drive the holy incense of true religion from the temple of the Most High God. If, for holding these views, and indulging in these fears, the writer should be called a pessimist, he will make no objection to the honor thus conferred. When the tide is sweeping to destruction, to be an optimist is to be a fool. Jeremiah, John the Baptist, Jesus Christ and the reformers sounded the

alarm when they saw the degenerating tendencies of their respective ages, and shall we listen to the siren-song of false prosperity in Zion until we die in the ecstasy of its damnable delusion? Is there not already a general demand for another reformation in Christendom? Indulgences are now sold under the acquiescence of our Protestant bodies. Tetzels mercenary mission has been renewed. And what shall the harvest be if we continue to seal with the sanction of Heaven the principles and practices of hell? It is not by such stultification that the towering steeples of the New Jerusalem are to arise above the dark domes of damnation and death. Let the Church cease her traffic in carnal merchandise, and dissipate the halo of false sanctity under which the unsuspecting people of the world are enticed to come and spend their money for that which is not bread, and their labor for that which satisfieth not the deepest yearnings of their deathless being.

There is evidently a tendency at work whose heading is in the direction of a closer union between the Church and the world. This tendency is frequently mistaken for the commendable spirit of enlarged Christian liberality. Something supposed to be Christianity is becoming more popular, and the same old degenerate world looms up as a whitened sepulcher. The dromedaries of Midian are coming into the camp of Israel because the needle's eye has been enlarged. The old landmarks between two distinct orders of human existence are passing away. Sheep and goats feed in the same range of pasture, and there is consequently not much apparent difference between their respective qualities of wool. Progressive eucher and retrogressive religion move hand in hand. The most popular amusements are common to saint and sinner. Both parties seem disposed to meet upon a common level and form a permanent treaty of peace. There appears to be a tacit understanding between the Church and the world that the former is to furnish the standard of orthodoxy while the latter shall be permitted to dictate the rules of social propriety and practical ethics. In view of this the near future gives promise of a very interesting programme. It may be several years before the influential members of church-society shall be willing to sanction the popular entertainment of modern Spain, or the gladiatorial feats of ancient Rome, but at the present rate of speed the goal will soon be reached. The American people are easily swayed and swept before the whirlwind of a popular craze. Under the pretext of charity Madison Square Garden may yet be turned into a national coliseum graced with the gigantic statue of the Boston boy, and dedicated to the glory of the manly art. Why not? If Christian communities and leading members of the Church patronize roller-rink contests for sweet charity's sake, why not encourage sparring exhibitions for the support of the poor? Is there less religion in the brawny fists of pugilism than in the comely heels of skatorial voluptuousness? Zeal for God! Heaven have mercy upon such willing victims of deep delusion! It is a flattering falsehood. And is the popular-church-fair-entertainment-for-money-and-fun-system any better? Not a bit. Why not throw off the miserable mask and serve the flesh without being handicapped with such pretensions to holiness? The only real value of such carnival religion is its prophetic utterances. They reveal the inward emptiness of mere nominal Chris-

tianity, and foretell its ultimate marriage with genuine iniquity. There is now a courtship in progress looking to such a consummation. May the chariot-wheels of God's beneficent providence move on with rapid speed, and bring the inevitable crisis.

To speed this matter of flirtatious courtship, and hasten the dawning of the nuptial-day, we dictate the following epistolary form for the free use of those church societies who find themselves enamored with the charms of Philistia's uncircumcised sons, and who may wish to enter into correspondence with a view to an early tying of the nuptial knot. It will also be found full of rich suggestions for appropriate business-letters, when there is pressing need for funds to send the Gospel to other heathen lands.

1885.

MR. JOHN L. SULLIVAN,
Boston, Mass.:

The Holy Carnival Society of the ——— Congregation in this place assembled last evening in regular session, and after the proceedings had been opened with that beautiful and inappropriate hymn, "Nearer, my God! to Thee," I was instructed, by a unanimous vote of the said society, to open a correspondence with you, in the hope of enlisting your sympathies and securing your co-operation in a grand religious carousal, to be given at such time in the near future most convenient to yourself. As you are having other engagements of a somewhat similar character, we have decided to allow you to name the time most in accordance with your wishes, provided, however, that the proposed set-to is to take place within 500 miles of Fremont, Ohio. It is the determination of the managers to make the forthcoming festival surpass anything ever offered to the public since the early martyrs were thrown to the lions. To make the occasion a complete success, it is proposed to render a programme which will include three general parts, viz.: gratification, sanctification, and stultification. Considered more in detail, the entertainment will be found to consist of music, ice-cream, unfermented wine (strictly a temperance drink), oysters, prayer, amusement, strawberries, spiritual songs, a few specimens of holy flirtation between the vestibule and the altar, and promenades on the porch, called Solomon's greatly wondering. The whole interesting affair is to be brought to a most thrilling degree of perfection, about the hour of midnight, with one of those inimitable exhibitions (without gloves) at sparring, which have made you the champion of America and the ring-master of the world. In making up the sparring match, you will please select some other bright star from the increasing number now nightly seen in your pugilistic galaxy. It is also the wish of the society that in scoring for points you both be exceedingly careful not to display any cruelty to animals for fear of scandalizing the sacred things with which the exhibition is to stand intimately connected. There are some members in our congregation who need the preventive grace of educational habit before they are willing to follow every sort of amusement to its last excess of revelry and riot. Our object is to proceed gradually until we bring religion down to a level with the world, that no one may have an excuse for remaining irreligious. We also hope to make the event an occasion of tariff for revenue—not for revenue only, but

for amusement as well. In fact, we believe in free trade with all foreign powers. If we shut our ports against the world with its cargoes of carnal commerce, the Church will be obliged to rely largely upon home productions and such legitimate resources as belong to her as a distinct order of organized being in the world. In that event consistent Christians would lose their popularity and be ruled out of the circles of the elite of society. Such a course would be ruinous to all the expectations of the flesh. The pride and ambition of men would protest against such a religion. Times have changed. We must now make Zion keep pace with the music of Egypt, Babylon, and the Roller Rink. To do this money is a necessity. By the way, Mr. Sullivan, we have noticed that in a recent speech of yours at Philadelphia, June 16, you proposed to match your single self with Ryan, Mitchell, and McCaffrey for \$10,000 each, and give the money to some charitable institution. If you cannot be with us in our proposed grand entertainment, we hope that in the beneficent distribution of the aforesaid \$30,000 you will remember us. We are poor, but exceedingly pious. On account of a little misunderstanding, our congregation is just now in quite straitened circumstances. Our case is somewhat peculiar, and yet not peculiarly so. The main pillars of our church are not members thereof. They had frequently accompanied their devout wives to the sanctuary when the weather was favorable to a fine display of millinery. It so happened that recently in their presence our minister made some mild criticisms upon prevailing haughtiness and pride among God's peculiar people; and incidentally mentioned righteousness, meekness, and self-denial as among the Christian graces, and necessary qualifications in all who walk the narrow path to eternal life. He did not intend to offend any one, for he is quite a gentleman indeed; and yet they have taken to themselves such a heavy dose of umbrage as to refuse any further aid to the support of the gospel. The salary is consequently in arrears. Something *must* be done. They have agreed that if your services can be secured upon the occasion proposed above, they will not only return to their pews, but will also assist in getting up an interest that shall revive the languid energies of our congregation. Will you not hear our Macedonian cry? By the magnetism of your personal and pugilistic presence we hope to realize sufficient funds to pay off the salary, get new furniture for the church kitchen and parlor, and have something left to send to the heathen. Don't you think that "we whose souls are lighted with wisdom from on high," ought to interest ourselves, and pour out our gushing sentiment in behalf of those ignorant pagans who make their wicked prayers in the vicinity of "Africa's sunny fountains?" Come and help us rally to their rescue. If the lecture-room of the church should be too small to accommodate the large audience expected, arrangements will be made to secure the Roller Rink. There will be no trouble about getting the use of that large and commodious building, as the managers thereof are members of the church, in good and regular standing. No pains shall be spared to make the affair a most brilliant success. That none may doubt the religious character of the entire performance, the exercises will be opened with prayer and the singing of some suitable hymn accompanied with music on a horse-fiddle! Your

early reply is looked for with emotions of pious anxiety and passionate anticipation.

Most affectionately yours,
Secretary.

Should any of the Broadway church societies see fit to make use, either in part or in full, of the above form, and receive an early reply from the gentleman addressed, it is hoped that a copy of such reply will be forwarded immediately to us at Fremont, Ohio, that it may be laid before the readers of *THE MICROCOSM* in the September number thereof. The managers of this magazine are determined not to be outdone by any other periodical in the world in matters pertaining to the progress of religion and philosophy. That great progress is being made there can be no doubt. But in which direction does popular religion make its progress? Is it not toward the world, the flesh, and the devil? If so, why? We shall attempt to give an answer in our next paper.

FREMONT, Ohio.

A SUGGESTIVE ADDRESS.

We take the liberty of copying the following extracts from the Rev. Dr. F. Hamlin's address delivered before the graduates of Rockland College on the evening of June 10, 1885. The entire address has the true ring of the Substantial Philosophy:

Mr. President, Ladies and Gentlemen, and Members of the Graduating Class:

It affords me pleasure to meet you this evening in a village so beautiful. It reminds one of that Ægean land where every scene is an inspiration, and every breath is baln. Nor need we be surprised if amid these verdant mountain notches the Muses with deft fingers sweep their shadowy harps, or if beside this magnificent Hudson the river-gods linger, as they did by Grecian streams in days of yore. Surely a location so charming must have been to this graduating class perpetual in spiration during these four years of mental application. I call the attention of this class, in the few moments allotted me, to a partial elaboration of this thought: "Ideal goodness, indispensable to ideal greatness." *Ideal greatness includes the culture of the mind, for the most valuable, and therefore the greatest product of any civilized age, is the mightiest and most correct thinker.* Surely thought is power. It melts the old iron of reading and observation in its furnace until it glows to a sunset red, which warms the studious who stand by, and scorches the senseless who venture too near. *Our nature reveals the visible as dependent upon the Invisible for its very existence.* I hold a flower in my hand and inhale its odor. You tell me that the existence of the unseen odor is dependent upon that of the flower. But think below the surface, and you will discover that *Cohesion* (which that thinker of this age, Wilford Hall, calls the "governing force of the universe next below the force of vital intelligence"), and it alone, prevents the flower from reverting, first to impalpable powder, then to intangible gaseous elements, and at last "back to the elemental fountain of incorporeal substance, out of which all matter was originally formed." And as in this case the seen is dependent upon the unseen for its existence, all the analogies of nature would in the last analysis point back to an invisible, immaterial, Infinite, from whom

and by whom are all things "that do appear." The fact that the General who holds the army together, and by his skill and magnetic power makes them proof against the attack of the foe, is *unseen* by that foe, because the army before him hide him from view, is no evidence that he is a mere "mode of motion," nor does his invisibility prove the army to be less dependent upon him for the solid front which it presents to the enemy.

Now, just as Cohesion is behind and precedes material existence, so the thinker is behind all material, social and moral progress in the world.

The material world is but an incarnation or materialization of God's thoughts. The picture cannot be before the ideal is in the mind of the painter, and the statue is in itself an indubitable evidence of the fact that a Thorwalden previously thought and idealized. So the fishes of the sea are but the materialized representations of what were previously so many thoughts in the mind of him who afterward took a *slater* from a fish's mouth; and as Jesus, the fleshly, was the Incarnation of the Divine Person, so star and sun, and river and ravine, and silver and sapphire are but visible representations of Divine thought. And as behind material creation was God and Cohesion, so behind all material, social and moral progress is the thinker. Surely he is the greatest product of any age. But *whence, then, comes intelligence and ability to think?* Surely not from the molecular friction of brain particles, for we have seen that matter is the child, and not the parent of the Unseen. A "mode of motion" is only a method or manner of activity, and a method is not the *precursor*, but the *sequence* of thought. If, then, everywhere in the field of the discoverable, existence depends upon the less gross, but more potential, it remains for materialism to prove that finite intelligence is an exception to the rule, and did not originate from that "Awful Unseen" in whom dwells "all power." In the light of the Substantial Philosophy, it is true science as well as true revelation, that God "breathed into man's nostrils the breath of life and he became a living soul." Surely the unseen is the real, for that is the real which is most enduring. Therefore, when, as Dr. Whedon says, "the fleshly eye sees a machine which is constructed on geometrical laws, and the soul's eye sees the laws themselves, the latter, the laws, are most real because eternal, while the former, the machine, is transitory." Thus we see, that as the material is the shadow, while the unseen is the substance, and as shadow cannot produce the substantial, intelligence and ability to think must originate from the Unseen; and so it might be shown that all genius is of God. That "the inspiration of the Almighty giveth understanding." But I hasten to make from the above this practical deduction:

He who is on most intimate terms with the great Author of Thought, namely, the Holy Spirit or God, is (all things else being equal) most likely to attain the ideal Greatness. All experience and observation prove that sin and immorality dwarf the intellectual forces, and measurably prevent the supernatural illumination of the mind. True, some who are either vicious, or pretendedly skeptical, attain, in some cases, to a measure of greatness, and in more to a measure of unmerited notoriety; but this is in part *in spite of* their moral condition, but chiefly because of the elevating influence,

both direct and indirect, of the very morality and Christliness which they ignore. An appeal to the history of nations proves that moral purity is conducive to intellectual greatness. Says that charming writer, Thos. Arnold—"The development of English literature is but a chapter of her religious history; for with the advent of Christianity came an intellectual quickening which gave us England's scholars." It was this that produced Bacon, and Shakespeare, and Addison, and Pope and others. The same is true of man individually. Whence came the polish and beauty of Solomon? Beside his sayings, Coleridge and Butler appear tame, and beside his exquisite figures the productions of Homer and Virgil and Shelley appear commonplace. The color of his style is like that of a humming bird's wing. With what perfect ease he draws the flocks of loose wandering thoughts into the pen-fold of proverbs, and then suffuses them with the soft slumbrous light of a July morning trembling amid beds of roses! Whence came this wondrous ability? *How came the "laws of Nature" to work so exceptionally in his case? Effects are not produced by ciphers. Upon him was an influence: and influence is the efflorescence of personality.* Nor can man be accused of unreasonableness if he considers Solomon as capable of stating the origin of his own superior abilities as are Helmholtz, or Darwin, or John Tyndall. Remember, young men, amid the "brain-throbbings" and aspirations of the future, that godliness "has promise of the life that now is." If you would attain to distinction, be yours that culture of the heart which enriches and beautifies the mind through communion with the God of all Wisdom. In the audience room of a large church in a Western city, there was placed an immense organ—tubes, pipes, stops, keys, pedals all constructed and arranged on a grand scale. When finished the hand of the unskilled brought from it only discord. The novice wrought music sweet but weak, and even the regular organist could not control it to the satisfaction of the owners. Finally the pastor said, I will have it tested. He sent for Morgan of Brooklyn. When he arrived and commenced playing, the bass seemed like Niagara's roar, and the audience shouted for joy; then the sharps sounded like a judgment trumpet; then in the minor key it seemed as if the Man of Galilee were saying "Peace, be still," but when he swept the upper notes all eyes were filled with tears, so sweet and touching was the music. As he left the instrument, Morgan said: "Its power is in its upper notes; it is too large and too intricate to be managed by most musicians."

Such an instrument is the human soul! 'Tis too large and intricate to be swept by the human hand. Its sweetness is unrevealed under the cold, angular touch of a Thomas Carlyle; it produces discord when fingered by J. Stuart Mill to the dirge of the "Unknown." It gives only a Miserere cry for Hugo, as with cooling hand he strikes it, and sings "Alas! alas!" It breathes no melody of peace and assurance as Tyndall and Huxley, and Helmholtz and Mayer press its keys; for their icy materialistic touch fairly chills and ruins it. It grates upon the ear when played by the "Plymouth pastor;" for, in his attempt to reconcile the irreconcilable, he leaves the upper notes untouched, and produces "confusion worse confounded;" but be seated, thou "King of the Jews," and strike

these notes to a charming symphony; touch the ivories that overlay the thoughts and the feelings and the will, and under thy Divine presidency earth shall rejoice; and as the upper notes respond the jasper walls will blaze with a "cloud of witnesses," who will shout for joy.

Aspire, then, we say, to Ideal Greatness; pursue it, seize it, retain it, but remember always that—

"The fairest flower in all the Garden of Creation is a young soul offering and unfolding itself to the influence of the Divine Spirit, as the heliotrope turns its sweet buds and blossoms to the sun."

HUMAN DEPRAVITY.

BY L. W. BATES, D. D.

The other day I handed a specimen copy of THE MICROCOSM to a friend, with the remark, "You are fond of scientific investigations—read that and see how you like it;" and he replied, "Yes, I belong to a scientific club, and my verdict is, that scientists are the greatest humbugs of the age."

Christianity does not have to contend with skeptical heads so much as with infidel hearts. "The fool hath said in his heart there is no God." The human conscience will seek the most trivial subterfuge to relieve itself of a sense of personal responsibility, and consent to any terms for security but that of ceasing to do evil. When Dr. Christlieb says of Dr. Strauss, "He is indignant that Jesus Christ should dare to bind the whole course of the world to His person, and should call all men, even Dr. Strauss, before His judgment throne," he but describes a class. Prof. Kurtz's forcible efforts to reconcile astronomy and the Bible account of creation, and the no less cogent reasoning of Prof. Guyot to harmonize geology and the Bible history of creation, will fall like a "sounding brass and a tinkling cymbal" on the hearts of infidel scientists.

If there be no God, conscience is a fraud. If there be no God, there is no responsibility; if no responsibility, there can be no standard of morals; if no standard, there can be no virtue; if no virtue, there can be no vice; if no vice, there can be no wrong; if no wrong, there can be no conscience, and "might makes right." Infidels, however, are compelled to acknowledge the existence of a right and wrong, but they have no standard, except civil law, by which right and wrong shall be tried, and their code of morals is elastic enough to yield to the strain of any emergency. Magruder's masterly reply to Ingersoll quotes the latter as saying, "Think of a great big man coming to a little bit of a child with a club in his hand. What is the little darling to do? Lie, of course. I think Mother Nature put that ingenuity into the mind of the child when attacked by a parent, to throw up a little breastwork in the shape of a lie to defend itself. * * * Suppose a man as much larger than we are as we are larger than a child five years of age, should come at us with a liberty pole in his hand, and in tones of thunder want to know who broke that plate? There is not one of us, not excepting myself, that wouldn't swear that we had never seen that plate." And yet this man, who proclaims himself thus capable of perjury, and "does not believe that truth is worth

suffering for, and that one had better lie than lose a drop of blood," insists that he and his fraternity should be credited as witnesses on the stand.

How is it possible to constitute a code of morals outside of the Bible? What system of philosophy can go beyond the requisition to "Love God with all the heart, and our neighbor as ourselves?" And who dare institute a code that comes short of this law? When Mr. Miln found himself compassed with meshes of infidelity, he had the honesty to pass from the pulpit to the stage. His example is worthy of adoption by those other preachers who deny the declaration of Holy Writ that man's body and soul came from the plastic hand and vitalizing breath of Deity, by proclaiming that man was evolved from a tadpole; and those other preachers, who deny the Divine Word that "by one man sin entered into the world, and death by sin;" and subscribe to a geology that introduces death-ages before man had an existence.

That the bias to evil is as inborn as is the susceptibility to disease needs little argument to prove. The infant heart is not a pure blank on which precept and example are infallibly to make their impress for good or evil; for, even in its freshness, it is so blotted and blurred that *unaided* precept and example cannot expunge the stain, nor write the law of virtue upon the page. The viler passions of human nature start up and assert themselves long before precept and example can be appreciated, or reason can comprehend the relations of life, and even in defiance of the tender influences applied to check their ebullition by the anxious mother.

If the moral principles be entirely subject to education, whence is it that those who have pious home example and instruction, become in many cases wicked? and those who have wicked home example and instruction, become in many cases pious? And whence is it that pious association does not as surely lead to virtue as vicious association leads to immorality? These questions are more emphatic by the fact that the vicious acknowledge that vice can result only in injury, and that virtue is the sure road to benefit.

The knowledge of evil could be attained only by observation, revelation or experience. Observation was impossible to the first man, and the Bible tells us that he discarded revelation, ventured upon experience, and thus depraved his nature. If so, in the very nature of things, by the inevitable law of generation, every child of his must come into the world with a corrupt nature; for he could not give to his posterity a nature superior to his own, nor place them in a higher position than he occupied; if helpless in his own behalf, he was helpless in theirs. It is left to the stupidity of infidelity to teach that the inferior can unaided, produce the superior.

Can philosophy or history trace human corruption to any other source than the first man? Can experience or observation attribute it to any other agency? Does any man live long enough to escape the promptings of evil, and reach a state in which all the impulses and inclinations of his nature are for the right? Where conflict with himself ceases, and purity and truth require no struggle for their maintenance?

What a dark, sad picture does sin present to our contemplation. As its consequences, man comes into this world with a corrupt heart,

biased to evil; and all the selfish passions aglow with envy, covetousness, malice and revenge; with falsehood, treachery, avarice and cruelty, and in the struggle for the mastery to cheat, and lie, and oppress, and kill, with no check upon these vile passions but that other passion of self-preservation: with the seed of mortality in his body, to be burnt up with fever, tortured with pain, and wasted by consumption; to be eaten up by cancer, marred by deformity, and mangled by accident; to contend with disorganized nature, not only to subdue the briars and thorns by the sweat of his face, but to suffer the pangs of famine and breathe the infection of pestilence; to be smitten by the thunderbolt and crushed by the tornado; to be engulfed by the earthquake and swallowed up by the waves.

What can relieve or illuminate this sombrous picture, but the forgiving mercy and regenerating grace of God, through the meritorious death, resurrection and mediation of our Lord and Saviour Jesus Christ?

GEORGETOWN, D. C.

A GREAT REVIEW OF THE "PROBLEM." No. 3.

[From the *Scientific Reporter* of Oct., 1878.]

The part of the work which he calls the "*Evolution of Sound*" is a curiosity in the line of scientific argumentation, though it seems, in portions of it at least, to be more personally severe, particularly in review of Prof. Tyndall, than was desirable or even called for. The antagonism which the author evidently felt toward the doctrines of evolution, amounting at times almost to bitterness, appears to have unnecessarily sharpened his pen as he assails Prof. Tyndall's "*Lectures on Sound*," and thus deavors, by arraying him against himself, to show his unreliability as a scientific teacher on the subject of evolution or any other question of physical philosophy. Less acridity of expression, however, would have given equal weight to the arguments employed. But Dr. Tyndall himself is no mincer of words in a scientific controversy, being an expert in the selection of strong language when dealing with an antagonist, as evidence his recent contest with Dr. Bastian on Spontaneous Generation. He is notoriously apt to call things by their proper names, and should he find an occasional cut in this tantalizing review of his "*Lectures on Sound*," his memory may possibly assist him to something bearing a family resemblance, if not equally affectionate, in his treatment of those who have unfortunately had an occasion to fall into his hands.

Aside from this single objection there can be no question about the annihilating character of the review as involving the current sound-theory and the writings of the three great physicists (Tyndall, Helmholtz, and Mayer) assailed. The logical overthrow of the teachings of these authorities on sound, it would seem, can admit of not a doubt in the mind of any investigator of physical phenomena who will carefully read this treatise. Not an inch of solid scientific ground appears to be left on which the wave-theory can now rest its claims. The author may well conclude, as he does, after so effectually accomplishing his task, that a theory which, in the hands of its ablest ex-

ponents, is forced to resort to so many self contradictions and physical impossibilities to sustain its principles, must necessarily be foundationless in science.

It would be difficult to give anything like an adequate idea of the demonstrative character of these arguments against the prevailing views of physicists without quoting more largely from the work than our space permits. Throughout the two hundred or more pages devoted to the question of sound one consideration after another, in regular sequence and rapid succession, is brought to bear against the received view, each one of which seems difficult if not entirely impossible to answer,—many of them, in fact, utterly unassailable.

The author not only attacks the popular work of Prof. Tyndall, but grapples with the writings of the great German investigator of sound—Prof. Helmholtz, acknowledged to be the foremost physicist of the age—and includes in the assault also the writings of Prof. Mayer, the leading sound expert and investigator in America. The havoc made with their logic and reasoning would seem to be hopelessly disastrous. What they will have to say for themselves when this aggressive treatise comes to demand their attention, or what explanation they will be able to give to the scientific world of the arguments here massed against the current hypothesis of wave-motion, remains to be seen; and will be anxiously watched for.

As impossible as it is to do justice to this masterly monograph in a brief review, it would be omitting a plain duty to the reader not to condense a few of the arguments employed in opposition to the popular theory of sound, though not one in ten can be even referred to, much less condensed.

Take, as an example, the following characteristic illustration of the reasoning of physicists on which, as the writer claims, the entire theory of wave-motion rests,—namely, the views entertained by all writers on sound in regard to magazine explosions and their effects in the destruction of buildings, the breaking of windows at a distance; etc., in which they invariably represent the sound-pulse and the condensed atmospheric wave which produces such results to be one and the same thing. He quotes Prof. Tyndall's careful description of an explosion which occurred a few miles from Erith by which nearly all the windows in the village were broken, and in which narrative he distinctly makes the sound-pulse and the condensed air-wave identical, using the two terms interchangeably.

The author then proceeds to demolish this fundamental error of the theory in a manner that will be anything but pleasant reading to sound-writers who have ever had the misfortune to describe magazine explosions in their books or lectures. He shows that they wholly ignore the fact that at such an explosion there are instantaneously added tens of thousands of cubic yards of gas to the atmosphere directly surrounding the magazine, which necessarily communicates a tremendous shove to the normal air, compressing and driving it off into such a condensed wave as not only to crush in buildings, but even to rend animals and human beings into fragments when it first starts on its destructive journey. The fragments of buildings and animals which happened to be near a magazine have often been found, after an explosion, scattered over many acres of ground,

caused unquestionably by the outward rushing of the displaced air-wave owing to this addition of powder gas; yet Prof. Tyndall and writers who copy his views tell us learnedly that such a displacement and compression of the air is only a sound-pulse,—nothing more, nothing less!

The supposition of physicists that simple sound or tone should thus be able to disintegrate a horse and scatter its fragments over acres of ground (as they absolutely teach by making the sonorous pulse and the compressed air-wave the same), is logically made by the author to appear almost infinitely ridiculous. As well, he insists, might they claim that thunder and lightning were one and the same thing, and teach that when a man is killed by lightning he is crushed to death by an intensely compressed thunder-wave! He shows that the tidal wave sent ashore by a volcanic upheaval in the ocean, which destroys shipping and buildings, is entirely analogous to the air-wave sent off by a magazine explosion, and which destroys buildings and crushes windows at a distance. Yet what physicist, he asks, would be so innocent of all true scientific knowledge as to teach that the shipping was destroyed by an intensely compressed aqueous sound-wave? A rumbling sound of the submarine explosion always accompanies such tidal waves, which are simply a displacement of the water by the accumulation of volcanic gases under its bed. The cases are thus exactly parallel, as he shows; yet no physicist thinks of making such a wave and its accompanying sound one and the same thing, as Prof. Tyndall so erroneously does in describing the explosion at Erith. Physical investigators who can be caught in such a ridiculously exposed trap as this scarcely deserve sympathy.

The author then calls attention to the fact, never intimated or apparently thought of by these writers on magazine explosions, that such supposed destructive effects of sound-waves are notoriously absent from all other kinds of sound of whatever intensity or loudness or however produced, where no gas is generated and added to the atmosphere, such as in tremendous concussions produced by the falling of trees or buildings, the collisions of trains of cars, or the dislodgment of a mass of rock over a precipice. He asserts, no doubt quite truly, that a sound thus produced, even should it be of ten times the intensity of that accompanying a magazine explosion, would not mar a pane of glass a dozen rods away from the source of the concussion, and hence, assumes boldly, in the face of the universal teaching of physical investigators, that the compressed air-wave accompanying the sonorous pulse, and which is sent off by an explosion, must be a separate and distinct effect from the sound itself, really having nothing to do with it, and at the same time traveling, as he broadly assumes, at a distinctly different rate of velocity, the same as in the case of the tidal wave and its accompanying sound.

He furthermore makes the prediction, deduced from the numerous arguments he advances, that whenever the experiment of an explosion shall be properly tried, for the purpose of determining the question, it will be found that near to the magazine, if the explosion be a large one, the condensed air-wave will necessarily outstrip the speed of the sound-pulse, but will travel slower and slower the further it advances and the greater the atmos-

spheric area embraced within the compression. till at a sufficient distance the sound-pulse will overtake and outstrip the wave, arriving at the station some seconds in advance of the concussive shock: since, as is well-known, sound travels with a uniform velocity at whatever distance from its source or whatever the quantity of powder consumed, its speed being about 1120 feet a second, 60° Fahrenheit.

He thus ventures to announce this scientific prediction (without having tried the experiment), based entirely on what he believes to be the laws of mechanics and mathematics, and that, too, in opposition to modern science as taught by the ablest physicists, and invites Prof. Tyndall or any body of scientists who may choose to do so, to have the matter tested, and the error of his prediction exposed, if it can be done. The reasoning of the author seems so flawless on its face, all the way through this exhaustive argument, that science can scarcely refuse to accept the challenge so plausibly and confidently thrown out. If nations and scientific institutions regard it of so much importance to the world to ascertain the approximate distance of the earth from the sun, as the author justly remarks, that they will expend millions of dollars in equipping and sending astronomical expeditions to far-off oceanic islands in order to observe the transit of Venus, surely some scientific association can well afford to settle forever the truth or falsity of the wave-theory of sound, when it can be done by the test proposed at a total cost not exceeding a couple of hundred dollars.

Should the result predicted by the author prove to be correct, including the details of velocity in the two effects, thus demonstrating that the sound-pulse and the compressed air-wave are two separate and distinct things, and that, too, independently of any prior experiment on his part, it will prove a scientific triumph unsurpassed in recent times, and only equaled by that of Leverrier's discovery of Neptune through pure mathematical calculation, without the aid of a telescope of sufficient power to reveal it to the eye! It may even be said to surpass the achievement of Leverrier, since he had no opposing scientific authority to fight against, going to show the impossibility of such a discovery; but, on the contrary, had the highest astronomical authorities confirming the existence of such a planet as probable. with other astronomers actually working at the same time to the same end.—as, for instance, Adams, of England, who virtually made the discovery prior to Leverrier, though he lost the credit by the neglect of another astronomer; whereas the author of the *Evolution of Sound* makes his scientific prediction, even to the minutia of acoustical and pneumatical details, as the result of pure philosophical and mechanical calculation, in opposition to the combined authority of the scientific world. For it is evident, should the result turn out as predicted, it must not only expose the erroneous character of the reasoning and observations of all physicists, ancient and modern, who have written on sonorous phenomena, but it annihilates at a single blow the wave-theory of sound, as the author justly concludes, by demonstrating that the corresponding air-waves known to accompany sound-propagation, are but an incidental effect of the action which generates the tone, and no part of the sound itself. Any reader who cares for the critical analysis of an interesting scientific problem should not fail to read this revolutionary ex-

pose, which is scarcely more than glanced at in this synopsis.

One of the clearest and most convincing arguments employed by the author against the wave-theory of sound is based on the stridulation of a certain species of locust which can be heard a mile in all directions, as admitted by Mr. Darwin and other naturalists; thus, if the current theory of sound be true, throwing this entire area of atmosphere into waves constituted of "condensations and rarefactions," and thereby shaking the tympanic membranes of hundreds of thousands of human beings who might happen to be in a position to hear it. This admits of no dispute; for, according to these eminent authorities whom he quotes in profusion, sound can only be heard by the dashing of air-waves into the aural passage, and the corresponding vibration to and fro of the "drumskin of the ear."

After this position is fully established by citations from the authorities under review, the author proceeds to show by mathematical demonstration that such a result by such a trifling physical cause is an infinite impossibility; for, as the air must necessarily vibrate at every square inch throughout this radius of a mile, including a mile high, and with calculable mechanical force in order to shake a tympanic membrane if located at any particular point, it follows that this insect, alone by the movement of its legs across the nervures of its wings, exerts a mechanical energy sufficient to shake two thousand million tons of physical matter, swinging it to and fro at the rate of four hundred and forty oscillations in a second, the pitch of its sound being A, and logically concludes that such a thing being impossible there can be no truth in the theory which necessarily teaches it.

The astounding figures and mechanical results here given are not jumped at by the author, but are deduced as the necessary result of the wave-theory of sound; because, as he shows by careful computation, within the atmospheric area permeated by the music of this insect there is an abundance of room for the separate or individual oscillation of 2,000,000-000 tons of such ponderable matter (counting 16,000 such membranes to a pound, which he had estimated by actual weight); and as there is no way to hear sound, according to the theory in question, except by the swinging to and fro of the "drumskin of the ear" at each supposed sonorous vibration of the air, it becomes impossible to evade the conclusion arrived at, that the stridulation of this diminutive creature must exert the inconceivable mechanical force here estimated, if the received theory has any foundation in science. As this amount of physical energy evidently could not be exerted by the combined strength of a million powerful horses, he quite reasonably concludes that the wave-theory, which logically and literally teaches such an impossibility, must be a fallacy of science.

The demonstrative character of this argument, presented as it is in a number of different ways, can only be appreciated after a careful examination of the facts and figures given by the author. On reading such an array of evidence against the popular idea of atmospheric sound-waves, and assuming the reasoning to be correct, it baffles comprehension how acute and careful investigators of physics should have been misled by any theory, however plausible on its surface, to accept an hypothesis so mechanically impossible in the

nature of things. If the facts, citations, and figures of this argument on the locust be not fallacious and willfully perverted to serve a purpose—and we confess our inability to detect the least discrepancy after going over several of the calculations and referring to the originals of many of the quotations—there really seems no way out of the difficulty but for Prof. Tyndall and his co-physicists to acknowledge to the world that the wave-theory of sound utterly fails to account for observed sonorous phenomena, and that the universally accepted view must therefore be a scientific misapprehension.

That such a trifling creature as a locust has the physical strength to literally shake even *thirty-two million membranes (one ton)*, swinging them back and forth at the rate of 440 complete vibrations in a second, to say nothing of oscillating 8,000,000,000 tons of the same ponderable substance (84,000,000,000,000 membranes), no rational man, it would seem, could for a moment believe. Yet the author proves by many citations from Profs. Tyndall, Helmholtz, and Mayer, and from the general teachings of the wave-theory, that the tympanic membranes of every man who hears the sound of a locust, if they could amount at one time to the above number, must be shaken or made to "bend once in and once out" at each sonorous vibration, or such sound cannot be heard at all. Hence, as the stridulation of this insect, according to the received theory, throws a sufficient mass of air into "condensations and rarefactions" to actually contain, and with sufficient force to positively shake, the above estimated number of membranes, if properly distributed throughout the area, it follows that a locust, by the movement of its legs, must exert a mechanical force greater than that of all the locomotives on earth combined. As such a supposition is infinitely impossible, we have no hesitation in declaring the author justified in his sweeping denunciation of the popular theory of sound as a stupendous and inexcusable scientific fallacy.

Besides a score or more of such arguments as these forcibly urged against the practical working of the wave-theory of sound, the author takes up the question of wave-motion from the other standpoint; that is, he examines in detail the various arguments and considerations advanced by writers on sound which seem to favor such an hypothesis, and in every instance claims and undertakes to prove that the facts lying at the foundation of such phenomena are entirely misapprehended and misinterpreted by physicists.

As an example of this aggressive reasoning he even undertakes to show that the *double siren*, so confidently relied upon by Profs. Tyndall and Helmholtz to prove the interference and mutual destruction of sound-waves, thereby establishing the assumed parallel with water-waves, is wholly misunderstood by these learned investigators. Such a position as this, boldly assumed by a writer who acknowledges that he never has seen a *double siren*, is startling for its audacity, and seems almost if not quite preposterous, especially when we consider that Prof. Helmholtz was himself the inventor of the improved instrument with which the experiments on interference were made. To suppose that this eminent acoustician did not comprehend the working of his own apparatus, attributing its acoustical effect in jumping from the fundamental tone to the

octave (on placing its two disks in a phase of opposition) to a cause which had no existence in fact, would be to weaken if not destroy all ground for faith in the investigations of modern scientists, which, as already intimated, was evidently a part of the author's intention. Should his conclusions turn out to be correct on the necessary action and acoustical effects of the *double siren* when operated in the manner described, in opposition to the deliberately formed judgment of these experienced investigators of physics, it would prove another scientific triumph of inductive reasoning without experiment over universally accepted authority and observation, only paralleled by his announcement already referred to in regard to the true solution of magazine explosions.

We have no hesitation in expressing the opinion, notwithstanding the apparent audacity just referred to, that when the tests on the *double siren* shall be made, as proposed by the author to Profs. Helmholtz and Tyndall, the solution he gives of the problem of this supposed interference of sound-waves will be shown to be entirely correct; and further, that the scientific world, including these physicists themselves, will be forced to acknowledge it.

Truly, if the present theory of sound, considered so long and so thoroughly established as science, and supported, as it is, by the highest living authorities, should be thus forced by the arguments of an unknown writer to abandon the foundation upon which it has always rested,—atmospheric wave-motion,—we may begin to entertain serious doubts as to the reliability of any of the boasted scientific theories of the nineteenth century.

We cannot venture to give the details of this original analysis of the *double siren*, as they alone would fill the remainder of the space allotted to this review. What we have said will be understood by scientific students who are familiar with works on sound. The value of the author's contribution to acoustical science on this question alone can scarcely be overestimated.

In a similar manner he takes up the *König* instrument, used for dividing a stream of sound into two branches of unequal lengths and afterward causing them to re-unite and interfere, and shows that so far from sustaining the wave-theory the instrument clearly overthrows that hypothesis, thus proving that Prof. Tyndall in his public lectures entirely misapprehended the apparatus.

In like manner that lecturer's experimental illustrations with a row of glass balls and a row of boys,—also with a long tin tube for concentrating a sound-pulse upon a candle-flame and extinguishing it by clapping two books together at the other end, etc., as illustrated in his work on sound, are demonstrably and amusingly turned against the wave-theory, leaving this eminent experimenter in rather an uncomfortable plight before the scientific world.

Some explanation on the part of the authorities reviewed by this author is called for, and absolutely unavoidable in view of so many direct and specific charges of erroneous teaching. If the charges were vague and unsupported by evidence and logical arguments, they might be passed over in silence. As it is, such a thing is impracticable. Dr. Tyndall, who proverbially never comes off second best in his scientific encounters, will hardly suffer these damaging arraignments to pass unnoticed,

though he will have his mettle tested to its utmost tension by such a tantalizing expose of his "Lectures on Sound." If he can succeed in still vindicating his well-earned reputation for master in the arena of scientific discussion by successfully meeting the assaults of this author, he will have achieved a controversial triumph compared to which his other tilts have been but as the play of children. We shall see that our readers are kept advised as developments take place.

(CONCLUDED NEXT MONTH.)

CAMPING TOUR TO THE YO-SEMITE VALLEY AND THE CALAVERAS BIG TREES.—No. 9.

BY PROF. I. L. KEPHART, A. M., D. D.

Tuesday morning, July 8th, found us enjoying the exhilarating influences of the pure mountain air, a refreshing night's sleep, and a hearty breakfast. The women having elected to remain in camp during the forenoon for the purpose of arranging their toilet and overhauling the culinary department, the professor and I strolled down to the hotels and visited the cabinet shop, the art gallery, and the curiosity bazaar. In the cabinet shop we found a very expert workman (an aged Englishman) engaged in producing from the native woods of the valley all kinds of trinkets—canes, urns, napkin-rings, vases, veneerings, and mosaics—all of which were not only highly interesting as relics, but exquisite specimens of the highest degree of skilled workmanship.

In the art gallery we had our choice of a great variety of stereoscopic views of all the interesting scenes in the valley; and in the curiosity bazaar was exhibited a collection of Indian relics, bones, teeth and skins of animals, that have been gathered up in and around the valley. Having made a purchase of views, trinkets, and relics, and having added our rhyming contribution to the great Tourists' Register, kept in the curiosity bazaar, we returned to camp in time to enjoy a good dinner of apple-dumplings, with which the women surprised us.

Dinner over, we hitched up the team and set out to "take in" the Yo-semitic, and the Bridal Veil Falls, and the Cascades. Having been informed that 4 P. M. was the best time to see the Bridal Veil Falls (that being the time when the sun's rays so strike them as to produce rainbows), we first drove to the Yo-semitic Falls. These are situated opposite the three hotels, near the middle and on the north side of the valley, and distant from them nearly a mile in a straight line, but *apparently* not more than two hundred yards, and are remarkable as being the loftiest cataracts in the world. As to their exact height authorities differ; but the latest measurements place the total descent at 2634 feet. This, however, is made in three sections. The first is a perpendicular leap of 1600 feet, having made which the water strikes on an apparently narrow, sloping ledge. The wall from which the waters plunge is slightly concave, and the gorge out of which they emerge to make their awful leap is a deeply cut channel, to the east of which the ledge towers up 3030 feet above the valley. About 100 feet below the top of the falls the waters strike a ledge projecting from the east side, which deflects them to the west, forming a slight curve. From the foot of the first leap

the waters descend in a number of cataracts, the aggregate height of which is 534 feet; but these are partly obscured from view by windings in the gorge and the projecting rocks. The third descent is a perpendicular leap of 500 feet, at the foot of which the waters strike upon a mass of granite rocks with a sullen, thundering roar. From these they rush down through rugged, ragged, confused, thrown-together rocks for a distance of half a mile, until they reach the level of the valley below. As you gaze upon the falls you see constantly shooting out from the face of the descending sheet clumps of white spray that present a rocket-like appearance, many of which continue to preserve their identity until they reach the rocks below. Viewing the falls from a distance, one is astonished at the apparently slow descent of the water, resembling the falling of light sheets of snow through the air. This is owing, however, to the fact that the distance through which the waters fall *seems* to be not more than 300 feet, while in *reality* it is 1600 feet. Looking at the upper fall, the gorge out of which the waters emerge seems to be not more than 100 feet wide, but by actual measurement it is a third of a mile. The Yo-semitic Creek has its source ten miles east of the falls, at the base of Mount Hoffman, and is formed from the melting of the vast beds of snow that fall on the mountains during the winter. As the snow disappears, and, as winter approaches, the volume of water in the creek diminishes, and the falls become less interesting. Hence, the best time to visit the valley is from the middle of June till the middle of July.

East of Yo-semitic Creek is Indian Canon, a deep defile out of which flows Indian Creek, which drains the water from the eastern slope of North Dome, and a mountain defile that extends to the west of Mount Watkins. West of Yo-semitic Creek tower the Three Brothers, and west of these El Capitan.

Having driven as near as we could we left our wagon, and the women having donned their gossamers, we set out for the foot of the falls. Up we went, clambering over huge granite boulders, creeping through narrow passages, cautiously stepping from one wet, slippery rock to another, all the while the roar becoming more deafening and the descent of the spray more drenching, until we stood right at the foot of the mighty cataract! But, O, what a place to stand—especially for women! What had appeared to us, when viewed from a distance, to be a gentle, smooth, descending, foamy sheet, emitting a constant gentle roar and a series of off-repeated booms and heavy thuds, has now been transformed by the nearness of our view into a terrible, angry, roaring, foaming, seething, battling pandemonium, whose noise and confusion are bewildering and deafening. The descent of the waters, fearful in their velocity, lashes the surrounding atmosphere into a perfect tempest, which in turn dashes the spray hither and thither with intense fury, causing you to gasp for breath, and drenching you thoroughly from head to foot! Think of a sheet of water thirty feet wide and two feet deep leaping down, perpendicularly, *five hundred feet!* It cannot be described; nor can the effect produced upon the mind of the beholder by the onrushing, tumbling, flashing, gleaming, murmuring, roaring, thundering waters, as he pauses in that fearful presence, and realizes that since the transpiration of the mighty convul-

sion by which these mountains, valleys and falls were formed, these waters have continued to flow, and this roar has never ceased, and that

"Men may come and men may go,
But they go on forever."

In this tremendous presence you find yourself unable to take in the wondrous details that enter into and constitute the whole of the scene. There are the mighty, towering ledges, the huge granite boulders, the shrubbery, the ferns, the mosses, and near by the stately pines of the valley—these all combine to constitute it a most wild, weird and yet awfully real scene, surpassing in grandeur and terribleness anything ever wrought out by the imagination of men. The power of these falls may be realized in part by the fact that the immense boulders lying around have been tumbled down from the cliffs by the onrush of these waters. Mr. Nelson, in his "Pictorial Guide-book," in speaking of these falls, says:

"It is said that in the winter the spray from the great cataract freezes, and piles up and again freezes, until a hollow pillar is constructed some hundreds of feet in height. Into that pillar the waters pour, and then rebound like rainbow-colored balls. In the spring, the rush of the cataract and its thousand voices seem for a moment to be arrested. You hasten to the spot. The floods have undermined this glorious pillar, and made ready to topple it from its elevation. The struggle is brief but desperate. Suddenly the ice yields, and is shivered and hurled into the air in a thousand fragments, sparkling and shining with a lustrous gleam, and then falling back into the stream, to be carried away and seen no more."

Returning to and entering our wagon, we drove rapidly down to the lower end of the valley, and thence three miles down the canon leading from the valley, where we had a fine view of the cascades formed by the Merced (river of mercy) as it flows out of the valley. In these the river flows down at an angle of about twenty-five degrees, roaring, dashing, and foaming amid the mighty granite boulders, in many places making perpendicular leaps of six, ten, and fifteen feet. Having found a place where the road was wide enough for us to turn around (which is not so easily found here), we retraced our steps to near the base of El Capitan, where we took the right-hand road, crossed the river, and went up to where the road crosses the creek flowing down from Bridal Veil Falls. This being quite near the falls, and affording a splendid view of them, and the women (owing to the remembrance of the drenching they underwent at the Yosemite Falls), not desiring to approach any nearer to these, we left them in the wagon, and the professor and I, taking the women's gossamers, started to "take in" the "Bridal Veil." In these falls the waters make a perpendicular leap of 640 feet, and then make an additional descent of 300 feet through a series of cascades and cataracts. Having donned our (the women's) gossamers, we clambered up over rocks and through shrubbery, until at last we mounted a huge granite boulder that lies within 100 feet of the foot of the falls. But O, what a scene! The volume of water being much less than that in the Yosemite Falls, there was not that immense lashing, roaring, thundering commotion; but the rays of the

four o'clock sun, lying right in against the falls, caused a series of the most beautiful rainbows to form complete circles right in front of us, so that one side of the circles lay right at our feet! Here was a scene of Nature's painting, which, for grandeur of design, exquisiteness of touch, and perfection of execution, not even a Raphael can approach to.

These falls were named by the Indians Pohono, which means, "the Spirit of the Evil Wind." They have a legend to the effect that at one time a beautiful young Indian maiden, while gathering berries, approached too near the verge of the ledge, was blown by the wind, slipped, fell into the water, was carried over the falls and never seen again; and they interpret the peculiar sighing sound of the falls as being the voice of the lost maiden, warning them not to approach too near to the fatal ledge. Consequently, they cannot be induced to look at or stop near the falls, and always hurry past them, believing that to stop near, or point at, or even look at them, is to invite certain death. The Bridal Veil Creek rises some twelve miles north-west of the falls, to the west of Sentinel Dome, and flows down through a deep canon to where it makes the tremendous leap. A little north and east of the cataract stand the Three Graces, three rocks towering up like gate-posts, that, with their mates (the Three Brothers) on the opposite side, stand guard over the approach to the valley. East of these rise Cathedral Rocks and Cathedral Spires, which, when viewed from a certain standpoint in the valley, present a most perfect appearance of a monster cathedral; and east of these rises Sentinel Rock, to the height of 8100 feet above the valley, and on the top of which, it is said, the Indians, when they held the valley, constantly kept a sentinel posted to warn the tribe of the approach of enemies.

Having satisfied our curiosity at the foot of Bridal Veil Falls, we returned to the wagon, drove up the south road, *via* the neat little chapel that stands in the shadow of Sentinel Rock, erected as a place for tourists to assemble on Sabbath for worship, and to the door of which we found tacked a printed, cordial invitation to visiting clergymen to make themselves known, and preach. From thence we proceeded to camp, where the evening was spent partly in endeavoring to persuade the women to permit us to hire ponies for them to ride to Glacier Point on the coming morrow. But, they, having had no experience at horseback riding, insisted upon it that it would be utterly, utterly impossible for them to stick to the back of a California mustang while climbing one of those steep trails; and inasmuch as a brother camper from Ohio had informed us that he and his two daughters had walked to Glacier Point a few days before, our women persisted in declaring that, if other women could climb that trail, they could too. Hence, it being evident that in this case it was again to be demonstrated that—

"When a woman will she will, you may depend on't,
But when she won't she won't, and that's the end on't."

the professor and I were obliged to become reconciled to their attempting to "climb" to Glacier Point on the morrow, and we could but walk over to Mr. Harris and inform him that we would not want the mustangs that we had engaged for the next day. But how we got to

Glacier Point must be told in my next. Suffice it to say now that we had an awful time.

WOODBIDGE, Cal.

IS DRUG MEDICATION A SCIENCE, AND HAS IT BEEN A BLESSING OR A CURSE TO HUMANITY?

BY MRS. M. S. ORGAN, M. D.

In the September number of the present volume we began the discussion of this question. It was our purpose to follow up the discussion in each succeeding number, but ill-health, combined with other unforeseen circumstances, prevented.

We have received a number of communications from various sources, all evincing a deep interest in the discussion, and recognizing the question as one vital to the interests of humanity. It is because this question is one of such primary importance that we have entered upon its discussion. We disclaim any bias of prejudice in favor of any "ism" or "pathy." Our only object is the elucidation of Scientific Truth: the practical application of which is the only lever for lifting humanity to higher planes of physical and mental life.

To make any discussion profitable, all individual, professional, and partisan feeling must be wholly set aside. In this spirit of impartiality, we enter upon this discussion.

The first proposition we laid down was, "The administration of drugs—dead, inert, inorganic matter—is false in philosophy, absurd in science, and contrary to the teachings of nature." This, I shall prove (1st) by admitted testimony of the highest authorities in the medical profession; and (2d) by demonstrated facts and logic.

Regard for their logical status, as well as an innate moral nobility, which incites to the declaration of Truth, have doubtless been the motor forces which impelled these gifted professors to publish their philosophical convictions.

Before entering upon the discussion, it may be well to give an explicit statement as to what we understand to be included in the term science. We feel assured that no one conversant with the principles of intellectual philosophy, and capable of deducing logical conclusions, will contest the accuracy of our definition, that science is that which is based upon principles demonstrated to be incontrovertible; or, in other words, science is but the intelligent and methodical unfolding of nature's recognized and undeviating laws.

Dr. Heule, Professor of Anatomy and Physiology in Heidelberg, Germany, in his work on "General Pathology," gives the following very pertinent and suggestive statement:

"With a material experience collected during two thousand years, we still see the leaders of the art despairing of all influences of medicines, and others in homogeneous cases taking diametrically opposite ways. We possess a Therapia which recommends for each disease its remedy, a Materia Medica which also recommends each remedy for each disease, and still we can hardly agree upon the diagnostic characters of the most important diseases."—*Gen. Pathology*, p. 20.

"There has not been in the Materia Medica a general system. This science has been governed by the different theories that have suc-

cessively predominated in medicine; each has—if I may so express it—flowed back upon itself. Hence the vagueness and uncertainty which it presents to-day; an incoherent assemblage of incoherent opinions, it is, perhaps, of all the physiological sciences, that which best shows the caprice of the human mind. It is not a science for a methodical mind; it is a shapeless assemblage of inaccurate ideas, of observations often puerile, of deceptive remedies, and of formulas as fantastically conceived as they are tediously arranged."—*Bidaul's General Anatomy Applied to Physiology and Medicine*. Vol. 1st, page 17.

Prof. Wm. McNeil, M. D., LL. D., of Bellview, Canada West, says: "Viewed in the light of Truth, the whole mass of medical doctrines and the ponderous volumes of medical literature, are made up of the most arrant nonsense and ridiculous vagaries."

The learned Dr. Evans, F. R. S., declares, "The present doctrine of medicine is, at best, a most unsatisfactory system, it has neither philosophy nor sense to commend it."

The eminent Dr. Bastrols, who has written the history of medicine, after collecting all facts, observations, and experiments, after reviewing all theories from the time of Hippocrates down, sums up the practice of the whole medical art as a blind experiment on the vitality of the patient. The following is a quotation from his closing chapter on the History of Medicine: "In other sciences, when we enter upon an inquiry, or propose to ourselves any definite object for experiment or observation, we are able to say whether the result of our inquiry has been satisfactory, and whether the object in view has or has not been accomplished. But this is unfortunately not the case in medicine. . . In our experiments we are seldom able to ascertain with accuracy the previous state of the body on which we operate, and in our observations we are seldom able to ascertain the exact cause of the effect which we witness. The history of medicine in all its parts, and especially that of the Materia Medica, affords ample testimony to the truth of these remarks. In modern times no one thinks of proposing a new mode of practice without supporting it by the results of practical experience. The disease exists, the remedy is prescribed, and the disease is removed; we have no reason to doubt the ability or the veracity of the narrator; his favorable report induces his contemporaries to pursue the same means of cure, the same favorable result is obtained, and it appears impossible for any fact to be supported by more decisive testimony. Yet in the space of a few short years the boasted remedy has lost its virtue, the disease no longer yields to its power, while its place is supplied by some new remedy, which, like its predecessors, runs through the same career of expectation, success, and disappointment."

Prof. Geo. B. Wood, in vol. 2d of his "Theory and Practice of Medicine," very minutely and thoroughly traces out the pathognomonic symptoms of dysentery—elaborates on the remedies that have been prescribed for its cure, and enumerates about fifty that have been tried; and as though weary of the endless system of empiricism, closes in these significant words: "After all, we cannot tell whether the patient gets well with these medicines, through them, or in spite of them."

Dr. Wood's "Theory and Practice" is received by the profession as standard authority,

and is used as a text-book by the majority of physicians in the United States; yet this very admission of empiricism stultifies all his claim to medicine as a science.

A National Medical Convention assembled in St. Louis a few years ago. This convention was composed of medical professors, authors of standard works, and men of medical distinction from all parts of the country. They met for the professed purpose of evoking scientific truth and advancing medical practice. The following resolution was discussed, adopted, and placed on record:

"It is wholly incontestable that there exists a widespread dissatisfaction with what is called the regular or old allopathic system of medical practice. Multitudes of people in this country and in Europe express an utter want of confidence in physicians and their physic. The cause is evident—erroneous theory, and, springing from it, injurious, and often, very often, fatal practice! Nothing will now subserve the absolute requisitions of an intelligent public but a medical doctrine grounded upon right reason, in harmony with, and avouched by, the unerring laws of Nature and of the vital organism, and authenticated and confirmed by successful results."

Could any antagonist of drug medication express his condemnation in more positive and decisive terms?

The admissions made in this resolution by these learned medical men most certainly evidence that they recognized the fact that there was not now, and never had been, a scientific basis established for medical practice. It showed, too, that they recognized what are the requirements for a medical science—"a medical doctrine in harmony with, and avouched by, the unerring laws of Nature and of the vital organism." Most assuredly, science must be based upon the well-established laws of Nature. Profs. Wood and Bache, in their "United States Dispensatory," lay down as a basis for medical practice the principle that "Medicines are those articles which make *sanative* impressions on the body." But, *per contra*, says Prof. Paine, of the New York University Medical School, in his "Institutes of Medicine": "Remedial agents are essentially *morbific* in their operation." Prof. Paine is one of the most profoundly logical and philosophical reasoners that the medical profession has in its ranks. Profs. Wood and Bache are also men of acknowledged ability, and their "United States Dispensatory" is held as standard authority. Here we have the highest authorities—representative men of the profession—laying down primary principles for a healing art which are directly antagonistic. Is it not a matter of vital import whether medicines make a *sanative* or *morbific* impression on the body? Assuredly everything depends upon a starting-point—upon the truth of the primary premise. Can there be any claim to science when the very principles upon which it is predicated are in controversy—are not determined by the recognized and established laws of Nature?

Do we find exponents of chemistry, mathematics, or any true science starting upon different basic principles? They may have different methods of arriving at conclusions, but it is an utter impossibility to have antagonistic primary premises in any science.

That the so-called medical science is no science at all, but is, and ever has been, in direct

opposition to the workings of Nature's laws, I shall demonstrate in my next article.

NEWBURGH, N. Y.

CLOSING OPPORTUNITY FOR OUR BOOKS.

As one number more (September) completes this volume, those who wish to take advantage of our present low prices of books, and extraordinary offers of premiums, should act at once if they are intending to do so. The "Problem of Human Life," which is now sent prepaid by express or mail for \$2., and the present volume of MICROCOSM, including all back numbers, sent free as premium, will not be thus sent after this volume closes. The next volume cannot be given as a premium with our books, nor can subscriptions for it be taken toward our great Encyclopedia offer, which see elsewhere. Our books will be sent in quantities at wholesale for cash with the orders, or C. O. D. at the present unparalleled low prices. Circulars will be sent to those wishing such information.

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A TRIBUTE WHICH HAS WEIGHT.

Elder Thomas Munnell, our old and esteemed contributor, closes a long letter with the following encouraging words, which we take the liberty of copying:

MT. STERLING, KY., July 15.

DEAR DR. HALL,— . . . THE MICROCOSM is still "more than conqueror." The wave-theory train was certainly "ditched" in the July number, if it never was before. But you are right in believing that when public sentiment asserts itself more positively, as it is sure to do after awhile, wave-theorists will be driven to a furious defense if they see any chance left. It is not safe to kick a half-dead lion, and Josh Billings says, "if you are going to preach a mule's funeral, you had better stand at its head." So there may yet be a final battle on this sound question, but it will only be a final defeat from which the old theory will never recover.

You are doing some of the finest thinking of this age, and I anticipate nothing less when the business cares of THE MICROCOSM shall be shifted to other shoulders. My interest in you and your work can never die. Among the thousands of your beneficiaries, I've not been the least. You have put a soul into nature by the Substantial Philosophy whose presence had been little more than suspected by many of us. The very earth now seems almost animate with life through its many immaterial and semi-intelligent forces, whose functions were never before made to stand out as connecting links between the temporal and the eternal—between the here and the hereafter—as they now appear to do. May length of days, strength of body and mind, and a peaceful ripening for the great Reaper be yours. Then, having gone through the Primer of God's two great books, you can begin a "Freshman" above.

Yours, as ever,

THOMAS MUNNELL.

WILFORD'S MICROCOSM.

23 Park Row, New York, August, 1885.

A. WILFORD HALL, Ph.D., Ed. and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent. EDITOR.

SUBSTANTIALISM AGAIN DEFINED.

From an article recently received from our esteemed contributor, Judge Lanphere, we are led to see the necessity of a concise definition of *Substantialism* in contradistinction to other doctrines which have regarded the soul and even the Deity as substantial entities. Especially is such a definition of the new philosophy of the greatest importance at the present time, in view of the tendency with some to confound Substantialism with Swedenborgianism, and even with modern Spiritualism. We cannot better express one phase of the mistaken ideas abroad, in regard to the supposed meaning of Substantialism, than to quote the words of Judge Lanphere, in his first paragraph, as follows:

"I am not aware that the word 'Substantialism' has been formally defined; but I have always understood it to mean a belief in two distinct, dissimilar things or entities, namely, *substance* and *matter*, the former non-material, and yet incomparably more real than matter, the two being separated by discrete degrees. One does not fade into the other, substance is not attenuated matter, nor is matter condensed substance. They are wholly dissimilar; or if there is any likeness between them, matter corresponds to substance, or takes form from it, somewhat as the shadow corresponds to the material thing that casts the shadow. Of course, both words are sometimes used in different senses."

This paragraph is a very concise definition of the "New Church" doctrine concerning *substance* and *matter*, as originally taught by Emanuel Swedenborg, but it is vastly different from the comprehensive definition of Substantialism—a classification of entities never suggested, so far as any record shows, until hinted at in the "Problem of Human Life," and more definitely elaborated in the various volumes of THE MICROCOSM. This radical and elementary difference we shall now try to make apparent.

First, let us say that Judge Lanphere, owing probably to his having but recently entered the list of contributors for this Magazine, is possibly not so fully read up in the Substantial Philosophy as are some of the older contributors, or he could not have been unaware that the word "Substantialism" has been formally and frequently defined. We have taken especial pains in two separate set articles to define this word so clearly that no possible doubt might exist upon the subject. One article was written for the *Christian Quarterly Review*, and copied into THE MICROCOSM in the April, May and June numbers of Volume 3. The other article embraced what we called the Formula of the Substantial Philosophy, printed in the first number of the present volume (August). We take pleasure in referring the Judge to those numbers.

Now so far from *substance* and *matter* being "two distinct, dissimilar things or entities" we have taken great pains to teach that all matter of whatever kind or character, is *substance*, or necessarily *substantial*, while substance, being the generic term, embraces not only all the material objects or entities in the universe, but vastly more than those, namely, all immaterial entities or things which everywhere surround us, whether such entities are the vital, mental, and spiritual substances of Swedenborg's doctrine, or the physical, un-

intelligent, and unliving force-elements of nature which influence our sensuous observation or otherwise manifest themselves in material and physical phenomena so as to come within the range of our reasoning power. We have said repeatedly that although all matter is substance or substantial, it by no means follows that all substance is matter or material. To make this point clear we have illustrated it by the familiar terms *metal* and *iron*. Although, for example, all iron is metal, it by no means follows that all metal is iron; nor yet does it follow that *metal* and *iron*, as Judge Lanphere would infer, "are distinct, dissimilar things or entities." *Metal* is the generic term, embracing not only all varieties or forms of *iron*, but also the various other metallic bodies, while iron is specifically but one of the metals.

We are thus forced to accept the proposition that *substance*, in its broad and universal sense, may be *immaterial* as well as *material*. Many persons find it difficult to conceive of anything as a substantial entity or objective thing, of which the mind can form a positive concept, that is not *matter* in some form or degree of attenuation or refinement. This difficulty arises wholly from our habit of definition and thinking. If, all our lives long, we have been used to employing *substance* and *matter* as synonymous terms, we will of course find it difficult, if not impossible, at first, to conceive of a *substantial* entity that is not a *material* entity. But in framing the principles of the new philosophy, we were irresistibly forced to a more careful and discriminating definition and distinction, by which the entire universe of entities or objective existences might be intelligently and harmoniously classified, and so arranged as to reconcile the apparent clashing and confusion of ideas encountered when we try to investigate and analyze the various phenomena occurring around us.

An *immaterial substance* must necessarily be such an entity as does not possess the recognized properties of weight, inertia, physical tangibility, etc., and which can operate or exist in defiance of purely material conditions. As for example, *light* passes without impediment through the hardest or most impenetrable bodies, such as diamond, crystal, etc. Of course we infer, according to Substantialism, that it would pass with equal facility through a block of coal or granite, so far as its material resistance is concerned, only that another correlated immaterial entity (*cohesion*) so controls and pervades the particles of these solids as to keep out light. So with the immaterial substance—*electricity*. It goes through iron with inconceivable velocity, in apparent disregard of the solid material particles in its way. But it would pass through glass just as readily, so far as its material particles can interfere with its progress, since it is nothing but the correlated immaterial force of *cohesion* within the glass which controls the immaterial force of *electricity*, and thus determines into what material substance it may or may not be admitted.

Other immaterial substances defy all bodies of a material nature, passing through them with the same facility as they would through the spaces they occupy if they were not present, as instance, *magnetism*, *gravity*, and even *heat* and *sound*, to a circumscribed degree. Magnetism, though a demonstrable substantial entity, or objective existence, is so entirely immaterial in its nature that no possible accumu-

lation of material obstacles placed in its path can in the slightest degree intercept its force or detract from the energy it exerts in actuating the distant armature. If not wholly immaterial, surely intervening sheets of glass, even if porous to some degree, as may be admitted, ought to detract something, at least, from its mechanical effect. But not the slightest appreciable weakening of the force occurs. This alone demonstrates the correctness of our definition and classification of substances into *material* and *immaterial* entities. Mind, soul, spirit, instinct, life, etc., accordingly all belong to the immaterial class of substantial entities, and like the immaterial forces of nature just referred to, show utter defiance to gross material conditions, unless circumscribed by their correlations with other forces.

And here was where the doctrine of Emanuel Swedenborg was altogether too circumscribed to meet the wants of mankind, and too narrow to answer the purposes of a universal philosophy. It was confined in its application exclusively to religion, and was never dreamt of by its founder as applicable to physical problems, or as of any use whatever in grappling with the scientific mysteries of nature as they are everywhere met with and have to be unfolded in our investigations of natural, physical, chemical, metaphysical and psychological science. What would the mere fact that we have a substantial spiritual body within this material form, and which is destined for a spiritual world constituted entirely of substantial spiritual objects, have to do with solving such natural mysteries and physical problems as were met and treated in our last month's leading editorial, or in our reply to Capt. Carter, or in our reviews of Sir Wm. Thomson? As in the case of the generic and specific terms *substance* and *matter*, so we conclude that *Substantialism* may properly be styled the *generic* philosophy of the world, embracing the whole universe of philosophic, scientific and religious truth, while Swedenborgianism may be regarded emphatically as a specific philosophy, dealing only with one phase of universal philosophic truth, namely, the subject of religion, or spirit as applied to the future life. So far from the great Swedish Seer having formed even a faint conception of the mighty scope and sweep of the Substantial Philosophy in its revolutionary effects upon modern science, as now taught, he did not vary, when having occasion to refer to the physical forces, from the same views held by all scientists of his time, namely, that force was not a substantial entity, in any sense, but rather a mode of material motion; that light was but the motion of ether waves, and that sound was only the successive dashing of air-waves against the tympanic membrane, causing it to vibrate correspondingly to and fro, thus conveying to the auditory nerve and to the brain sound sensations as simply translated material motions. One would have suspected that a seer so spiritually refined and sublimed as was Swedenborg, would have been led deep enough into natural phenomena to extend his visions of a substantial spiritual world, down to the real, invisible, but substantial world of physical force with which the daily life of man brings him into intimate and continual contact. Had his guiding angels who gave him, as he claimed, so many beautiful and plausible ideas in regard to a future spiritual life, which can only be accepted on faith by his warmest adherents, let him into the secret of the grand philosophy by

which all the physical forces can be shown to be real substances, and by which their substantial correlations can be verified scientifically. Swedenborg need not have died with but a corporal's guard of believers in his "revelations," or *dreams*, as nearly all thinking men regard them. Such physical and scientific demonstrations of the substantial nature of the imponderable forces, as are now given out in the new philosophy, and made to harmonize with all known truth, used as confirmatory proofs of these remarkable visions of the seer, would have added inestimable strength to his claimed revelations, and made cohorts of converts from the susceptible religious minds of Sweden, Norway and Denmark, where his doctrines were first taught. And we say here to the "New Church" people, as we have frequently said to some of their ministers privately, if they ever wish to extend their lines and strengthen their stakes, and to make the claimed revelations of Emanuel Swedenborg appear worthy of the serious consideration of the average thoughtful, scientific mind, let them cease their narrow and bigoted opposition to the Substantial Philosophy, accept its broad teachings as the scientific basis of all truth, both in nature and religion, both in the material and the spiritual realm; and then, if they choose, they may work into the superstructure, the beautiful spiritual thoughts of Swedenborg as the ornamental and comforting appendages of religion.

In defining the Substantial Philosophy, therefore, we state it as that system of doctrine which recognizes every force or form of energy in Nature, whether physical, vital, or mental, by which any effect or phenomenon is produced within the reach of our sensuous or rational observation—as a *substantial entity* or *real, objective thing*, not, as now universally taught, as but the mere motion of material molecules, which motion, not being entitative, necessarily ceases to exist as the moving molecules come to rest. In presenting to our readers the self-evident claims of this broad and universal philosophy, we have frequently had occasion to refer to the materialistic tendency of modern science as everywhere taught in our schools and colleges, and to the fact that the chief atheistic defenders of evolution, such as Haeckel and Huxley, lose no opportunity to seize upon this accepted teaching of the scientists as proof positive that there can be no such entity as a substantial immaterial God capable of intelligent thought and action, and that the idea of a substantial soul, mind or spirit, which can exist as an objective or subjective entity separate from a material body, is, in their view, a mere vagary, only worthy of the poetic fancy of a sickly sentimentalist. Against this overwhelming argument of the atheist and materialist, the scholastic clergy, educated in the scientific departments of our colleges, with their mode-of-motion philosophies, can oppose no reply. They stand dumb and at the mercy of Haeckel or his followers; and, as a logical consequence of their education, are forced to admit if sound, light, heat, electricity, magnetism, etc., are only the molecular motions of material particles combined in certain peculiar ways, then the soul, life, mind, or spirit, showing no more marked manifestations as natural phenomena, can in the very nature of things possess nothing more substantial or entitive, and, like sound, light, or heat, as modes of motion of material molecules, must necessarily cease to exist as soon as the nerve and brain

molecules producing such motion come to rest at death.

To show the unanswerable nature of this argument of the materialist, and how fatally it tells against every resource of our current religious philosophy, the reader has only to note the confusion in which the eminent Joseph Cook became involved in one of his Boston lectures in trying to answer some of the materialistic objections to the soul's entity, as we had occasion to point out in the "Problem of Human Life," pages 71 and 72. Joseph Cook, let the reader remember, is the profoundest and most critical thinker on that subject now living, and if any one could avoid such materialistic breakers he could. Yet, in trying, according to modern, undulatory science, to prove the soul to be an entity, he flatly broke down the argument, and gave it away to Haeckel and Huxley, thus proving the soul to be but a mere mode of motion of the material molecules of the brain, by comparing it to *sound* and *light*, as taught in the schools and the text-books!

Had the great Boston lecturer been an intelligent convert to the Substantial Philosophy, he could well have employed sound, light, heat, electricity, magnetism, gravity, etc., as analogical considerations, by which to elucidate the nature and permanent durability of the soul, mind, life, and spirit, as substantial entities, and which, as such, necessarily were capable of existing separate and apart from the material bodies through which they manifested themselves here. But he was at that time wholly uninformed upon the great truths and principles of this philosophy, and as a consequence he deliberately but unthoughtedly thrust both his hands into the devouring jaws of the materialistic dragon. And so does every clergyman in these United States to-day who denies the substantial nature of sound, light, heat, magnetism, electricity, etc., or who goes into his pulpit to preach an undulatory religion, not recognizing the facts and principles of Substantialism, which make all the forces or forms of energy in Nature as really objective entities, as are the material air we breathe, water we drink, or solid bodies we feel in contact. Still, with the truth of this serious charge undeniable, and resting at the threshold of every pulpit in this land, there are ministers who, when told by their more fortunate and better posted brother clergymen about the wonderful revelations and advantages of the Substantial Philosophy in dissipating the materialistic and atheistic objections to the immortality of the soul and the existence of God, will turn on their heels, calling Wilford Hall "a scientific crank," and declaring with contempt that they "want nothing to do either with the Substantial Philosophy or its founder!" This was the actual experience of the Rev. Dr. Hamlin, our able contributor at Peekskill, N. Y., as related to us by himself recently when calling at our office. This shows the lamentable extent to which prejudice can influence the minds of intelligent and educated men even against their own best interests. More than one of such ministers have afterward become intensely ashamed of the rashness of their conclusions, and have written to us, as works meet for repentance, reproaching themselves for their inexcusable bigotry. We forgive all such, and only wish that thousands of the educated clergymen in this country, similarly prejudiced, could be induced to read the

arguments upon this subject, and thus be enabled to avail themselves of the benefits of this glorious philosophy in giving substantial force and point to their pulpit ministrations. The time will come in the near future, and no mistake, when those ministers who do not take advantage of the Substantial Philosophy in meeting the materialistic objections to a hereafter for humanity, will be the rare exceptions to the rule. The crisis in the affairs of the church, and the fullness of time in the progress of religious philosophy, seem to have come just at the time when Substantialism made its advent into this country. No such a juncture of concurrent and favoring circumstances, perhaps, ever before presaged a revolutionary departure in science and philosophy. The religious sentiment of the whole Christian world was ripe for its all-levelling sickle, and the investigating clergy were earnestly beginning to cast about, almost in dismay at the rapid spread of materialistic evolution, for something in the shape of a more radical and fundamental religio-scientific philosophy which would be able to cope with these vandal hordes of infidel scientists. Even great World's Conventions were planned for the convocation of the chief ecclesiastical minds from all the civilized portions of the globe, to discuss and present such arguments, if possible, against scientific infidelity as would form a breastwork to prevent its further rapid spread. Prayers in countless numbers went up from conferences, synods, and other kinds of religious convocations and conclaves, for some new light, or interposition of Providence by which the skeptical craze started with new impetus by the publication of Darwin's "Origin of Species," might be checked, and by which thinking church members might feel the scientific and religious ground more firmly established beneath their feet. Pious parents became alarmed in sending their sons to college, and religious colleges trembled in selecting their scientific professors, lest the seeds of materialistic evolution should take root in the new soil. The mind of nearly every minister in every church in Christendom was tensioned to its utmost on account of the revolutionizing aspect of this new and dangerous theory of descent which had been so defiantly promulgated even by clergymen, and each one was asking himself, and each intelligent layman, almost in a whisper, was asking his confidential brother, is there no way out of this wilderness of materialistic unbelief? It was at the very culmination of this mental strain that the Substantial Philosophy was unceremoniously announced to the world, as embodying the very providential interposition for which the churches, the conventions, the conferences, the synods, and the individual clergy had been so fervently praying. But even when their prayers were signally answered they would not believe the evidence of their own eyes and ears. The overwhelming arguments against atheistic evolution and materialistic unbelief generally, and the unanswerable proofs that death does not end all, but that when man dies he shall live again, were so unmistakably lacking in form and comeliness and in that respectable heralding, which so often are necessary to commend the truth to highly cultivated minds, that it was despised and rejected by the very men who should have gladly received the word. Had the soul-confirming and spirit-elevating principles of the Substantial Philosophy, by which

materialistic infidelity had received its mortal blow, been formally and originally announced through an official pronouncement of a world's convention, and then had it been confirmed by the conferences and synods of the country when brought to their attention by the returning and jubilant delegates, and without one grain of additional argument more than is now unfolded in the new philosophy, it is safe to say that not a pulpit in this wide land but in one form or another, as regular as the Sabbath services should occur, would now be greeting the ears of the increased audiences of attentive listeners with the new revelations of the Substantial Philosophy as thus formulated against the blighting and soul-destroying scourge of atheistic materialism. Why, in the name of Christianity, we ask the ministers of this nation, should not the same arguments, as spread out in this magazine, meet with the same thankful reception at the hands of the clergy and the churches, and be permitted to do the same good? More next month.

NEWTON'S GREAT FORMULA—THE RELATION OF DENSITY TO ELASTICITY.

In the May number of *THE MICROCOSM*, in reply to Capt. Carter's query, we were led into a brief discussion of the question of the elasticity, density, and compressibility of bodies as relates to the nature, propagation, and velocity of sound. We showed in that part of the argument, of a page and a half of *THE MICROCOSM*, that the formula of Sir Isaac Newton, by which he and all scientists since his time have attempted to determine the necessary velocity of sound theoretically through various bodies, in accordance with the wave-theory, must be erroneous on its face, judging by the known density and absolutely determined elasticity of certain bodies, and comparing them with the velocity with which sound is known to travel through them. We presented that argument as something new and overwhelming against the current theory of acoustics, and we say here in all candor that the more we reconsider it, in connection with the bearing of every objection that we have heard urged against it, the more completely are we satisfied that the single consideration there presented is sufficient to overturn the wave-theory, if nothing else could be adduced. So important do we still consider that argument, bearing as it does with such force against the very foundation of the wave-theory, and so important do we regard the overturn of the wave-theory itself to the ultimate and triumphant establishment of the Substantial Philosophy, that we feel it an imperative duty we owe future scientific investigators to lose no time in placing on record an elaboration and extension of that argument which we consider so invaluable to the cause we are pleading.

The whole theory of sound, as a mere *mode of motion*, and not a *substantial force*, as now universally taught and believed, rests upon the three properties of matter—*elasticity, density, and compressibility*. Hence the importance of a definite understanding of the meaning, application, and scope of these terms as applied to the sound discussion. We propose here to present such facts, definitions, and arguments, and to present them so concisely, on that subject, that the attentive reader will never forget

them. To save the space it would take to reproduce the argument referred to, and which is absolutely essential to the completeness of this article, we beg of the reader who desires the real benefits of this discussion, to turn back to the May number of this magazine, and re-read carefully page 245 and first column of 246, and he will then be prepared for the following critical considerations:

When that argument was read by Dr. Mott, on the first appearance of the May number, he called our attention to an oversight which he alleged we had committed, in not recognizing the latest improved teaching of modern science, namely, that "*all bodies are perfectly elastic within the limits of their elasticity!*" We were astounded at this information and demanded the proof that anything of the kind had ever been put forth as science. But sure enough, the next day that prodigious devourer of scientific libraries came smiling into our office with the veritable evidence culled from the works of Daniels, Arnott, Des Chanell, etc. We gave it up, and set about at once going down in our intellectual diving-bell, as Dr. Swander would express it, to fish up a good and sufficient reply.

In the first place, we might be willing to admit that all bodies are perfectly elastic within the limits of their *compressibility*, provided they will return to their original form after the outside compressing force is removed. *Perfect elasticity* simply signifies the property of complete restoration of form, however small the compression may have been. More of this, however, after a little. But, for grave scientists to write such philosophical twaddle as that a body is "*perfectly elastic within the limits of its elasticity*" is so childish that we feel it almost not worth ridiculing. But let us see what can be done for it. If all bodies are "*perfectly elastic within the limits of their elasticity*," then all bodies should be *perfectly dense* within the limits of their density, and therefore Newton's pretended law, making sound velocity in a given body depend upon the relation which exists between its density and its elasticity, distinctly implying a difference, when all bodies are perfectly elastic and also perfectly dense, would seem to be a perfect fraud on its face. If all bodies are perfectly elastic and perfectly dense, in the sense of Newton's formula, then what is the *relation* between the density and elasticity of a body that determines the velocity of sound through it? Is it not unscientific to talk about a different relation of the two properties in a given body when both properties are perfect in all bodies, which they ought to be if either property is? If all bodies are perfectly elastic within the limits of their elasticity, then all bodies ought to be perfectly compressible within the limits of their compressibility; and of course all bodies should be perfectly mobile within the limits of their mobility. We must never again talk about the imperfect combustibility of any material, since scientists now would tell the unsophisticated as well as mystified student, that all bodies are *perfectly combustible within the limits of their combustibility!* The truth is, if there is any rationality in this view of elasticity, as taken by the great authorities quoted, it forces us to accept for science the plainest self-contradictions that can be stated in terms. For example, if all bodies are perfectly elastic within the limit of their elasticity, then all bodies should be *perfectly inelastic*

within the limits of their *inelasticity*. All bodies are *perfectly fusible* within the limits of their *fusibility*; therefore all bodies should be *perfectly infusible* within the limits of their *infusibility*. All bodies are *perfectly transparent* within the limits of their *transparency*; therefore all bodies should be *perfectly opaque* within the limits of their *opacity*. All bodies are *perfectly hard* within the limits of their *hardness*; therefore all bodies should be *perfectly soft* within the limits of their *softness*. Clearly, we are beginning to believe that all modern science is *perfectly absurd* within the limits of its *absurdity*; while most of the modern scientific writers seem to be *perfectly insane* at least within the limits of their *insanity!* How's that, Dr. Mott?

But now for a little serious reasoning, after this explosion of the books with their own dynamite. And first, as to what is meant by one body being *more elastic* than another—a matter, by the way, about which more vaguity, confusion, and want of correct definition exist in the text-books than perhaps upon any other single subject discussed in physics. Elasticity consists alone in that property of bodies which permits them to expand after being compressed, or *vice versa*. This brief statement is all the definition there is, all there is needed, and the only one that can properly be given, of this property of matter called elasticity. One writer has tried to make out two kinds of elasticity—one relating to the *compression* and *expansion* of bodies, such as rubber, air, water, etc., by which pulses are claimed to be sent to a distance; and another kind, as in the *bending of springs* and their recovery of form when released. But the weakness of this distinction is manifest when we reflect that no spring bends and recovers form only by the compression of its elastic particles on one side of a line through its center, and the expansion of them on the other side at the same time. And this writer, the author of this childish distinction, claims, *par excellence*, to be one of the most acute and accurate scientific thinkers of modern times. But let us now come directly to the question as to what constitutes the amount of elasticity in a given body, on which Newton's formula depends.

Although Silliman and other authorities correctly teach that bodies can only be elastic in proportion to their compressibility, and that they are necessarily inelastic in proportion as they are incompressible, it by no means follows that they must necessarily be *elastic* to the full *extent* of compressibility, for some bodies will not completely recover their form after compression. No body, however, can be any more elastic, under any circumstances, than the range of its compressibility. Perfect elasticity within the range of compressibility consists in a capacity for complete recovery of form after the outside distorting force is removed, otherwise the elasticity is not perfect. Hence, water may be regarded as perfectly elastic within the range or limit of its compressibility (not, of course, within the limits of its *elasticity!*), but remember this has nothing whatever to do with the *amount* of elasticity one body possesses in comparison with another, which was the only proposition before Newton in formulating his law of sound velocity through different bodies. Men who write on these subjects confound the *perfection* of elasticity in this one respect with its *quantity* or *extent*. They seem to forget that a drop of water is as perfect a combination of oxygen and hydrogen as

an ocean would be, and that a diamond spark is as perfect crystallized carbon as the Koh-i-noor, though they are by no means equal in extent or amount. The amount of elasticity in any given body *consists in the extent to which that body can be compressed with a given force, while possessing still the innate property of restoration to its original form when released from pressure.* This is the only true definition of the amount of elasticity, and this simple and self-evident scientific distinction is not, we believe, to be found in any scientific work; yet we do not think that any unbiased and competent scientific investigator will dispute its truth after we are through. To illustrate: Air, as all admit, can be compressed 10,000 times as much as water with the same amount of outside force, and will be perfectly restored to its form by elasticity on removal of this compression; therefore air, according to Prof. Silliman, possesses 10,000 times as much elasticity as water! Was ever a logical deduction more conclusive on its face than this? and was ever a great truth more ruinous to an accepted theory of science? The real quantity or amount of elasticity, therefore, possessed by any given body, can alone be determined by the amount of compression it is capable of receiving with a given force, while retaining capacity for complete restoration, as here set forth. This simple definition of the amount of elasticity in a given substance certainly appeals to our reason and common sense, and no other possible explanation, as we insist and will immediately show, will bear the sunlight of a moment's careful investigation.

It is not true, as advocates of the wave-theory insist, that the quantity or amount of elasticity in a compressed body depends upon the force with which it resumes its previous form, since such force is simply and solely the same mechanical force which made the compression, and which by that act, for the time being, was stored up, by the co-operation of cohesive force among the particles of the compressed body, there to be used for its restoration of form. The force, therefore, which a compressed body exerts in resuming form, as in the case of a bent steel spring or a rubber ball, is no part of its elasticity, any more than was the force which originally compressed it, since they are both, intrinsically, the same identical force. The property of elasticity in a body is caused by the peculiar arrangement of its particles under the direction and control of cohesive force, which permits the storing up of mechanical energy externally applied in the act of compression to be retained as reactive force for restoring the body's form. Elasticity is not, therefore, a force in any sense, and this continuous use of the term in all scientific works is false, superficial, and misleading. It is only a property by which force is allowed to operate on matter in a certain way. Hence the amount of elasticity in any given body *consists alone in the amount of compression and restoration which that body will permit a given mechanical force to effect.* We are aware that all this is new to science, having never been intimated in any work till it first appeared in the pages of THE MICROCOSM. But it contains the most self-evident scientific truth all the same, as well as the most important addition to our knowledge—facts which will be abundantly accepted by independent scientific thinkers when this cruel war is over, and

when allayed prejudice will allow simple justice to be meted out to every true discovery in science.

Neither is it correct, as some have supposed, that the amount of elasticity in a given body consists in the quickness with which a compression is restored to original form after the outside force is removed. This quickness depends upon the mechanical force stored up, and also upon the quality of the elastic property of the body in permitting the reaction among its particles by this stored-up force, and not at all upon its quantity or amount. Certain bodies might require tremendous mechanic force to compress them only a very little, yet their arrangement of particles by the force of cohesion, which causes their peculiar quality or property called elasticity, might be such as only to permit this stored-up mechanical force to react very sluggishly, and frequently only partially, if at all, to restore the body's form. When bodies require great force to compress them, and no restoration or re-enlargement takes place, as in the case of lead, gold, platinum, etc., the mechanical force thus expended and stored up, instead of reacting through elasticity, is converted into heat, and thus returns to the original fountain or force-element of nature, according to the Substantial Philosophy, and as the only possible way the idea of the conservation of force can be maintained. No possible definition, therefore, we repeat, can be given of the amount of elasticity of a given body except the one here formulated, namely, the extent of compression and complete restoration which a body or substance may receive by a given application of mechanical force.

If there is anything, therefore, in Newton's formula of the relation of density to elasticity in a given body, for determining the velocity of sound conveyed in it, it must mean the amount of elasticity as well as the amount of density the body possesses; and this amount of elasticity, as we have seen, must be in exact proportion to the amount of compression produceable, with the innate capacity of the body for complete restoration of form after being released. But the fact is, if the formula of Newton be true, and bodies do conduct sound by elastic pulses, then bodies should *increase* in their elasticity about in proportion to their *decrease* in compressibility, since sound goes faster, further, and easier through bodies having the least compressibility. Indeed, Prof. Tyndall ("Lectures on Sound," p. 39), seeing this formidable difficulty in the way of Newton's law, actually does adopt the preposterous view here suggested, that the elasticity of a body *increases* just as its compressibility *diminishes*, a doctrine which, if carried out, would make the body most elastic of all when it should become *wholly incompressible*, and therefore of course *wholly inelastic*. *Reductio ad absurdum!* His words are: "The less the compressibility, therefore, the greater is the elasticity." He also, in the same connection, makes the following random and weak remarks: "The greater the resistance which a fluid offers to compression, the more promptly and forcibly will it return to its original volume after it has been compressed." This pure assumption was necessary to sustain his other position, that elasticity increases as compressibility diminishes, and thus keep the apparent breath of life in Newton's formula. How did he know that there was the least truth in the statement just quoted, and that water returns to its original

form 10,000 times quicker or more forcibly than air, because it takes 10,000 times more force to compress it? As just seen, some bodies do not return at all after compression, and a ball, composed half of rubber and half of sand, though elastic to the full range or extent of compressibility, requires many times as much force to compress it as would a ball of pure rubber, while it reacts vastly less "promptly" and vastly less "forcibly" than would a ball made wholly of rubber! How does Prof. Tyndall know, then, that water, milk, alcohol, quicksilver, molasses, tar, soft mud, etc., may not act just as variously in relation to the force expended in compression as diverse solid bodies? The truth is, he knows nothing about it, and he merely assumed it in order to help out his absurd notion that elasticity increases as compressibility diminishes, and thus maintain a show of truth in Newton's formula.

To show the self-contradictory character of this whole teaching, it is a fact that air and the gases are pronounced by all authorities to be "*perfectly elastic*" and among the *most elastic* of all known bodies. Indeed, Tyndall himself virtually admits it, and we could quote proofs enough from a hundred natural philosophies to make a volume sustaining this very position. Yet Tyndall in his desperate necessity to sustain the wave-theory of sound as based on Newton's formula, *makes water 10,000 times more elastic than perfectly elastic air, because it is 10,000 times less compressible, and he makes quicksilver 200,000 times more elastic than perfectly elastic air, because, as all know, it is 200,000 times less compressible!* But the simple scientific facts are exactly the reverse, as Silliman and all other authorities teach when they are not discussing the sound question, and are thus not under the necessity of defending Newton's formula in order to support the wave-theory. When not thus biased they can give play to their scientific intuition and correct judgment, and teach, as common sense requires them to do, that elasticity can only exist commensurate with compressibility, and that bodies are necessarily "*inelastic*" if "*incompressible*," and inelastic in proportion to their incompressibility. Tyndall, however, had a scientific ax to grind, so to speak, in defending Newton's formula; therefore he reversed the order of nature and made all bodies *elastic* in exact proportion as they are *incompressible*. If, however, it be really true, as Silliman teaches, that water is 10,000 times *less* elastic than air, because 10,000 times *less* compressible, it follows, if Newton's formula be correct, that sound, instead of going four times faster through water than through air, should go only one 10,000th as fast, even if water were no denser than air, or only at a velocity of *one inch and a third in a second*. Think of it! But when we deduct the difference in density from the velocity of sound in water (1800), we demonstrate, according to Newton's boasted formula, that sound should only travel in water the *one eight hundredth of an inch in a second*, and in quicksilver only the *one sixteen thousandth of an inch in a second*, instead of ten times faster than in air! What need we of further witness? Our analysis, then, stands unimpeachable, that water has but a very small fraction of elasticity as compared to air, being limited to an almost infinitesimal amount of compressibility, upon which elasticity necessarily depends, as Silliman teaches correctly, being almost "*incompress-*

ible," and therefore, as he says, almost "*inelastic*."

(To be concluded next month.)

THAT FIRST-INSTANT DISCOVERY AGAIN,

A Strange Turn in Affairs.

The scientific correspondent of Dr. Mott, referred to last month in the "*first-instant*" discussion, after reading the doctor's reply has taken him all aback by declaring in a long rejoinder that he has been entirely misunderstood, and that by the "*first instant* of forward motion" he had no reference to the *start of the prong's swing* at all, but that he referred simply to the *entire swing of the prong as representing the commencement or "first instant" of a pendulum's swing!* He now positively asserts that by the "*first instant*" of the prong's forward motion he meant nothing more nor less than the *entire swing of the prong in one direction before turning to go the other way*, and that this whole swing of the prong was what does the condensing of the air, being equivalent to the "*first instant*" of a pendulum's swing when starting to go a foot!

Now, if he has really been so egregiously misunderstood, and so outrageously misrepresented in these pages, it is but fair and just to the reader, even though the professor's name has been withheld, that this correction he made on the spot, and that what he says he did mean by the "*first instant* of forward motion" be stated in plain words just as he now corrects it, and as given above. Nay, further, we are free to confess that if we have been guilty of thus shamelessly or ignorantly misconstruing and perverting his meaning in a set and carefully written editorial, we are not fit to edit this or any other journal, and should at once have our pen taken away from us and be consigned to the tender mercies of a lunatic asylum for the remainder of our life.

First, however, in meeting this serious charge, let there be no mistake as to what he now claims to have been his meaning. He asserts in the most solemn manner, and repeats it over and over in various ways, that by the original "*first instant*" of a prong's motion he meant nothing more nor less than the whole motion of the prong in one direction, and he declares that he presented it in the clearest language of which he was capable, so that there might be no excuse for misunderstanding his meaning. And judging from the vehemence of his rejoining letter, he really believed when he wrote it that by facing Dr. Mott right down to it he could force him to accept the new version as correct, even in direct defiance of his plain and unmistakable language, as given in his original argument. But let us try to focus a little pure logical sunlight upon this "*first instant*" business, and see if it would not have been vastly better for the professor's scientific reputation, should he ever become publicly known in the matter, to have honestly confessed his mistake, as the doctor kindly urged him to do, rather than attempt to twist out of it by such a disingenuous falsification of his own undeniable language.

To understand the points we are about to make, will the reader please turn to the July MICROCOSM and reread "*The Main Point Now*," commencing on page 811, in which the professor states the "*first-instant*" doctrine in detail, and then consider what we say, as follows:

1. What was the object or aim of that "first-instant" position? If the author of it really meant by "first instant" of a prong's motion, as he now positively asserts, the entire swing of a prong in one direction, as that which does the condensing, what was there new or startling about such a statement, that he should introduce it with a flourish of underscores, and with such a portentous heading as "THE MAIN POINT NOW," as if he had struck something completely new and annihilating to the doctor's objections? Look at the ridiculous plight. What he now says he meant as this "main point" or "first-instant" surprise, is as old as Pythagoras! Every writer who has ever tried to explain the wave-theory of sound takes that very position, namely, that the whole swing of a prong in one direction is what produces a condensation of the air! Yet our critic supposed the idea (taking his present version of what he meant) to be something so revolutionary and surprising as to form an entirely new departure in acoustics—so new and original with himself that even the versatile Dr. Mott would "seem to know nothing about" it. What! the doctor, so thoroughly read in all scientific lore, know nothing about the simple and patent fact that, according to the wave-theory, the entire swing of a prong in one direction sends off a condensation! How could he help being acquainted with this most elementary doctrine of current acoustics—about the first thing taught on the subject in every text-book published? Bosh! a hundred times bosh! If our critic was really putting forth such a stale and commonplace proposition, with which every beginner in natural philosophy is familiar, and if this was what he meant by the "first instant" of the prong's forward motion, as he now positively asserts, why does he say to the doctor, "*I want your keenest attention while I try to bring it before you!*" "Keenest attention" to what? Why, to this "first instant" or start of a prong's forward motion which does the condensing of the air—surely not to the prong's entire motion in one direction, as he now pretends! Neither did he want his "keenest attention" to the fact that the entire swing of the prong in one direction resembles in effect the "first instant" or small fraction of a pendulum's foot-swing; for that was the very thing to which the doctor had been trying to draw his "*keenest attention*" in previous letters! Hence, it is plain that the only thing to which he wanted the doctor's "keenest attention" was this "first instant" or start of the prong's swing, by which he now asserts that he meant the complete swing of the prong in one direction. That, and that alone, according to his present version, is exactly what he meant by the "first instant"—by "*the main point now*," and this hackneyed idea, that had always been taught in every school, that is found laid down in every text-book; a thing that no one had ever disputed or doubted who believed in the wave-theory; the simple threadbare idea that a prong by its entire swing in one direction produces the condensation of a sound-wave, he actually supposed to be his own original discovery, worthy of a stunning announcement and a capitalized heading as "THE MAIN POINT NOW," and so novel and far-reaching did he regard it, and so difficult for a common mind, like that of Dr. Mott's to grasp, that he would "*try to bring it before*" him, provided he could secure his "keenest attention," as if it

were doubtful whether or not he could succeed in unfolding to his comprehension such a profoundly scientific matter as this "first instant" discovery! Yet, after all this mountainous labor, a more insignificant and woe-begone mouse never was caught in a trap, according to his own virtual admission. Here it is in all its logical and astounding deformity: "*I ask your keenest attention*" to this "*first instant*" of a prong's motion.—this "*main point now*," which "*you seem to know nothing about*"—namely, *that the prong of a tuning-fork, by its entire swing in one direction condenses the air!!!*

We now candidly ask the reader, in view of the foregoing cursory examination, if it is at all likely that Dr. Mott, with his masterly analysis of the English language, with his critical study of the professor's original argument, and with his earnest desire to get at his true meaning, could have wholly misapprehended him, and that by the "first instant" of the prong's swing he really and honestly meant the entire swing of the prong in one direction instead of its commencement or start? For the professor now to claim such a thing as possible, is to admit himself incapable of writing so as to be understood; and he should, therefore, from this time forward, feel himself utterly disqualified from attempting to write upon any subject, however simple! Such, however, cannot be the true solution of Dr. Mott's clear and undoubted understanding of that "first instant" argument. Is it not more probable, even if there were no direct proof on the subject, which there is in abundance, that the professor, after reading Dr. Mott's answer, and finding himself hopelessly cornered at every turn, decided to adopt this hazardous course of shifting ground, and covering up his tracks by cunningly confused sentences, rather than make an honest and manly confession that he had hastily fallen into error? That this latter conclusion is correct to the letter, we will now briefly proceed to demonstrate, and fasten upon him so indelibly that he will never, while he lives, be able to wash it out, except by the frank confession required.

To get at his true meaning, further, before coming to the direct proof, let it be remembered that the entire drift of his letter to Dr. Mott was intended to neutralize the demonstrated fact in Capt. Carter's experiment that the prong's entire swing was, when nearly dying out and still sounding, 25,000 times slower motion than that of the hour hand of a regulator clock, and that such slow motion manifestly could not drive off a pulse in a mobile fluid, free to slip around like the air. This conclusion was clearly too self-evident for the critic to contend against, unless some new factor could be discovered and introduced. He was equal to the emergency, however. He struck a genuine and original idea in science, and even if not correct, abundantly worthy of his heading and his italics, and one no doubt justifying his supposition that the doctor might know nothing about it—one requiring his "*keenest attention*," etc. That is to say, that it is not this enormously slow swing of the prong, exposed by Capt. Carter's experiment, which condenses the air, but that it is the "*first instant*" of the prong's swing, or the first contact of the prong against the air-particles while they are at rest, and before they have time to get out of the way, at which the condensing takes place, and that no further condensing occurs in front of the prong during that swing after the air-parti-

cles once get into motion. Now to show that we have stated his original teaching precisely as he meant it, and as he himself stated it, here is the direct proof from his own words, quoted from his fourth paragraph, as follows:

"To my apprehension, it is the *first instant of forward motion that does the condensing of the air* [not the first whole forward motion of the prong, surely, as he now pretends was his meaning!], and the following motion adds little of anything to it."

But this is not all. Let us see if he is talking about the "first instant" of a *pendulum's* "forward motion," as he now indignantly asserts was his meaning, and that he had no reference to the "first instant" of a prong's swing, and upon which he is so positive in his statements that he charges Dr. Mott with "misrepresentation," and with "misstating the case" because he had so understood him. Here is the evidence which nails him. He goes right on from the above quoted sentence, as if to make his future backdown impossible:

"For in the *first instant the air next against the prong in front* [not next against the pendulum!] *has not time to get out of the way through the air's mobility*, but when longer time is given (by continued forward motion) the further air reached has time to move aside," etc.

Thus one single motion or swing of the prong is all he is analyzing, or talking about, and in the plainest possible words he speaks of its "*first instant of forward motion that does the condensing*," and goes on to tell the doctor that the "air next against the prong in front" has not time to get out of the way of this "first instant" of contact, but that it can slip aside "when longer time is given," and that as the prong continues its "forward motion" "the farther air reached" can get out of the way without being condensed. All this he taught in words so clear and explicit that a child that had but just learned to read could not mistake them. Yet now, as an example of the most unmitigated, bare-faced, and inexcusable tergiversation perhaps to be found on record, this distinguished scientist and critic declares in his rejoinder to Dr. Mott, with solemn asseveration, that by the "*first instant*" of the prong's "*forward motion*" he simply meant *the entire swing of the prong in one direction*. The truth is he meant nothing of the kind, and his illustration of the box dragged through loose snow immediately following the paragraph just quoted, abundantly confirms it, since he there repeats his meaning unmistakably, namely, that it was the "first instant" or the *first portion* of this single motion, both of the prong and of the box, as well as the pendulum that did the "piling up" or "condensing" in front, while "*the succeeding instants of unchanged motion*"—this same "*forward motion*," as he expresses it, did not condense either the air or the snow, but allowed it to part and slip aside. But why hammer a position after it is once annihilated? The simple, unvarnished truth is, he saw that he was utterly overwhelmed by the arguments which Dr. Mott had brought to bear against him, especially by the fact that the *first instant* of any simple harmonic motion, however short or long, like that of the prong or pendulum, was enormously slower than the center of the swing, a fact he had not thought of when formulating his "one main point" discovery. Hence, when this, to him, new light flashed upon his vision through Dr. Mott's reply, he saw that his "first-instant" game was up, and

after waiting nearly three weeks, hesitating what course to take, instead of frankly confessing his error, as the doctor had generously urged him to do, that he might consistently continue the correspondence with him, he at last decided to face the music and take the ugly bull by the horns, in the manner as we have here presented it, rather than endure the humiliation of confessing his mistake.

As we have frequently had occasion to forewarn our readers, here is another startling recorded proof that no scientist, however shrewd or versatile, can put his pen to paper in a serious effort to elaborate and defend the wave-theory of sound without involving both himself and it in numerous and irreconcilable self-contradictions. The reason why: It is inherently incongruous and self-contradictory. Let scientists remember that the straight and narrow way which leadeth unto *truth* is the only safe and reliable course to pursue in their investigations.

THE END OF VOLUME FOUR APPROACHING.

The next number of THE MICROCOSM will close the fourth volume of its career. The Prospectus of Volume V., under the auspices of the new management and proprietorship, will be found on the second page of cover, to which the attention of every reader is especially directed. The new publishers, under the firm and style of THE MICROCOSM PUBLISHING COMPANY, have long and carefully considered the various details connected with the successful continuance of this magazine, and especially have they weighed the price at which they can safely undertake its permanent publication. Even in its much cheaper and less elegant form, as now issued, it has not been a money-making enterprise at \$1 a volume. This fact, however, mattered little to us so we could only continue to send out THE MICROCOSM on its mission of shedding new light to the world on religio-scientific and philosophical subjects. We are glad and even proud to say that by singular good fortune, and by what we must regard as providential aid, this magazine has not, during the four years of its existence, failed to meet its obligations to its subscribers, nor has it, as we have numerous evidences before us, proved a journalistic disappointment to its friends.

But because the work has thus progressed without financial profit for four years, is no reason, the new publishers think, why a fair price for the magazine, enlarged and greatly improved, should not be charged in the future. We do not believe we are guilty of egotism or vanity when we express our humble conviction that THE MICROCOSM has, by its four years of missionary service, under difficulties, justly proved itself worthy of continued patronage and support in its new form and at its advanced price.

It will contain 48 pages and cover each number, same size as at present, and on fine supercalendered paper nearly one-half heavier than that now used, making the magazine about as cheap at \$2 a year as at \$1 in its present style. The first number of the volume (12 numbers constituting a volume) will be issued and mailed on the first of next October, and those who wish their names to stand among

the first honored patrons of Volume V. will remit their \$2 as per Prospectus, directed to THE MICROCOSM PUBLISHING COMPANY, 28 Park Row, New York. Those of our old subscribers, or any others, who do not feel able to spare the whole year's subscription at one time, can send \$1 and have the magazine forwarded to them for *six months*; after which we are very certain that they will find some way of raising the other dollar, rather than allow the "*Little World*" to cease its visits.

Send all subscriptions for Volume V. to THE MICROCOSM PUBLISHING Co., and direct to HALL & Co., as heretofore, all subscriptions for Volume IV., including back numbers of said volume, and also all remittances for bound volumes of THE MICROCOSM and for our other books, as set forth in special notices from month to month.

As we expect to conduct THE MICROCOSM jointly with Dr. Mott, the Managing Editor, we will endeavor to give our best services, with the sole aim of perpetuating this magazine and making the *Organ of the Substantial Philosophy* a permanent success, worthy of support by all friends of true progress. In this view we heartily commend it to the old subscribers who have so nobly sustained our efforts during the years that are past.

AN ENTHUSIASTIC INDORSEME

Here are a few sentences extracted from a recent editorial in the *Patrol*, a very sprightly journal published at Geneva, Ill., as a sample of many similar notices:

"In the recent college commencements, Galileo has, no doubt, had honorable mention by more than one-half the graduates. Galileo was a great man, and no mistake. To-day we laugh, and every schoolboy laughs at and guys those eminent gentlemen of Greece who persecuted him, and descant on Galileo's grit; but we never think of practising it ourselves. Galileo never pulverized the old masters in science any finer than an intellectual giant of New York has done, who rose from obscurity to be known of some, and whose name shall yet shine brighter than the name of Newton, or of Morse, or of Edison, or of Stevenson, or of Liebig, or of Agassiz, or of Humboldt. Galileo pulverized no finer the old theories of the heavenly bodies than this New Yorker in our own day has pulverized the absurdities of the undulatory theory of sound, which theory, with all its absurdities, is taught in all the books, by all the professors, in all the schools—except a few—and is believed in by these same graduates who so extol the bravery of Galileo. Five hundred years before Christ, a tramp by the name of Pythagoras evolved the wave-theory of sound, and men have been too lazy to examine into it for 2400 years. Yes, one man did, and his reward is eternal fame. By the side of the name of Galileo—and there are few higher on the scroll of honor—shall live the name of Wilford Hall, philosopher and annihilator of a theory that had stood the longest and in the broadest light of any that ever received the blind submission of learned men. This is not an advertisement. We say that \$2 will be well spent if you send for a copy of the 'Problem of Human Life.' Let graduates read the book."

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[From last month.]

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That the Substantial Philosophy involves a mighty revolution in current modes of religious-philosophical and scientific thinking, no one questions for a moment who has caught but a

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I cite these facts merely to show the importance, to every intelligent person in this land, of possessing a copy of this great volume, which so fully and profusely unfolds the principles of *Substantialism*, as this new philosophy is often called. The time will no doubt come, and before very long, when the university here foreshadowed will have commenced its educational work, and when the volume we now offer, containing the origin, development, and elaboration of the Substantial Philosophy by its founder and by its earliest advocates, will be prized and sought for as the most popular and valuable scientific and philosophical book published. Now, therefore, is a good time to get it, and then to study it, in order to be prepared for the impending revolution which is rapidly approaching.

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THE PHILOSOPHY OF POVERTY—ITS CAUSE AND CURE.—No. 2.

BY PROF. H. S. SCHELL, A. M.

In the August number of *THE MICROCOSM* I advanced the position that the extreme poverty and suffering witnessed in all large cities, and, though somewhat modified, over the length and breadth of the whole country, is mainly caused by the abstraction from the products of labor—the earnings of the people—of more than one thousand two hundred millions of dollars, taken annually as rent, merely for the use of land upon which to labor, and exclusive of the use of buildings or other improvements which may be upon the land. To this I will now add that three fourths of all the failures of manufacturers and business men generally, in cities, towns and villages, is attributable to the same cause; and further, that the disastrous seasons of business depression which succeed each other with remarkable regularity about every ten years, are, to a very great extent, the result of this gigantic drain upon the industry of the country.

When we consider that, besides this enormous sum taken by landholders, there is drawn annually by the Federal Government from duties on importations and by internal revenue taxes, three hundred and fifty millions of dollars, and by the local governments, state, county, town, and city, much more than this sum, we can realize to some extent how the industrious classes are ground between the upper and nether mill-stones, and how, with a vast number of our toiling fellow-citizens, life is "a struggle for existence," a burden grievous to be borne. Far different is it, however, with the fortunate landholder, who, by force of unjust and oppressive laws, is allowed to appropriate the earnings of his countrymen; and, while contributing nothing to the wealth of the community, lives in luxurious ease, using for his pleasures that wealth which others produce, and when inclined to increase his income, has merely to advance his rents, and thus absorb the fruits of the labor of the toilers.

As an illustration of the working of this unjust land monopoly, I will narrate an incident which will serve as a type for hundreds of others that are constantly transpiring, not only over the whole of this country, but wherever civilization has its seat. The writer, a few months ago, stepped into a down-town shoe-store, and while engaged in making a purchase, asked the proprietor, merely from curiosity, what rent he paid. The building stood on a good business corner, and the cost of its erection was about seven thousand dollars. It had four floors, and the shoe dealer occupied the lower one only. The lot, though but twenty-five feet front by thirty feet deep, would sell for twenty-five thousand dollars. In reply to my question, he said, in effect, "I moved here fourteen years ago, and have built up a fair business. At that time I paid sixteen hundred dollars per annum, but as my business increased, the landlord raised my rent almost yearly, and I now pay

three thousand six hundred dollars, which is the utmost I can stand. I have ten thousand dollars capital, pay cash down for all I purchase, and by close attention to business, meet my store and personal expenses; but the rent is too heavy to allow my saving anything worth speaking of." Now if taking the earnings of this man is not equivalent to robbing him—legally, of course—I do not appreciate the difference, and for myself I would prefer having my wallet, even if well filled, stolen by some poor fellow, or my house robbed, than lose money in the way this man does.

When the writer was a boy he frequently saw in the streets of New York a man, then about seventy years of age, who was reputed to be worth three millions of dollars. This man had made money, and invested one hundred thousand dollars or more in the purchase of land located less than two miles north of what was then the center of the city. On some of this land he built and then rented, and, as the population and the income from his rents increased, he continued building and renting, until, at his decease, he left about four millions of dollars in land and buildings; to-day the land he had bought, without the buildings upon it, would sell for more than twenty millions of dollars. His heirs and their descendants have continued to follow the example he set them in buying land, building and letting, and now own about two thousand dwellings and other buildings and more than that number of lots, in marketable value at least one hundred and fifty millions of dollars. Two or three years ago last winter one of these descendants, not satisfied with an income of five millions of dollars, gave instructions to his agent to raise the rents of his buildings ten per cent. This soon got into the newspapers, and immediately nearly every owner of a house or store who had either one or the other to let the ensuing spring, raised his rents ten per cent., and thus six millions of dollars in additional rent was drawn from the earnings of industrious citizens and put into the pockets of landlords, not one of whom earned a dollar of it.

Think of that vast sum, more than the aggregate of the wages for a whole year of twelve thousand able-bodied men, representing sixty thousand of our population, appropriated to their own use by a few thousand drones. This is the kind of business that impoverishes our people and causes the failure and pecuniary ruin, yearly, of very many of our business men; that brings on "hard times" and fills our almshouses and prisons; that robs the poor widow struggling to support her little ones; that foully stains our boasted civilization and eradicates from the mind a belief of the goodness and justice of God, and even of his very existence; but it is the natural outgrowth, the legitimate fruit of laws which sanction the private ownership of land on which all must live, and which God gave for the free use of all.

But with regard to the landlords, we must not be too severe, as many of them are men of high moral character and often exhibit traits of benevolence. It is the system which allows such extortions that is

chiefly to be condemned, for I fully believe that not a single one of these landlords thought he was doing the slightest injustice when he took his proportion of this money, and the very one whose act I have especially criticised has given often and liberally and even princely. Only last spring he finished and furnished a large and noble building which he gave to the city to be used as a dormitory for poor little girls and boys who have no homes or friends, and who earn their support by peddling newspapers, or trying to "shine yer shoes." Hundreds of these little waifs, many of them scarcely six years old, may be seen every evening resorting to their new home, no longer compelled to sleep in or under carts, or in alleys, or under house stoops, often in bitter cold weather. Surely this was a considerate, a noble act of charity, exhibiting a kind, generous and sympathetic heart, and worthy of all praise—the other was, however, "business." The Saviour would have done the one, but left the other undone.

Many attempts have been made to justify private ownership of the land of a country, but when we see that through it thirty millions of the descendants of those who fought for their country's liberty, and shed their blood for the free use of its soil, have been deprived of the use of a single rod of that soil; when we see that they have not only been robbed of the land, but of the forests, the coal fields, the petroleum streams; that all the gold, silver, copper, lead and iron mines are private and exclusive property, and that by these deprivations they have been virtually reduced to the fate of bondsmen to their oppressors, who take from them all the fruits of their toil save enough to keep them in working condition, the question "Is private ownership of the public domain just?" is settled; there is no basis for argument, and controversy is at an end. If a hundred volumes, each the size of "Webster's Unabridged," were written in its defense, they would not affect the justice of the verdict which condemns it an iota.

When Dr. A. Wilford Hall, in his matchless "Problem of Human Life," demonstrated that if the "Wave-Theory of Sound" be the true theory of sound propagation, then *must* a locust, by the simple *force* of its song, shake every atom contained in four cubic miles of air, and do it four hundred and forty times a second, keeping up the agitation a full minute, he settled the fate of the "Wave-Theory" forever, and, as a consequence, overturned the current theories respecting all the natural forces, thereby demolishing the foundations of materialistic infidel philosophy; and all the efforts of Helmholtz and Huxley, Tyndall and Haeckel, by teaching, lecturing or publishing, to re-establish them will prove futile. One fact which is positively inconsistent with a theory is as powerful as a hundred in overthrowing it.

While the public domain is held as private property, and its holders can drive from it all who will not accede to their terms for its occupation, and while such is the case over the whole country, and no spot is exempt from their control, what folly to imagine ourselves freemen? They have the power to place such rent upon the land as will take all we can earn, save enough to afford us a bare existence, and they constantly do it; they can make us vote as they please, and they do it; they can demand even the sacrifice of the honor of our wives and

daughters to their will, and have often done it, especially in England, Scotland, and Ireland. No! we are slaves to our masters, the landlords, and will be such as long as they hold the soil on which we must live. "They who own the soil, own those who live upon it." Our forefathers went to war with England rather than permit her to levy an insignificant tax of three pence per pound on tea, and yet England had more right to tax us than landlords have, for these states were then her colonies, and, she claimed, were an expense to her in affording them protection; but the sturdy freemen of that day preferred to protect themselves, and refused to acknowledge the right to tax, when they were not represented in Parliament. They fought and suffered every hardship for seven years, and thousands laid down their lives rather than submit; but we, their degenerate descendants, allow not only our own countrymen, but the aristocracy of England, France and Germany—for they own millions of acres of our lands and tens of thousands of building lots in our cities—to tax us over a thousand two hundred millions of dollars every year, thus reducing to poverty and wretchedness vast numbers of our people, often paralyzing all branches of industry, and frequently throwing millions of men, women, and even children out of employment, besides converting into tramps hundreds of thousands of industrious men who are able and anxious to work, compelling them to wander over the country seeking employment, and forcing them even to beg for food. With regard to the expediency of inflicting a tax of two hundred millions of dollars annually on the industry of the country by means of a tariff on importations, much has been said and written pro and con, and cogent reasons should be given by those who advocate it. If we reflect a moment, we shall see that it is a blow at our liberty. It says to the people, "You shall not buy as cheaply as those from whom you wish to purchase are willing to sell." Is this not infringing upon the little liberty we have left? Is not the taking from us everything except air and water enough? And yet this is called "the land of the free and the home of the brave;" a more appropriate appellation would be the land of the fleeced and the home of the slave. But let us examine some of the reasons given in favor of the tariff. *First*. "We must protect our manufacturers." It would be far cheaper to pension them and give their "hands" free access to land, thus making them men instead of machines; or the government might make office-holders of the manufacturers. The idea that fifty-five millions of people should be taxed every year two hundred millions of dollars for the benefit of a few thousand of their number is absurd. *Second*. "If we abolish the tariff, and nations with whom we trade do not, they will flood our country with their goods, while purchasing few of ours, and thus absorb all our gold to equalize the exchanges." There is some truth in this, but the remedy is easy: Impose a duty of five hundred or five thousand per cent. upon the products of any government, which, after we have abolished the duties on its products, refuses to abolish the duties on ours, and within ninety days its ports would be free to the entrance of our goods without tariff. *Third*. "The tariff is necessary for revenue;" but this is also absurd. Why should we tax the products of industry, or, in other words, the laborer, when we have land to tax? Land

is rich and costs nothing. It is the *gift* of God—while the laborer is poor and often has a family to support. Let Providence give but rain and sunshine to the fields, and lo! food for thousands and thousands of cattle springs up and fits them for man's use. Sow five bushels of wheat and you reap a hundred, or five bushels of corn and you reap two hundred, but where is the laborer, who, by expending one dollar's worth of time on work can reap even two dollars from it? Land often grows very rich.

Two hundred and fifty years ago all the land on this island was bought for twenty-seven dollars; it is now worth five hundred millions of dollars.

It is rich, and absorbs the wealth which the toilers produce—tax it for revenue and for all expenses of government. The support of the Federal Government should devolve upon the States, each contributing in proportion to the value of its lands, and each raising by taxation on those lands sufficient for that purpose and also for self-support.

As suggested in my last paper on this subject, a tax of four per cent. on the full value of the bare lands in use, excluding any buildings or other improvements which may be upon them, and a tax of eight per cent. on lands not in use or under cultivation, but held by speculators merely to await higher prices, would secure more than all the money necessary and relieve the products of labor from all other taxation; and, what is equally important, relieve railroad companies and speculators generally of millions of acres of idle lands which, but for them, would be farms, and millions of unoccupied lots in cities and villages, which should and would be covered with dwellings or other useful buildings, and restore them to the States or Federal Government to be leased for occupation for long or short terms, as may be desired, but subject to periodical valuation. If our government would pursue this course, I believe other nations would follow its example, and thus a mighty load would be lifted from the shoulders of their people, and in a very few years intemperance and poverty would be banished and peace and plenty gladden millions of homes.

It may be thought that a tax of four per cent. would bear heavily upon farmers and upon those in cities and villages who occupy their own homes or stores, but I am confident it would not. They would have no tax to pay on dwellings, furniture, stores, merchandise, bonds, stocks, money in bank, barns, fences, cattle, implements, or anything else, and no duties or taxes on anything they purchased, whether of home or foreign production; and then consider the enormous increase in business that would result by abolishing the tariff, and giving to the people the use of unoccupied lands. Commerce, foreign and domestic, would be greatly increased, and we would import and export three times the amount we do now, and this activity in business would give abundant employment and liberal wages to all, and "hard times" would soon be unknown.

By our present system of taxation our people are actually treated as criminals, and fined for making any improvements in their dwellings or their surroundings. No sooner does a person erect a new building in place of an old one, which he has torn down, than the tax-gatherer is after him, and he is doubly or trebly taxed; and so instead of being commended for adding to the attractions of our homes, and of the city or village in which we reside, we are fined.

Does not common sense teach us that such a system of taxation is absurd? And notice the effects of duties on importations. Take silks, for example, on which the duty is fifty per cent. Silks which can be purchased in Europe and imported for fifty cents per yard, cost the consumer \$1.20 per yard, whereas were there no duty they would afford the necessary profit if sold for seventy-five cents per yard, a saving of at least \$8 on a dress pattern. Then estimate the extra amount paid on the two millions of patterns that are sold annually in this country, and we see that sixteen millions of dollars more than should be paid is paid for this article alone. It seems to me that the tariff is nothing else than a senseless robbery and wholly useless. The broad principle of justice teaches that labor should never be taxed—that is, fined—for it is useful and honorable and should always be encouraged. Tax land for all necessities of government, for it is rich, cost nothing, and yields a royal return.

Had the vast sums which landlords took from the people as rent for land during the progress of the civil war, been taken by the government in taxes, at the close of the war the country would not have owed a dollar; and if England, one hundred and fifty years ago, had taxed her lands instead of the products of industry, and continued to raise revenue solely from that source, she, to-day, would not owe a shilling; but her law-makers were then, as now, her landlords, and they preferred absorbing by means of rent most of the wealth produced by industry, leaving the government to squeeze out of the people what remained; but sufficient pressure could not be exerted—hydraulic presses were not in general use—and now the debt is about a thousand millions of pounds sterling, and as the landlords continue to absorb by rent most of the net earning of the people, the latter are ground almost to dust to pay the interest and support their government. Over one million of them are public paupers, and supported as such, and several millions are on the verge of pauperism. But even now, the whole debt could be paid off in twenty-five years, if the ground-rent money absorbed by the landlords of the United Kingdom were appropriated as taxes by the government. These facts show the folly and danger of electing large landholders or land speculators as representatives in Congress, or to State legislatures, as they, almost invariably, legislate for their own interests, rather than for those of the people.

From careful thought on this subject, I am convinced that no one will be permanently injured by the changes I have suggested, should they ever be carried into effect, except the land speculator. When this enterprising individual finds an annual tax of eight per cent. on land lying idle and yielding no income, he will be apt to sell for what he can get, or, failing to find purchasers, or to raise the money to pay his taxes, will have to abandon his lands, and they will then revert to the people, who have been unjustly deprived of them; and, as he holds many millions of our broad acres, and millions more of village and city lots, the land monopoly will receive a shock, and the land-shark a lesson that will be long remembered. In regard to those who hold improved property which they let, and upon which a tax on the value of the land would be four per cent.—but no tax on the improvement—the plan I suggested in my former article, viz.,

that they be allowed to charge this tax to the tenant, as well as ten per cent. on the value of the improvements—but no more—would bring them a liberal compensation; and should they build in future, no part of their capital would be required to pay for land. Let us, for a moment, consider how tenants would be affected. We will suppose a wholesale merchant pays \$15,000 per annum for the rent of a store worth \$50,000, which stands on a lot which would sell for \$100,000—and many such there are in New York. By the plan I have suggested, he would pay \$5,000 for the use of the store, and \$4,000 for the use of the lot, a clear saving of \$6,000, which, in ten years, would amount to \$60,000, with about \$8,000 interest additional, a moderate fortune in itself.

Seven millions of voters in this country, each having as much right to the free use of land as he has to the free use of water, air and sunlight, have, by unjust laws, been deprived of that right, and are obliged to hire or purchase it. If these voters would, in every community, present petitions to the State Legislatures asking that all taxes be abolished except upon bare land, and that however small be the tax levied on homesteads and land in use, it be doubled or trebled on that kept from use, and that landlords be restricted in renting to ten per cent. on the value of their improvements and the land tax, they would probably effect the object desired, and pave the way for their emancipation and elevation. But should this fail, as it might in some States, then let the voters require from all who solicit their votes for legislative or congressional representation, and for any other important offices, a pledge that they will favor and vote for the abolition of all taxes except upon land, and let them vote for no one who will not give this pledge. Ignore all other political questions for the time being, as this is the only one of vital importance at present. Other and great abuses exist, but they can easily be reached and rectified when the object now in view is obtained. Let all the industrious classes, viz., professional men, merchants, farmers, mechanics, all wage-workers of every kind, and all who love their country and their countrymen, join in one grand effort to rescue their country and its institutions, and make it glorious in being in truth "the land of the free" and a refuge for the oppressed, and I believe the Divine blessing will crown the effort.

No. 372 West 32d. St., New York.

UNDULATORY RELIGION.—No. 2.

BY REV. J. I. SWANDER, A. M.

In our last communication we dictated an epistolary form of address, and offered it for the free use of any church-society desirous of taking the nearest road to the point toward which much of our popular religion seems to be tending. In the closing paragraph of that paper we also intimated the possibility that the notoriously distinguished individual addressed might thus be induced to look with favor upon the proposition therein contained, and signify his acceptance thereof in such a reply as would have the effect of thrilling the broad-gauged churches of the pleasure-loving world with emotions of wild delight. We also promised our intelligent and consistent Christian readers that, in the event of such a responsive communication being received from the pugilistic Athens of America, at a sufficiently early date

for this number of *THE MICROCOSM*, we would have it published as an item of most absorbing interest to all who are watching the significant signs of the times. We are sorry that such of our friends are now doomed to disappointment. For once the gentleman addressed has failed to be on time. His hesitancy is unusual, and the cause of his silence is ominously shrouded in a cloud of mysterious perplexity. At this present writing we do not think it probable that he will ever deign to return an answer. Indeed, we suspect that he has been offended at the attempt of the Pharisees to rob the Publicans of their peculiar methods. This is just what false faith is trying to do. No wonder that the world is disgusted at the wave-theory of religion and the wayward practice of its pretentious piety. And yet there are some extenuating facts which should not be left out of consideration in making up a righteous verdict for the defendant. The kingdom of heaven suffereth violence. Foreign elements have rushed into the Church until the chartered ship of human salvation is apparently ready to founder under an aggregate accumulation of carnal tonnage never authorized in her heaven-given charter.

It is the primary mission of Christ's Kingdom in the world to lay hold of the unleavened elements of humanity, and, as far as they are assimilable, incorporate them as organic parts of itself. That is no mere flourish of inspired rhetoric which represents the Church as "the body of Christ." A "body" is not a mere aggregation of material thrown together in convenient and comely shape, but an *organism* of invisible forces and plastic powers which ever seeks to complement itself in material form. As the human body takes up elements of the lower kingdoms—mineral, vegetable, animal—permeates them by its own powers, assimilates the assimilable, and throws off the excrementitious matter, so is it the mission of the Church, as the embodiment of the higher kingdom of heaven, to receive the salvage elements of the sub-kingdom of humanity, quicken them by the heavenly life of which it is made the bearer, and, when heedless indifference or hellish resistance does not thwart the heavenly purpose, assimilate them into the substance, and make them very members incorporate in that mystical body and kingdom which "ruleth over all." Again, just as it is possible for a human system to take into the stomach too much foreign matter for thorough digestion and consequent health, so is it also possible for the Church to become gorged with indigestible flesh and thus disturb the functions of the religious stomach, develop unmistakable symptoms of ecclesiastical dyspepsia, and bring a morbid condition of piety into the most pretentious portions of Christendom. According to the view of the writer, this is now the peculiarly alarming condition of the Church throughout the civilized world; and if our opinion is founded upon fact, it is certainly the part of wisdom to institute an earnest inquiry both as to the cause and the cure of the chronic malady.

There is a great diversity of opinion concerning "the hurt of the daughter of God's people," and also as to how that hurt may be more than "slightly" "healed," Jer. vi: 14. The common mistake is made in locating the disease in one or several of the mere symptoms thereof. Pelagius was finally condemned, but semi-Pelagianism is the very devil in false the-

ology, once let loose and still at large deceiving the nations. Pelagianism grounds itself in a superficial view of the moral condition and real necessities of humanity as the subject of salvation from sin. The popular theology of this age, however emphatic the language of the confessions may be in the opposite directions, is considerably dipped with Pelagian error. It does not regard the human family as very seriously affected with anything like the epidemic essence of moral death. The term "regeneration" is frequently, if not commonly, used to emphasize the importance of conversion, while the latter means nothing more than a conviction that something wrong has been done, accompanied with an honest intention to quit making such mistakes. This is quackery in its most unostentatious perfection. No wonder that so little account is made of the positive and substantial entities of the Christian religion where there is no clear discovery of a necessity for such a healing balm in Gilead. An empirical diagnosis leads to empirical therapeutics.

As long as such theological poverty prevails in molding the sentiment and in shaping much of the questionable workings of Christendom, it matters but little what theory of doctrine, church government, or religious customs may be in the ascendancy. Calvinism is the finest system of metaphysical abstractions ever wrought out in the laboratory of human brains; and yet, blind to the beauty of the concrete, and deaf to the music of heaven's choral symphonies in the organic conception of the truth, as a mere theory of the Divine Being's mode of motion in the "plan" of redemption, it does not contain "irresistible grace" enough to insure the final perseverance of one poor saint. Arminianism emphasizes the other side of the same abstraction. It may be regarded as a theory of the mode of motion on the part of fallen humanity in its fruitless struggles to transcend the limits of its own helplessness. Transubstantiation, consubstantiation and the negative sacramentarian theories of unsubstantiation would do well to remain silent for about the space of a half hour, that the basic and primary question of *IMMATERIAL SUBSTANTIATION* in being may have a respectful hearing in the court of Christendom. Until that point is reached, it would be unwise to make any expensive preparation for an early dawning of the millennium. Evangelical Alliances, Pan-Assemblies, Holiness Convocations, Church-Conferences and Salvation Armies may serve to reveal the existence of a felt want, and even act as agents in leveling down the mountains and filling up the valleys, but they can never make the comers thereunto perfect. Better things are required. Not the least of these things is a better philosophy. It may be said that true religion has nothing to do with philosophy. Possibly not; yet it occurs to us, just at this writing, that false philosophy has had enough to do with religion to impede the proper progress of Christianity in the world. And now, in this approximate dawn of her twentieth century, Zion unconsciously sighs and seeks for something to roll away the false philosopher's stone from the door of the sepulcher of Truth, that the invisible forces and consequent glory of her salvation may appear.

The weak point in the Church's armor is not in the Gospel, but in her defective apprehension thereof. The objective "faith once delivered to the saints" is perfect, while subjective faith, like those by whom it is exercised, is

defective. Such defectiveness in faith has always been the primary hinderance in the way of Zion's effort to possess those heavenly powers necessary to beat down the powers of hell. It was really no discovery of a new remedy that led the reformers to announce "salvation by faith" as the battle cry for a new charge upon the ramparts of an old enemy. The situation now is similar, and yet somewhat different from that of four hundred years ago. The dry distinctions and dialectic subtleties in the scholastic philosophy of the middle ages favored the dead march of centuries toward the vortex of that godless formalism which culminated under the reign of Leo X. Since then the rudderless ship of the world's philosophy has moved with the controlling current of rationalistic thought until it has finally floated out into the ocean of materialism, with nothing aboard but excessive ballast and bad seamanship. The prevailing influence of such philosophy has so affected the theological thinking and teachings of the Church as to substitute either reason, sentiment or sight for that necessary *faith* which is "the conviction of things not seen." Our popular faith is defective, not so much in the want of the respective elements of trust, affection and zeal, as in the *absence of disposition and power to see the invisible*. The responsibility for a continuation of this organic disease in popular faith is found largely at the door of our Christian colleges and influential centers of learning. Students are instructed to believe in the unseen verities of our holy religion, while the invisible forces of nature are denied. This opens a wide door for educated skepticism. Seniors rightly wish to know why the realities of religion and the forces of God's higher kingdom should be accepted as immaterial and intangible, while the very same authorities teach, as for instance in the wave-theory of sound, that the forces of nature are material. When they receive no satisfactory answer to their reasonable inquiry, some of them assume the responsibility of doing a little thinking for themselves, and consequently become substantialists. The majority, however, move in the other direction, with a natural tendency to deny everything in religion which cannot be measured by the understanding, proven by the testimony of the senses, or shadowed, through the camera of fancy, upon the surface of a morbid imagination. This false tendency, according to the extent of such prevailing educational influence, prevailing temperament in the individual and community, and other modifying circumstances, leads to one of several defective and dangerous forms in diseased religion, under the predominance of either cool, reflective intellectualism, cold, cadaverous formalism, or passionate sentimentalism.

We repeat, therefore, that the way to the antidote for all such diseased religion is found alone in the proper recognition of those invisible forces which God, in the grand unity of his design, has placed, both in the kingdom of nature and in the higher kingdom of grace and glory. And right here we have no hesitancy, whatever, in affirming that it is the highest mission of the Substantial Philosophy to point out and emphasize the primary importance of this balm for the healing of the ecclesiastical nations. If Substantialism were of such a character as to make its fundamental principle incapable of an application to the higher philosophy of the Christian religion, we would im-

mediately dismiss the former as unworthy of our further attention, or reluctantly lose our confidence in the latter for making the most unreasonable demands of anything ever palmed upon the credulity of miserable man. But we have no such difficulty; and we have heard of no Christian, or Christian minister who, in reading the new philosophy, has not found it a valuable stimulant and auxiliary to his faith. Why should it be otherwise? Is it unorthodox to admit the possibility of such benefit to religion from the resources of sound philosophy? If so, God have mercy upon the unsubstantial souls of orthodoxy. Did not the prophet say that Zion should suck the milk of the Gentiles, and the breast of kings? Every true science is a royal sovereign in its realm, and tributary to the "river, the streams (canals, conduits) whereof make glad the city of God." True science. Hitherto Zion has had a poor supply of lacteal food from scientific sources. It was impossible to draw nourishment from the ornamental udders of materialistic evolution; and if the wave-theory of sound is not like Solomon's little sister, it has furnished nothing better than the fluid of ridiculous fallacy for those unscientific babies, who, for centuries, have vainly tried to suck truth from its milkless mammaries.

The Church needs a *substantial theology*. If St. Augustine, the father of metaphysical divinity, had been able to take a position more similar to the one since occupied by Schleiermacher, he would have driven the pest of semi-Pelagianism out of the world, and shut Pelagius up, as Dr. Hall did Tyndall, another Briton—in an exhausted receiver of eternal silence. Yet the old Latin father did well for one born of Pagan parents. Let modern theologians of superior privileges now answer the correspondingly superior demands of their more advanced and advancing age. There is such a response in process of preparation. Forty years ago the seed thoughts of Schleiermacher were planted in American soil. The Mercenberg school of theology began to reproduce the best types of German thinking in this country. This led to the adoption of the Christocentric principle as since advocated and developed in the *Reformed Quarterly Review*. According to this more organic theology, Christ saves the world, not so much by what he began to do and to teach, as by virtue of what he became and is in the hypostatic constitution of his being. It is claimed that Christ, as such a foundation of salvation, is present in the Church in a real manner, and not merely in historical record and spiritualistic vaporings. A recognition of such a Messianic presence is now the one thing needful to save the Church from general religious dissipation.

Mercenberg theology, during the forty years of its meanderings in the American wilderness of clashing theories, has made comparatively slow progress in its effort to apprehend the mystery of Godliness in a substantial way. Surrounded with the unfavorable environments of false philosophy, it could do little better than to "see men as trees walking." Its eyes were not fully opened. It needed another oculist—a philosophy which would begin its mission, as did the Author of our salvation, by descending "first into the lowest parts" of its wide domain, and in the world of physics show, by incontrovertible discoveries and demonstrations, that even there the intangible is the real, the plastic and the abiding. That necessity has

been met. Substantialism has made its appearance in the fullness of time. Now let the blind receive their sight, and the deaf hear something better than the music of undulatory wind-pipes. As the person of Christ is the center around which all sound theological thought must be organized, so Substantialism is the key to all correct philosophical thinking, even in the sphere of theology. It is sheer nonsense to talk about "The historical Christ" without a Christ substantial. If Christ is present in Christendom in no deeper sense than Geo. Washington is supposed to be present on the written pages of American history and in the sentiments of our patriotic devotion, we have nothing more than a mythological Immanuel in our churches, and Christianity is no better than a farcical abstraction. If it be said that Christ is in the world by a spiritual presence, we reply that there is no unsubstantial spirit, human or divine. The abstract religion of mere motion is no better than the absurd philosophy of modern materialistic mud. Blow the trumpet in Zion; call a solemn assembly; let the ministers weep between the porch and the altar, let the entire militant church put on the whole armor of her strength, and with the substantial weapons of offensive warfare drive back the powers of darkness until the dawn of heaven shall part the veil that hangs before the eternal day.

FREMONT, Ohio.

THE SKEPTICISM OF THE NINETEENTH CENTURY.

BY J. W. LOWBER, M. A., PH. D.

The position of infidels has varied in different ages. In the early history of Christianity, skepticism was strictly united with a religious creed; and it was on the defensive, in opposition to the aggressive spirit of Christianity. It would not be right to charge the philosophic opponents of Christianity in the first centuries with all the atrocities and abominations of paganism; but there can be no doubt that the greatest of them, Celsus, Porphyry, and the Emperor Julian, accepted polytheism in a modified form. In one sense they have been an advantage to Christianity, for they admitted the genuineness of the gospel narratives; and they now become important witnesses in proving the canonicity of the books of the New Testament. The skepticism of the seventeenth century was the result of the religious wars and the divided condition of the church after the Reformation; and it prepared the way for the outbroken infidelity of the eighteenth century. There were two schools which represented the infidelity of the seventeenth century—the Deistic school and the Pantheistic. To the first belonged Lord Herbert and Hobbs; to the second, Spinoza. Bayle was something of a pessimist; he fought without all camps, and wielded quite an influence over the skeptical writers of the next century. During the eighteenth century infidelity was more daring than it had been before, or has been since. Deism was carried into Atheism; and Pantheism reached an extreme of which even Spinoza never dreamed. The student of the skepticism of the eighteenth century will have no difficulty in understanding that of the nineteenth. The infidelity of the present century is passive compared with the fiery aggressiveness of that belonging to the eighteenth.

In the skepticism of the nineteenth century there are two strikingly marked tendencies; first, to deny the supernatural origin of Christianity; and, second, to regard Christianity with more favor than did the infidel writers of the eighteenth century. Many of the opposers of Christianity at the present time are willing to concede almost anything to it, provided there can be some natural explanation of the phenomena. Naturalism has really run mad.

David Friedrich Strauss may be taken as the best representative of the German school of skeptics in this century, in attempting to solve the problem of the life of Christ and the origin of Christianity. When Strauss wrote his first "Leben Jesu," in 1835, he was a Pantheist; when he wrote his second, in 1864, he was a Theist; when he wrote "Der alte und der neue Glaube," in 1878, he had reached the gloomy abyss of Atheism. As Strauss belonged to the left wing of the Hegelian philosophy, his writings became the creed of his skeptical brethren, and through his influence there was a reaction against the orthodox tendency brought about by Neander. He was diametrically opposed to Neander in his historical ideas; for he regarded history as faint legends of the ideas which is the soul of all that is valuable in the past. A contempt for the historical and personal is the key to the "Leben Jesu." This work was the earthquake shock of the nineteenth century to the moral feelings of Christendom. It was soon answered by the learned and faithful Neander, and has now nearly spent its force. No man with such quick perception and critical ability as Strauss, can be satisfied with any school of infidelity. Such has been the case with this great man; he has sought rest, and found none. After trying the different schools, and decisively opposing Schopenhauer, he has landed into pessimism at last, although not so avowedly. Such is the sad end of a mournful career, and it will be the end of all who ignore the religious demands of man's nature. With his critical ability, Strauss might have become one of the greatest defenders of the truth; but, as it is, he has only created ripples upon the great ocean of truth, to subside, and be lost forever. Truth will triumph, and woe to the person who opposes it.

Ernest Renan is the French representative of the Straussian philosophy and theology. He is not an author of such marked ability as Strauss, and his writings will not live. Renan is far more conservative with regard to the New Testament writings than Strauss; in fact, he substantially admits the genuineness of most of the book. With regard to the purity and nobleness of the life of Christ, Renan is far more eulogistic than was Strauss, even in his Hegelian period. He exhorts his fellow-doubters to remain in the church, and to proclaim religion as a necessity to meet the demands of man's nature. He refers to the French revolution as a consequence of infidelity. It should teach all skeptics a lesson.

John Stuart Mill comes nearer representing, in England, the position of Strauss and Renan than any other man. Mr. Mill places great stress upon the Theistic argument from design, although opposed to the doctrine of infinity, still he admits the existence of God. He also admits the possibility of a revelation, but is not satisfied with the evidence. In the presentation of his thoughts in reference to the origin

of Christianity, Mr. Mill shows a gleam of Butler, as well as a reflection of English Deism.

LOUISVILLE, Ky.

AM I? OR AM I NOT?

BY ELD. J. J. MILES.

I used to think I was absolutely certain that I am. But God is truth itself—sees things as they really are. And it is said, that with God it is *one eternal now*. My consciousness tells me that a few years ago I was not here, I had no existence as a man, boy, or infant even. During the infinite ages preceding, the present J. J. M. had no existence. True, the immaterial substance out of which he was formed existed in God, but J. J. M. himself was not. My consciousness testifies that for sixty-two years I am; but during the previous infinite ages I was not. *With God it is one eternal now*. Which "now" is the true "now" with God? the infinite past "now," or the present sixty-two years' "now"? Can sixty-two years of present now weigh anything against an eternity of past now? The logical argument *against* the assumption that I am, is as infinity against sixty-two years. I give it up, and conclude that *I am not*.

And if time be nothing with God, space may be nothing with God. But God sees things as they truly are. Time and space, then, have no existence. They are only ideas, or thoughts, or images. But thoughts or images cannot exist without a thinker or imaginer. And how can a thinker or imaginer exist without time or space in which to exist? In this case they must exist nowhere and at no time—in other words, not at all. And if there be no time, no space, then God exists nowhere, at no time—that is, not at all.

If my consciousness testifies to anything, it testifies to the existence of myself, to the existence of time, and of space. Woe be to logic when logic contradicts one's consciousness. Such logic reasons us out of being, reasons God out of being, or reduces God to an all-pervading ether or electricity without form or parts, and deprives God of powers that we know we ourselves are possessed of. A father can comply with the requests of his child, but the infinite Almighty Father cannot gratify the wishes, grant the requests, of his children! Alas for fallible logic, that is false logic, contradicting very consciousness!

Give us the Bible and its teachings; and the beauty of the Substantial Philosophy which is in harmony with the Bible.

CLINTON, Ill.

CAMPING TOUR TO THE YO-SEMITE VALLEY AND THE CALAVERAS BIG TREES.—No. 10.

Climb to Glacier Point.

PROF. I. L. KEPHART, A. M., D. D.

My last contribution was concluded by stating that it was our purpose to visit Glacier Point on the following day, and that we had failed to persuade the women into attempting to ride horseback. It was the morning of July 9th. We were up and ready in good season, and rode in our wagon down below the chapel, till we were right under the shadow of Sentinel

Rock. Here we left our team, provided with hay, and with a small lunch in hand we commenced the ascent. The trail strikes the southern wall of the valley at the base of Sentinel Rock. The morning was serene and beautiful. The birds were singing their sweetest songs, squirrels were barking, and the cool breezes from the snow-capped cliffs wafted refreshment in every breath. But the ascent! It was tremendous! On we tugged, vigorously at first, but gradually we "slowed." The women, enthused with all the energy of their well-formed determination to "make this trip a-foot," toiled along bravely over the first mile, chatting merrily, panting, and halting in turns.

But by this time we were up above the tops of the trees in the valley, and the July sun began "to lay its rays in upon us" with unmerciful vigor! The poor women! How they began to perspire! (and the men too, for that matter). But we tugged along for another half mile, all the while the ascent becoming steeper and the sun hotter. The women's faces were flushed; perspiration flowed; but all the while they kept up their spirits, and chatted as merrily as if at a picnic. Of course we "rested" quite frequently. But our case was becoming desperate, and it was evident we were nearing the crisis in our (the women's) foolhardy attempt, when we were overtaken by a Mr. McCauley, who proved to be one of the cleverest Irishmen I ever had the good fortune to meet. He was riding a little mule, and driving a pack-horse in front of him, the horse heavily loaded with supplies for the hotel at Glacier Point, of which he (McCauley, not the horse) was the proprietor. On overtaking us he took in the situation at a glance, and his big heart at once prompted him to offer relief; so, bounding off the mule, he exclaimed:

"Sure, and wouldn't the little gal (meaning Lizzie) like to ride?" But she, being timid, expressed her fears of the mule, when he replied: "Och, sure, and he is just as gentle as a little dog, and he'll be glad at any time to carry a little lady like you, instead of a big lubberin' Irishman like meself. Here, jump right on, and he'll carry you up like a daisy." With that Lizzie was soon seated on the mule, and she, the Irishman, the horse, the mule, and I, went wending our way up the trail, leaving the professor and the women quite a distance behind. But oh, how steep and how hot it was! How I puffed for breath; and on seeing this, my clever Irishman exclaimed: "Here, take hold o' this!" And with that, he caught hold of the mule's tail and insisted on my doing so too. Of course it required but little persuasion to induce me to take his advice, and for quite a distance, we toiled along, both holding on to the mule's tail.

By this time I began to realize that Mrs. Kephart would never be able to reach Glacier Point, and as we halted to rest, I said, "Oh, I do wish my wife were on this mule. She will never be able to reach Glacier Point." Again my Irishman was equal to the emergency. "Here," he exclaimed, "I'll fix that. You keep this mule right here. I'll go on wid my horse and supplies for dinner, and when she comes here, you git her right on to this mule. The little gal is rested now, and she and her mother and the other lady can ride the mule in turns, and that way you can bring them all up."

"All right, and a thousand thanks to you, sir," I replied; "but be sure and have a good dinner ready for us by noon, for we will be as

hungry as wolves." "Och, you're right, I'll have a good dinner ready. My wife is a Pennsylvania Dutchwoman, and it's herself that knows how to cook a good dinner, now mind I tell you. But you be sure and bring them up."

So saying, he scrambled along up the steep trail as rapidly as possible, to overtake his pack-horse; and Lizzie dismounted, and we waited the arrival of the professor and the women. Slowly, but *surely*, they came; and only a little persuasion was now necessary to induce Mrs. Kephart to lay aside all her fears and horse-back prejudices; and in due time she was mounted on his muleship, and again "the procession" moved forward. On we went, zig-zagging up the face of that awful cliff, till at the end of about two hours from the time we took the trail, we arrived at "the half-way tree;" this is called Union Point. Here we halted a moment for rest. This Point is 2,300 feet above the valley, and affords a fine view of that wonderful rock called Agassiz Column. This is a somewhat cucumber-shaped boulder, and stands out about forty feet from the wall of the cliff to the left of Sentinel Rock. It is a huge granite column, *apparently* thirty feet high and ten feet in diameter; but *actually* seventy feet high and twenty feet in diameter; and is seemingly so poised on the brink of the precipice that a little "yank" with a crowbar would send it thundering down into the valley. However, there it stands as it has stood for ages, in all its silent, majestic, expressive loveliness; and there it is likely to stand in the hereafter until thrown down by an avalanche or earthquake.

Having rested, again we moved forward. Mrs. Kephart now mounted on the mule. Thus for two hours more we continued to climb the tremendous mountain cliff, zig-zagging back and forth as the narrow, steep trail led us on amid the clumps of chaparral that dotted the side of the ledge, the women taking short turns at riding the mule, until finally, at 11.30 A. M., almost completely "done out," we arrived at the Glacier Point Hotel, where we received a cordial welcome and hearty congratulations from our jolly, friendly Irishman. O, how we enjoyed a rest on the veranda, the invigorating draughts of crystal water, and the balmy breezes of pure mountain air, loaded with the aroma of the stately pines that so majestically towered all around.

But we could not sit still very long when so near to where was to be had one of the most grand, enrapturing, awe-inspiring views that it has ever been the privilege of mortal to behold. A walk of ten rods from the hotel brought us to the very verge of the awful cliff! Here iron railings have been securely fastened into the rocks so that tourists may approach to the very verge, lean over and look down! Slowly, cautiously we draw near! we take hold of the iron rails! we lean over!! we look down!!!! Tremendous immensity!!!! There we all stand, hand in hand, side by side, leaning over that railing, looking down, almost perpendicularly. THREE THOUSAND TWO HUNDRED FEET!!!! Reader, think of that height. The Washington monument, the highest human structure in the world, is 555 feet high. Pile five such monuments one on top of the other, and take your stand upon the apex of that eminence, and still, we, standing on the verge of Glacier Point, look down upon you by just 425 feet!

There we stood and gazed, overwhelmed with the awe-inspiring sight, and almost saddened

with the realization of the utter poverty and impotency of language when it attempts to describe *such* scenery, or express the feelings that well in the human breast, amid *such* surroundings! I have looked upon all that wonderful display of human production spread out in the Centennial Exhibition. I have stood 'mid the thunderings of cannon, the racket of musketry, the crash of shells, the ghastly dead, and the groaning dying on the battle-field; I have been an eye-witness of the blowing-up of the fort in front of Petersburg, Va., July 30th, 1866; I have looked upon some of the grandest of natural scenery from the heights of the Alleghanies, but none of these, nor all of them combined, could produce the impression made by this sublime view; and in our hearts we all felt like exclaiming: God be praised, that we live to see this grand sight!

Right beneath us, 3,200 feet below, lay the valley. Across the valley, and from the opposite heights, poured the Yo-semitic Falls. In the face of the opposite ledge we beheld the Royal Arches, and their neighboring falls; a little to the right of us stood South Dorne, and further around to the south-west, like strips of white lace hanging over the ledges, lay the Vernal, the Nevada, and the Illilouette Falls. All these were strikingly visible from our standpoint; but all these latter were as nothing compared with the sublime view into the valley below. There we stood, spell-bound, as we gazed into that "one vast mass of mingling shade, whose brown magnificence a narrow vale unbosomed," and through which we could, here and there, catch glimpses of the sparkling Merced, as it meanders through the valley.

While thus leaning over the railing and gazing into the immense distance below, suddenly the thought occurred to me, "What if the railing should give way?" and, as if startled by an electric shock, I shrank back and exclaimed, "Ugh! Come away." At once all turned and looked at me; and instantly my wife commenced to "poke fun at me," for being frightened, while she (naturally timid and nervous), Mrs. Klinefelter, the professor, and Lizzie continued to gaze into the valley with composure and delight.

Having feasted our eyes on this scene to surfeiting, we returned to the hotel, where we soon sat down to one of the best dinners it was ever our good fortune to enjoy, and with appetites as keen as any that ever stimulated to a thorough relish for food. Mr. McCauley and his good wife did the honors of the table, and vied with each other in their efforts to anticipate our every want, and load our platters with the choicest and most palatable viands.

Dinner over, the professor and I left the women to rest at the hotel, and chat with Mrs. McCauley, while we traveled one and one-fourth miles further to make an additional ascent of 1,000 feet, to the top of Sentinel Dome. In making this ascent, we traveled over immense beds of snow, so solid that we could make but slight indentations with our heels. Having reached the summit of this dome, we found it to be an immense granite rock, rounded off on all sides, and rounding up in the center like an immense cathedral dome that towers above the top of all the surrounding trees.

Here another grand feast of vision spread out before us, different, again, from any before enjoyed. Now we stood almost on a level with the highest peaks—4,150 feet above the valley, and 8,210 feet above the level of the

sea. On all sides we could look down into immense canons, in which towered the lofty pines and firs, and could almost see over the Sierra Nevadas into the valleys that lay east of this mighty range. Looking eastward, right under Nevada Falls, is Snow's Hotel. A little to the left is South Dome, whose snow-capped summit is glittering in the sun. West of Snow's towers Cap of Liberty, 8,100 feet; beyond this and a little to the right looms up in the glittering sunlight, Mount Star King, 5,100 feet; and to the left of this Cloud's Rest rises above them all 6,150 feet. To the northeast of us we see Mount Watkins, North Dome, and Washington Column; and to the south, south-west, and west we see (all apparently within speaking distance) the Three Brothers, El Capitan, the Three Graces, and the Three Sisters. In this transporting presence we stood for a short time, almost overcome with admiration, when the professor broke the silence by exclaiming: "Let us sing, 'Praise God from whom all blessings flow,' " at which we devoutly removed our hats and sung "the long-meter doxology," with mingled feelings of reverence and delight.

Returning to the hotel, we found the women well rested and in the best of spirits; and, going once more over to the iron railing, we took a fond, farewell view of that sublime scenery in the valley below, when, taking our leave of Mr. McCauley and family, at 3 P. M. we commenced to retrace our steps down that awful trail, the women again riding the mule in turns. When we had almost reached the valley, we met Mr. McCauley's son, (a lad who had been to school) and turned the mule over to him to ride home upon. At 6 P. M. we arrived at our wagon, found all things well, and in a reasonably short time were "back to camp" where, having prepared and eaten supper, we sat around our camp-fire, chatting, posting our diaries, and singing, until 9 P. M. when, sufficiently tired to enjoy the luxury of our wagon bed, we "wrapped the drapery of our couch about us and lay down to pleasant dreams."

CHRISTIANS AND SCIENTIFIC THOUGHT.

BY REV. W. H. SLINGERLAND, PH. M.

Nature is to the mass of mankind a book written in an unknown tongue. The casual and unlettered reader finds only now and then a sentence in his own vernacular, and the grandest and best thoughts stored in the volume are unread and meaningless. But before the mind of the careful student "a wide world of glorious meaning" is unfolded as Nature is intelligently read. And yet, strange as it may appear, there seems to be some slight measure of bliss in ignorance of the greater part of Nature's teaching. We meet men every day who, without necessity, plod around some narrow circle of commonplace routine, and never heed the thousand voices of the universe about them. By habit or purpose, or both, their ears are dull, their vision myopic, their brain closed to all but gross impressions. For them there is no sphere of substantial entities except that which appeals directly to the material organs of sense. And very often they rejoice that they are not as other men, or even as these Substantialists, who pretend to find realism on a realm where the senses can perceive none.

Well, it may be best for some not to be "wise above that which is written" in books

musty with age. It may be best to be conservative, even if the progressive thought of the world never inspire our sluggish minds. It is safer, perhaps, to follow the dust-covered beaten track than to face the toil, and danger, of a march nearer the pioneers. But, after all, no man—no thoughtful, clear-eyed, strong-brained man, can be satisfied in the rear, when honor and enemies are all in front.

It is on those lines of thought where neither Nature nor verbal Revelation offers solutions that the human mind, "*in the image of God*," meditates most of all. The reason lies deep in our nature. Not a vulgar curiosity, but a laudable desire for knowledge is its basis. Until this divinely implanted root of action shall be grubbed out of our minds, we will go on searching for the *Alpha* of existence and character in every field open to human investigation. Not long ago a good Christian friend, in a conversation referring to religio-philosophical thought, said:

"I have no desire to read such books, or waste time in the study of such themes. I can get more profit out of my Bible. I devote my reading-time to the study of the good Book." There is one sense in which the good brother is right. The Bible is the best and most profitable reading the world affords. Yet it is possible that wayfaring men, even though *not* fools, may err in some interpretations of even the Word of God. Not that any, of even the commonest kind of people, *need* err in the essentials of salvation as taught in the Bible; but that many incidental things therein mentioned are liable to misconstruction. The Scriptures are not a bare outline of duty, reward and punishment; the volume also includes incidental references to almost every phase of human thought. Or, rather, as it appears to me, human thought, in all its wide investigations, has never gone outside the themes at least alluded to in this ancient volume. "It is written, man shall not live by bread alone, but by every word that proceedeth out of the mouth of God," said the tempted Saviour. Did He not mean that mind as well as body must be nourished, and that *every word of God*, that is *every truth*, is nourishment to inquiring immortals? So I firmly believe. And so far as God gives us ability and opportunity it is duty to glean after the reapers in all God's harvest fields, and gather what we can of the scattered grain of finite knowledge.

By so doing, if no mistake has been made by those at whose feet I sit in willing pupilage, the Bible will prove to us a storehouse of treasures whose rare colors and sparkling light never greet the eyes of unenlightened readers. So it is not in scorn of the Scriptures, not in a spirit of vulgar curiosity, but with a reverent desire to gain new light concerning God and man, and for the better interpretation of God's book, that we use the results of human investigation in solving problems which rise in the mind of every devout student. Religion gives us the strongest of all incentives to thorough culture, inasmuch as it alone enlightens us as to the true worth and exalted destiny of the human soul.

Hence I have little sympathy for the idea of contentment in ignorance. I am like Ingersoll in desiring "the storm and tempest of thought and action rather than the dead calm of ignorance," but unlike him in believing that exalted faith is no hamper to the widest learning and deepest investigation. Over twelve hundred

years ago the Mohammedans captured Alexandria in Egypt. There was the library that for nearly a thousand years had been the glory of the city and of the civilized world. An order was issued by the Caliph Omar for its immediate destruction, in these brief and bigoted words: "If these writings of the Greeks agree with the Koran, they are useless and need not be preserved; if they disagree, they are pernicious and ought to be destroyed." Some of our nineteenth century conservatives show equal appreciation of the treasures of human learning and the products of our ripest thought. Whether these agree or disagree with the moss-covered ideas on which they have built their lives, matters not. They are useless or pernicious. Away with them. The Lord deliver us from an Omarian spirit, and guide us as we humbly reach forth to pluck the no longer forbidden fruit of the tree of knowledge.

The great object of the "Problem of Human Life" and of *THE MICROCOSM*, is to so present truth as it is in nature that we may be led to know more of the Author of Nature, and be better able to do His will. The great questions discussed by Dr. Hall and his contributors are vitally connected with moral and intellectual progress. It is short-sighted unwisdom for Christian teachers to ignore the current and drift of human thought. The most limited observation will show that superficial work no longer satisfies even the masses. The thoughtful of our times, and thinkers, independent thinkers, grow rapidly these days, both in numbers and power—are seeking the heart of Nature both with microscope and telescope; they are tracing the ages of the past, not only in the geologic strata themselves, but also in the fossil remains therein contained; they are studying human history, back beyond written records, in tradition, myth and legendary lore, and in the buried relics of remote antiquity. As never before in the history of the world great questions are held before the gaze of the multitude, and answers asked, not of the few, but of the many, for with the advancement of civilization community of thought has largely increased. Among the questions the following are prominent: Shall the Bible stand? Is the race one or many? Was there a "golden age" of humanity? Is the Eden of Genesis a myth? Did man come from the moneron, or was he formed by special creation? Is the God of the Bible the coinage of inquiring and imaginative mind?

On many, if not all, of these lines of thought the work done by Dr. Hall has been exceedingly valuable. But I believe there is still a wider work to be done in the future. All scientific thought should be both dependent and independent. To strike the golden mean in this regard requires the noblest type of mind. It is wisdom to depend on all related truths in making our way beyond old limits in all scientific investigations. So interrelated are all sciences that discoveries in each one modify all. On the other hand, the thoughtful scientist must not be held by these relations from pushing his researches along special lines, even beyond what kindred sciences may support or warrant. In other words, the scientist must depend on all sciences as a basis, but push advanced investigations for each one separately. The mass of science is the mass of the range; the special researches are the mountain peaks. The mass of science has become common—the world knows it. But only

special explorers reach the high summits. The mass of science has become so well known that the grandest truths are ordinary and unexciting. But when some Moses of natural law comes among men with a new revelation, it meets slow recognition because it is extraordinary and excites interest, and often opposition, because as seen in the light of old interpretations, it seems unnatural.

The President of Boston University says: "For many years the public mind has been schooled in a narrow naturalism which has in its world-view as little room for the extraordinary as it has for the supernatural. Decade after decade, the representatives of this teaching have been measuring the natural phenomena of every age by the petty measuring-rod of their own local and temporary experience. So long and so successfully have they dogmatized on the constancy of Nature's laws, and the uniformity of Nature's forces, that of late it has required no small degree of courage to enable an intelligent man to stand up in the face of his generation and avow his personal faith in the early existence of men of gigantic stature and of almost millenarian longevity. Especially have clergymen and Christian teachers, and writers upon Biblical history been embarrassed by the popular incredulity on these subjects, and not infrequently by a consciousness that this incredulity was in some measure shared by themselves."

The Darwins, the Tyndalls and Spencers are not all dead. Their teachings are in every library. And the only way the generation of thinkers now coming on the stage of action can be held by the bridle of truth, is for Christian teachers and scientists to open the windows of God's storehouse so broadly, and expose its treasures so attractively, that our youth will have no disposition to bolt the beaten track of faith to wander in the marshes of infidelity.

To do this work is the mission of the true scientist. The world is to be brought under the sway of truth; and Nature rightly interpreted will always reinforce Revelation. God and Heaven as substantial verities will become actual to universal human thought only when the truth is scientifically presented. If there has seemed to be less power of late years in Christian doctrine, it has not been because the truth was less valid or dynamic in itself than formerly, but because our methods of presenting religion have not kept pace with the scientific progress of the people. Rightly understood and presented, the word of God will reach the human heart just as easily to-day as in the past. This is a scientific age, and theology, called queen among the sciences, must not only be scientific in form but also in presentation. Right here, Christians who are scientists have a great work to do. The fallacies of infidel scientists are to be exposed, and truth "set in order" for the nations. Christianity has great need of true scientific thought to-day, and no doubt the future will bring forth developments whose bearing on religion can only be determined by a truly scientific mind. No true Christian can then be indifferent to scientific thought. The eternal destiny of millions may be decided by the position of the Church of Christ in regard to the systematic *scientific* classification of revealed and natural truth and the proper presentation of the same to the world.

STATE CENTER, IOWA.

A GREAT REVIEW OF THE "PROBLEM." (Concluded.)

[From the *Scientific Reporter* of Oct., 1878.]

It is not possible here to notice more than this specimen of the author's scathing review of the different experiments relied on by physicists to favor the wave-theory. He does not show the least disposition to skulk the strongest or most plausible facts tending in that direction, but attempts to prove by a logical course of reasoning that all the observed phenomena of sound are not only opposed to the current theory of wave-motion, but are clearly favorable to (or at least not inconsistent with) the corpuscular hypothesis, which he claims to be the true solution of all sound-phenomena.

That the wave-motion of air or any other substance through which sound freely passes, —such as water, wood, glass, or the various metals,—is unnecessary in accounting for sonorous propagation, he conclusively shows in a number of different ways, and particularly from the arguments of all modern scientists, who, to sustain the undulatory theory of light, are forced to assume an actual substance (luminiferous ether) resembling "jelly," as claimed by Professor Tyndall, and constituted of real corpuscles circulating freely among the molecules of the diamond, and whose waves constitute the only possible solution of the phenomena of light. If such a substance can actually permeate and pass through the hardest body known, it can not be unreasonable to suppose that the corpuscles of substantial sound-discharges may also permeate and pass through iron the same as electric fluid and magnetic currents are well known to do, involving none of the demonstrated difficulties and impossibilities of wave-motion.

He does not overlook the objection urged against the corpuscular hypothesis, namely, that it would be impossible for a locust to fill four cubic miles with any kind of sonorous substance, however tenuous, without appreciably reducing its size and weight, or entirely dissipating itself at a single stridulation. This apparent anomaly he shows to present no difficulty whatever, on the universally admitted assumption of the existence of a substantial luminiferous ether, a thousand cubic miles of which would not weigh, probably, the millionth part of a grain, even if such a substance could be shown to exist at all. He even shows that odor, enough to surcharge four cubic miles of atmosphere, will actually emanate from a mass of musk without reducing its weight the smallest appreciable amount, tested by the druggist's scale; yet odor is admitted by the whole world to be a physical substance, constituted of real corpuscles, while sound is claimed to be incorporeal substance not subject to physical conditions so far as weight, inertia, etc., are concerned.

One of the most interesting portions of this treatise is the able analysis of the five senses, and the graduated scale of similarity in their mode of receiving impressions, exhaustively presented at the close of the fifth chapter. He shows by numerous logical and analogical considerations that with odor admitted substantial, and the nasal membrane and olfactory nerve acknowledged to receive their impressions by the direct contact of fragrant corpuscles, independently of the wave-motion of the atmosphere or of any vibratory action of such

olfactory apparatus, there can be no rational or consistent ground for supposing *sound* and *light* to be modes of motion—an abrupt departure from the continuity of Nature's plan—instead of the direct contact of analogous corpuscular emissions. We can only allude to this part of the subject. The beauty of the argument, based on the analogy of the five senses and their consistent graduation from the lowest to the highest on the plane of corpuscular contact, can only be appreciated after being carefully read.

A noticeable feature of the work is the critical exposition of the effects of wind on sound, and the original suggestions of the author in regard to the probable stratification of the air itself as the cause of all the hitherto inexplicable phenomena recorded by officers in charge of our signal service stations. He rejects Professor Tyndall's hypothesis of banks of invisible aqueous vapor as the cause of echoes, often heard returning from a mass of clear atmosphere, or as causing the stoppage of sound at a quarter of its normal range; thus showing that while the controversy was going on between Professor Tyndall and the friends of the late Professor Henry in regard to priority of discovery on that question, this author was quietly experimenting to wipe out the whole ground of dispute by showing that they were both practically contending about a shadow. No clearer argument can be imagined than he advances, while on this question of the effect of air-currents on sound, to show that atmospheric wave-motion is wholly insufficient to account for the range of sound, which can be heard, as is well known, a dozen miles against an intense gale.

Nothing, he contends, but the discharge by the sounding body of pulses of some kind of incorporeal substance, analogous to electric fluid, passing through the atmosphere by an unknown law of conduction, can afford any kind of a satisfactory solution of sonorous phenomena like these. The originality and clearness of this analysis of an important problem, which is now puzzling the greatest scientists of the world, can hardly fail to attract attention to this treatise, filled as it is with just such original and startling suggestions.

The recent invention of the telephone, phonograph, microphone, etc., which some have supposed to favor the wave-theory, is examined in a critical note at the close of the volume, in which the author shows that, so far from supporting the old theory of sound, the observed phenomena of telephonic communication point directly to the corpuscular hypothesis; and, what is more, he sustains this view by no less authorities than the eminent Scotch physicist, Dr. Ferguson, and the celebrated inventor of the phonograph, Mr. Edison, though neither of them had the remotest idea, when they penned their statements and admissions, that they would ever be made logically to bear such a construction.

Finally, at the close of the treatise he presents what may be called his masterpiece of argumentation against the wave-theory of sound—an argument based on the nature of wave-motion as illustrated by the observed action and effects of water-waves—thus furnishing, as he claims, demonstrative evidence that sound does not and cannot travel on the principle of wave-motion at all. The observations and measurements adduced as proof are so simple and unmistakable that the general

conclusion deduced from them against the possibility of any kind of wave-motion as a part of sound-propagation cannot be otherwise than logical and convincing.

He first of all shows by many quotations from the authorities he is reviewing that the theory of atmospheric sound-waves is based entirely on their supposed similarity to the observed movements of water-waves, in which those eminent physicists repeatedly use such language as the following: that sound-waves and water-waves are "essentially identical," "precisely similar," and are propagated "exactly in the same way;" after which he proceeds to show that there is no similarity at all in the two classes of phenomena, but, on the contrary, that in every essential feature of their movements, they are diametrically opposed to each other. We will only refer here to a couple of differences pointed out which are so novel and original as to at once attract the attention of the scientific reader, and constitute such direct proofs that sound-pulses cannot be constituted of wave-motion, as to leave no remaining doubt on the subject.

By reference to the record of experimental facts, as observed in the movement of water-waves, he shows that any true system of waves, whether constituted of water or any other fluid substance, must invariably and necessarily involve a relationship of about 1 to 10 in feet and inches between the amplitude of the oscillating wave-particles and the running wave-length, or the distance from crest to crest as the system proceeds. This he shows to be an unavoidable law in all true wave-motion, giving the scientific reasons therefor; whereas in the case of sound, passing through *iron*, for example, where the theoretic wave-length of a certain pitch of tone (low E of the double bass) is 476 feet, in order to make it harmonize with the theory, the amplitude of the wave-motion in the mass of iron is confessedly nothing at all, since the most powerful microscope fails to reveal the slightest oscillation to and fro of the particles constituting such supposed iron sound-waves.

He here holds up to merited ridicule the enormous absurdity of a system of iron sound-waves "essentially identical" with water-waves, and traveling "exactly in the same way," having a *bona fide* wave-length of 476 feet from crest to crest, or "from condensation to condensation," if physicists prefer it, yet with no amplitude at all, or, if any, not even the thousandth part of a hair's breadth! Yet such a system of so-called waves, as he shows, is actually taught by modern physicists as an essential part of an accepted theory of science, never before called in question by any physical investigator.

If this amount of undulation is all there is in the passage of such a system of waves—ininitely less in depth of sinus than the diameter of a hair to an actual wave-length of 476 feet—the author pertinently asks how much sound lacks of passing through iron or through any other substance in a *straight line*—the very way it ought to pass, according to the corpuscular hypothesis? Thus, the much talked-of waves of sound are shown by the author to be practically minus all amplitude—the scientific play of Hamlet with the Prince of Denmark left out.

Then, to clinch the proof that no similarity whatever can exist between sound-propagation and wave-motion, he shows by many carefully

recorded observations and measurements that the *velocity* of every system of water-waves of whatever dimensions is found to be in precise proportion to wave-length or distance from one wave to another, the velocity in all cases increasing exactly in proportion as the size and length of the waves increase; and clearly proves that *ocean billows actually travel from five to ten times swifter than do systems of waves produced by throwing pebbles into a still pond*. These facts admit of no dispute; whereas sound, as every one knows, travels with the same uniform velocity whether high or low in pitch—whether its so-called wave-lengths are *four inches*, as in the high notes of the piano, or *forty-one feet*, in air, as with the lowest note of the same instrument—whether the sound be loud or soft, requiring a large or small theoretic amplitude of the wave-particles—thus demonstrating beyond all doubt that the very nature of wave-motion contravenes the current theory of sonorous propagation, a stubborn class of facts which no writer on sound has ever taken the trouble to notice.

We will only offer a single comment on the argument here imperfectly epitomized. Either Professors Tyndall, Helmholtz, and Mayer were aware of these fundamental facts in regard to the necessary relation of amplitude to wave-length and the relative velocity of waves of different lengths, or they were not. To suppose that they possessed no such knowledge is difficult if not impossible to believe, especially in the foremost physicists and sound-experts of the age. But assuming that they did possess it, and thus knew that there was no kind of resemblance or approximation in similarity between water-waves and so-called sound-waves, either in their form, velocity, or mode of propagation, then how are we to account for their language, as quoted by the author, "essentially identical," "precisely similar," and propagated "exactly in the same way"?

It must seem evident, therefore, even to the superficial reader, puzzled as he may be to accept it, that such language as this in regard to the nature and manner of propagation of the two classes of phenomena, could only have been employed by writers who were entirely unaware of the elementary facts in regard to water-waves, as developed in the argument condensed above; and hence we may fairly expect that when these essential facts of wave-motion shall come to their knowledge and be duly weighed, the wave-theory of sound, as based on the similarity of sound-waves and water-waves, will be publicly abandoned.

In concluding our remarks on this important monograph, we desire, in simple justice to its author, to say that if the "Evolution of Sound" has really and successfully overthrown the wave-theory—as we make no question the judgment of the scientific world will ultimately be forced to acknowledge—it will prove a greater achievement in original physical research, all things considered, than has ever been accomplished since the recorded dawn of scientific investigation. We say this cautiously, but, at the same time, advisedly.

No universally accepted theory of science has ever been revolutionized at a single blow, or by the unaided efforts of an individual investigator. The nearest approach to it was probably the work of Copernicus, in his departure from the Ptolemaic system of astronomy. But there is a vast difference in the classes of circumstances surrounding these two workers in

science. In the case of Copernicus, the way had been prepared for his achievement by many suggestions from different philosophers, from the days of Pythagoras down to his own time, some even boldly outlining the possible hypothesis that the earth revolves both on its axis and around the sun; while Ptolemy himself admitted the earth to be globular, instead of flat, as he is popularly supposed to have taught. Copernicus had only to take advantage of these suggestions and observations, and extend them by dint of his great mathematical knowledge, and thus formulate them, as he did, into a regular theoretical system.

But the case with the author of this attack upon the wave-theory is entirely different. He was compelled not only to undertake his task of revolutionizing the established theory of sound, with the entire scientific world opposed to him, but to do so without a single recorded suggestion in all history pointing in that direction. The superficial or apparent evidence of wave-motion accompanying tone as the basis of the accepted theory of sonorous propagation, must be admitted in all respects equal, if not superior, to the apparent movements of the heavenly bodies, which formed the basis of the Ptolemaic system of astronomy. These atmospheric wave-movements accompanying sound, and apparently constituting it, have proved sufficiently influential to bind the intellects of the greatest investigators of all nations, and for hundreds of years, to this theory of wave-motion, without permitting even one of them to suggest the possibility that such motions might be only *apparently* the cause of sound.

It required, therefore, no ordinary intellectual genius, under such circumstances, to cut loose from this universal teaching of science, and, without chart or compass, except those of his own intuition, to strike into the open sea of physical research, overcoming every obstacle and solving every problem, till he had at last overthrown the old theory of sonorous propagation, and established a new hypothesis upon its ruins. If he has really done this, which it seems impossible to question, while the great analytical investigators of physical science, from Pythagoras to the present time, have taken exactly the opposite ground, the author of the "Evolution of Sound" will unquestionably stand alone in the history of scientific research as an original thinker and discoverer, and without a peer for the revolutionary results of his unassisted labors.

That the world of physical investigators will readily or at once admit the revolutionary character of this author's work, or surrender without an intense, possibly a bitter, scientific struggle, is scarcely to be expected, even if his positions are well taken, and if his reasoning shall in the end prove to be unassailable. It was more than a hundred years after the death of Copernicus before the present system of astronomy, which bears his name, had gained sufficient hold upon the minds even of the educated classes to rank as an established or accepted scientific theory. But it must be remembered that the Copernican hypothesis of the double revolution of the earth had the intense prejudices of the time to contend against, which exerted a shackling and blinding effect upon all classes of the people—even upon the most educated scientists of that day; while the prison-bars, as was experienced by poor Galileo, stared every man in the face who dared

to teach, except as a provisional hypothesis, that the apparent diurnal movement of the sun was not real.

No such influences—thanks to the advanced state of scientific cultivation, universal religious tolerance, and the reign of civil law—now exist or can be brought to bear to prevent the immediate acceptance of the new hypothesis of sound in lieu of the old one, provided the arguments employed to substantiate it shall be found to bear the scrutiny of impartial and enlightened scientific investigation. This surely ought not to take long to determine, considering the refinements now brought to bear in all matters pertaining to modern scientific research.

That this revolutionary onslaught upon one of the best-established and most completely formularized theories of the time has inaugurated a genuine scientific sensation which bears on its face the probability, at least, of having accomplished its purpose, no one can doubt for a moment after reading the work carefully through. The opinions of physicists as to the real weight of the arguments employed by the author will, no doubt, be watched with intense interest by every scientific reader.

E. L. T.

SUBSTANCE.*

BY HENRY A. MOTT, PH. D., F. C. S.

As a result of scientific investigation, matter has been shown to be indestructible, its quantity to be unalterable, and from these facts, deduced by experiment, we are convinced of the objective reality of matter, science having nothing to do with the coming into existence of matter, but simply with the coming into existence of the forms of matter. We cannot destroy nor can we produce even the smallest portion of matter. "Reason," says Tait, "requires us to be consistent in our logic, and thus if we find anything else in the physical world whose quantity we cannot alter, we are bound to admit it to have objective reality as truly as matter has, however strongly our senses may predispose us against the concession."

"Heat, therefore, as well as light, sound, electric currents, etc., though not forms of matter, must be looked upon as being as real as matter, simply because they have been found to be forms of energy, which in all its constant mutations satisfies the test which we adopt as conclusive of the reality of matter."

"Heat," says Tait, "whatever it may be, is something which can be transferred from one portion of matter to another . . ." Again, "It has been definitely established by modern science that *heat, though not material, has objective existence in as complete a sense as matter has . . .*"

This is the view of pure Substantialism, which considers the forces of nature as objective existences, substantial but immaterial in their nature.

It is assumed that there is one primordial substance, which permeates all space as well as all material substance, and that this is the force-element of nature, emanating from and being sustained by the Infinite.

It is an immaterial, intangible, and incorporeal substance, and out of which, in the begin-

ning, all material substance was produced by the great intelligence who formulated the laws of nature. It will be the object of this paper to sustain this view, as not only probable, but so probable that the probability amounts almost to a certainty.

An *immaterial substance* must necessarily be such an entity as does not possess the recognized properties of weight, inertia, physical tangibility, etc., and which can operate and exist in defiance of purely material conditions.

We are to understand, then, that while all matter is substance, it does not necessarily follow that all substance is matter. For, by the word substance, we are to understand it to include both immaterial and material substances.

It may be somewhat difficult at first for some to believe in the existence of an *immaterial substance*, but any such difficulty vanishes when we examine the subject of Odor, Magnetism, or Gravitation, and the great mystery of the forces of nature is at once explained in such a manner as appeals directly to our reason and common sense.

The difficulty already referred to, experienced by some people, of conceiving of anything as a substantial entity or objective thing of which the mind can form a positive concept, that is not *matter* in some form or degree of attenuation or refinement arises, says Dr. Hall, wholly from their habit of definition and thinking. They have been accustomed to employ the word substance as synonymous with matter, and hence their difficulty of conceiving of a substantial entity that is not a material entity.

All substance, then, will be considered under two divisions: 1st, material or corporeal substances; 2nd, immaterial or incorporeal substances.

MATERIAL SUBSTANCES will include those of which we may take cognizance by our physical senses, and by the appliances of philosophy, chemistry and other sciences, and will appear in the solid, liquid, fluid, semi-fluid, aeriform, gaseous and other more or less attenuated forms.

IMMATERIAL SUBSTANCES will include three classes: (a) *Intelligent entities or forces*, as mind, spirit, etc. (b) *Vital forces*, including both animal and vegetable life. (c) *Physical forces* without mind or life, as gravity, magnetism, electricity, heat, light, sound, etc.

To better understand the nature of Immaterial Substances, let us examine for a minute the subject of odor, which is the most highly attenuated form of Material Substance, as this may throw some light on such substances.

It is well known the quantity of a substance we are able to recognize by the organs of smell is extraordinarily small. The merest trace, in a gaseous form, of a drop of oil of rose is all that is necessary to produce in our nostrils the impression of a pleasant odor.†

The smallest particle of musk is sufficient to impart its characteristic smell to our clothes for years, the strongest current of air being insufficient to drive it away; and Valentin has calculated that we are able to perceive about the three one hundred millionth of a grain of musk. The delicacy of our sense of smell thus far surpasses that of the other senses. The minute particles of a substance which we perceive by smell, would be quite imperceptible to our

* See Prof. G. R. Hand.—*Microcosm*, Feb., 1885, p. 142.

† See Bernstein.—*Five Senses of Man*, p. 289.

* By permission, free use has been made of various articles on this subject by Dr. Hall.

taste, and if they were in a solid form we should never be able to feel them, nor to see them, even if illuminated by the strongest sunlight. No chemical reaction can detect such minute particles of substance as those which we perceive by our sense of smell, and even spectrum analysis, which can recognize fifteen millionths of a grain, is far surpassed in delicacy by our organ of smell. The sense of smell in man is truly finite in comparison to that in animals. Therefore, to show the marvelous tenuity of odor, and to show that all efforts of the imagination are set at defiance in trying to conceive of the minuteness of the material particles of an odor, we have only to consider for one moment the sense of smell in the hound.

This animal will follow the direction of a fox over hill and dale, through forest and jungle, hours after it passed, and even when it has reached a score of miles ahead.* Yet the hound does not depend on touching the tracks of the fox with his nose, or even of following its exact path; in fact, he will frequently vary rods from the true path, yet, keeping on in the general direction, will pursue his game with unerring certainty, but if momentarily mistaking the back track, the difference, probably, in the intensity of the surcharged air, warns him of his error and leads him to reverse his course. Though the wind may blow across the trail, carrying off for hours the odorous clouds which have risen from the instantaneous impress of the feet upon the earth, filling thus perhaps vast areas along the trail with those magical particles of perfume, yet sufficient odor remains, extending for rods on both sides of the trail, to enable the hound to pursue his distant game with infallible precision. The acuteness of the sense of smell of the animal itself, according to Bernstein, far surpasses that of the hound, for the animal is able, when the wind is favorable, "to scent the huntsman at a distance of several miles. The number therefore of those volatile substances which are perceived by animals at such great distance must be inconceivable. Their minuteness defies estimation."

Tyndall speaks of them as infinitesimal particles, and states in the sense of smell, the senses are stirred by them.† Here, truly, we have a highly attenuated form of material substance, so attenuated that the skill of man is defied to condense it into a pellet. This condition of a material substance is probably on the border-line between the material and the immaterial. Surely the gradation so manifest in material substances all around us, ought to suggest to a reflecting mind a continuance of this graduated scale into immaterial and intangible substances; for surely the difference between the heaviest of all metals, iridium, through the lightest, lithium, up to hydrogen gas or odor, in point of attenuation need not be surpassed in rising above odor, for example, to reach an immaterial condition and yet find substance as real and *entitative* as a block of iron or lead.

Let us examine the action of magnetism in forcibly drawing a piece of iron from a distance or through sheets of glass, as also through water. We know intuitively and positively that the magnetic something called *force* which could do this, however invisible or otherwise intangible to our physical senses, must be *sub-*

stantial, and being *substance*, it must be immaterial substance, since by passing through sheets of glass the same as if nothing intervened, it manifestly acts in defiance of all material conditions, though it emanates from a material body. It is utterly inconceivable, to any man who will give free exercise to his reasoning powers, that a piece of inert iron should start from a state of rest and move toward a magnet in opposition to gravity, unless something absolutely substantial passes between the two bodies to produce this result. If nothing entitative connects the two bodies, then manifestly it is a substantial and physical effect with *nothing for its cause*, and if a physically impervious material substance, like a sheet of glass, may intervene between the two bodies without interfering with such movement in the slightest degree, as is well known to be the fact, then positively such magnetic force cannot be a material substance, but must be an immaterial or incorporeal entity.

It is the active force of the substantial magnetism radiating from the magnetic poles which seizes by sympathy the latent magnetic force residing in the iron of a similar quality with the magnet, thus drawing the two bodies together by cords of sympathetic force.

The earth, in a like manner, only draws a stone downward by the substantial cords of gravital force from the earth, interlocking sympathetically with the same substantial force centering in small quantities also in the pebble.

In a letter to Dr. Bently, Sir Isaac Newton caught a glimpse of this new world of incorporeal entities as he contemplated the law of gravitation. He says:

"That gravity should be innate, inherent and essential to matter, so that one body can act on another at a distance through a vacuum, without the mediation of anything else by and through which their action and force may be conveyed from one to the other, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it." Newton however, illogically, fought against substance beyond the range of the senses, and denied its existence because it could not be demonstrated. Numerous scientific (?) men on the same grounds have denied the existence of an immaterial substance, yet they find no difficulty in conceiving of the existence of a highly elastic medium called the Luminiferous Ether,* which is supposed to fill all space and surround the supposed atoms of all material substance—it is compared to an impalpable and all-pervading jelly, through which light and heat-waves are constantly throbbing. Electrical attraction and repulsion are supposed to be due to local stresses in such a medium. Current electricity is claimed to be due to a throb, or series of throbs, in such a medium when released from stress, and magnetic phenomena are attributed to local whirlpools set up in such a medium. By theoretical calculation Clerk Maxwell infers that the density of the Ether is 986-1,000,000,000,000,000,000,000 that of water, or equal to our atmosphere at about 210 miles, a density vastly greater than that of the same atmosphere in the interstellar spaces, and that its rigidity is about 1-1,000,000,000 that of steel, hence it is easily displaceable by a moving mass.

When ether was suggested to Newton to account for the phenomena of Light, he rejected

* See Daniel's Phys., p. 208.

* See Evolution of Sound, p. 185.—Hall.

† See Tyndall on Light, p. 57.

it, and still held to the corpuscular theory, making the sun's rays a material substance. If he had suggested the existence of an immaterial substance pervading all space, and capable of passing through and occupying all material substances, there would have been no use for the solid jelly-like ether.

The first objection* to the corpuscular theory was in reference to the velocity of the corpuscles, and the consequence which must result from the impinging effect of such particles on the eye, for if such particles weighed but the one hundred and fiftieth part of a grain they would have eight times the momentum—battering power—and five million times the penetrating power of a rifle bullet; and as many million of them might be entering the eye at once, it seemed impossible to reconcile the supposed facts with the excessive delicacy of the organ of vision.

It was also established that streams of light are not continuous, but in unequal "pulses." These phenomena were supposed to be inconsistent with the emission theory, and to suggest waves which required a medium, hence the invention of the solid luminiferous ether. Surely if the oscillations of this solid medium be in the direction of progressive motion, like the supposed sound-waves, the impact against the eye ought to be more severe than the direct impingement of the radiating corpuscles invented by Newton.

Had Newton thought of the simple fact that Light is generated in pulses or waves by the incandescent tremor of luminous bodies, he need not have been driven from his ground; for surely a wave of substantial light itself will just as readily explain refraction as a wave of this supposed ether! What was the use of inventing an all-pervading substance out of which to construct wave-motion, when light, viewed as an immaterial substance emitted in pulses or waves (as it really is), accomplishes the same results? For immaterial or incorporeal substances do not possess the distinctive properties of gross matter at all, are not subjected to its laws, since many of them can not only move themselves and other bodies, but can occupy not only the same place at one instant of time, but can occupy the densest of material bodies—iridium, glass, water, etc.,—without the displacement of their particles in the slightest degree.

Because that mysterious something, called gravitation, which pulls a weight toward the earth, can neither be seen, heard, felt, tasted, or smelt, is no proof that gravity is not an immaterial substance as really and truly as water, iron, or platinum are material substances. Only the substantial particles or attenuated threads of gravity are of such a nature that we cannot recognize them except through our higher faculties of reason by what they accomplish. We must therefore judge of the substantial or entitative nature of anything of which the mind can form a concept, not by its recognizable or unrecognizable qualities through the direct evidences of our finite senses, but by its demonstrable effects upon other and known substances under the exercise of our rational faculties in judging, analyzing, comparing, etc.

As the world advances, it is beginning to realize, and very rapidly, that as certainly as no effect can be produced without an adequate cause, so long held by philosophers of all schools, just so certain is it that no material or

corporeal body, whether it be an armature, a suspended weight, or an animal organ, can move or stir without the actual contact of a real substance, either corporeal or incorporeal. This incontrovertible proposition leads to another postulate equally self-evident, namely, that we are in the midst of two worlds of substantial entities, totally separated and distinct from each other in nature; yet separately interblended in many respects; namely—a world of physical or corporeal entities such as come under the recognition of sensuous, chemical and mechanical tests; and an incorporeal world of substance such as can only be recognized by the aid of the higher faculties of man, and can only be demonstrated to exist by the philosophical and metaphysical tests of logic and reason. Yet the existence of the latter world of entities is commencing to be recognized with the same certainty as is the former world of physical and sensuous objects and facts.

This inevitable recognition of these two grand divisions of the universe of entitative existence leads to another almost equally important classification, namely, that as the physical world of substance consists of a graduated scale of entities from the denser to the rarer, from the grosser to the more refined, such as the metals, minerals, earthy substances, wood, water, flesh, air, vapor, the gases, odor, etc., so the immaterial world of entities presents a corresponding graduation of substantial existence, rising from the grosser to the more subtle spheres of nature, beginning the ascent at odor, where the physical left off, and proceeding with electricity, magnetism, gravitation, heat, light, sound, life instinct, mind, soul, spirit, up to God himself, as the fountain of all life and mentality, and the ultimate source whence came the entire material and immaterial universe.

The fact that any tangible, material body recognized by us can be converted into its original invisible gaseous element, even by our own puny efforts, through the agency of heat or other chemical and mechanical action, furnishes strong evidence that gross matter of whatever grade, is but a concentration of invisible, imponderable, and even incorporeal substances, by a power in Nature above and unknown to man. It is even beginning to be conceded by the ablest thinkers and investigators that the sixty or more elemental substances heretofore supposed to constitute the natural material bodies surrounding us, are reducible to some one primordial substance, from which, and out of which, the great central intelligent creative force has manufactured all classes of material bodies and substances by a simple process of concentrating or synthesizing that one element in different directions. It has been conceived by some scientists favoring the molecular theory of matter,* that the chemical element may be formed of the same primordial matter distributed into molecules, which vibrate or rotate in different specific periods, and that these differences of movement may correspond with the observed differences in external qualities.

This idea presupposes the existence of molecules, which cannot be shown to exist, and in the case of compounds the supposed molecules would have to move in a manner different from the molecule of their constituents. If the first view be true, then it might be rationally inferred that the alchemistic notion of the Rosicru-

* Microcosm, vol. II., p. 173.—S. Wood.

* See Chem. Phil.—Tilden, 1876.

cians and advanced theosophists, that gold and iron are the same in their basic element, is not a dreamy fancy to be flouted and despised as the vision of a disordered brain. If gold and iron can originally have come from the same primordial element by a synthetic process carried on in nature's laboratory in two different directions, we only need the analytical facilities and appliances, first to reduce iron back to the basic element, and then the synthetic facilities and appliances to condense it along the golden line of material construction, in order to change a ton of iron into a ton of gold or a ton of coal into a ton of diamonds. That man will ever be placed in possession of such analytical and synthetical facilities to accomplish this result is unquestionably very doubtful. This fact, however, should not influence our belief in the correctness of the solution, provided the same appeals to our reason as a more probable solution to the problem than any other.

As a result of the investigation just presented then, we find that the word substance is the generic term, and embraces not only all the material objects or entities in the universe, but vastly more than those, namely, all immaterial entities or things, whether such entities be on the one hand vital, mental, or spiritual, or whether they be the physical, unintelligent, force-elements of nature which influence our sensuous observation or otherwise manifest themselves in material and physical phenomena so as to come within the range of our reasoning powers.

Dr. Hall then in defining the Substantial Philosophy states it "as that system of doctrine which recognizes every force or form of energy in nature, whether physical, vital or mental, by which any effect or phenomenon is produced within the reach of our sensuous or rational observation, as a *substantial entity* or *real objective thing*, not as now universally taught, as but the mere motion of material molecules, which motion not being entitative, necessarily ceases to exist as the moving molecules come to rest."

THE SUBSTANTIAL PHILOSOPHY, PAST, PRESENT, AND FUTURE.

BY ROBERT ROGERS.

About eight years ago the "Problem of Human Life," by A. Wilford Hall, Ph. D., was sent out on its mission, and which has proved to be, by all odds, the grandest mission in its aim and results ever undertaken since the inauguration of the Christian religion. The chief object of this book was to put forth new and radical doctrines of physical science, and thereby to found a system of physical, psychical, and religious philosophy around which men of all shades of belief might rally and co-operate for advancing and enlightening the world.

These ideas in physical science were so novel and startling as to attract general attention wherever the book was introduced, and so thoroughly did the author's arguments and discoveries impress the thinking masses, that one person would tell another about the wonderful book he had read, and thus the influence would spread, and has spread, till now more than fifty-three thousand copies of that book have been sold.

From intimate familiarity with these sales and with the correspondence relating thereto,

I am certain that no book ever published has created such unbounded enthusiasm in the minds of its readers, or won a place so near the hearts of its purchasers, as this. Hundreds and thousands of letters from Christian men and women, which I have read, and which have passed through my hands as corresponding assistant of the author for several years, place the "Problem of Human Life" in their libraries, only second to the Bible; and many of these jubilant readers have declared that they would not part with it for one hundred dollars, if another copy could not be obtained. What is more, as regards the effect of this book, the enthusiasm of its readers does not die out by a single perusal, but, as I happen to know personally, many of these admirers have read certain chapters over and over, each time with renewed and ever-increased interest, while one professor, and, by the way, one of the ablest contributors to THE MICROCOSM, assured me that he had read the book consecutively five times through, since he purchased it about four years ago. Plainly, a book that can thus be read, studied, and appreciated, must, in the nature of things, possess unusual interest.

Its radical teachings on physical science are, however, only a part of its revolutionary work. Its physiological, anatomical, and especially its psychological discussions and investigations, in handling the various facts and arguments of Darwinism, and in meeting the difficult positions and deductions of atheistic materialism, are among its grandest achievements.

But all these portions of the book are confirmed by the demonstrated positions taken in physics. The bold ground assumed, that all the forces of nature are substantial and objective entities, was the key that unlocked the door to Substantialism. Even *sound*, the most unlikely of all the so-called modes of motion—as all the physical forces had heretofore been regarded—the author dared to place among these objective entities as a real substantial emanation from the force-element of nature, generated through suitable vibratory action. No adequate description can be given here of the innumerable analogies and other arguments drawn from light, heat, magnetism, electricity, gravity, cohesion, odor, etc., by which this substantial position was maintained, and the opposite view of wave-motion was assailed and overturned. The greatest living authorities on acoustics were sifted and their writings shown to be totally self-contradictory in their attempts to explain and elaborate the old theory. The aim of this entire warfare on the sound question was plain and simple. It was to show that if sound was a substantiality, all the other forces must, in the nature of things, be also substantial; and hence that the life-force and mind-force, which actuate and move our bodies, must also be real substance, and out of which be deduced the dual organism of every living creature by which to explain all physiological and psychological phenomena. All these arguments and positions were intended to lay the foundation for the Substantial Philosophy, now so rapidly spreading and taking such a firm hold upon the minds of thinking men, and to which so much space is given in this magazine.

This new philosophy, therefore, really had its rise in the pages of the "Problem," though its elaboration and the details of its superstruct-

ure were reserved for these pages. The four volumes of this magazine, now completed, form the epitome of this vast system, though the future volumes will constantly add to its evidences, analogies, and finishing touches for many years to come, as we trust and believe, under the able direction of Dr. Henry A. Mott, the future managing editor, even if its original founder should unfortunately be called hence. Should he die now, however, there would not be the slightest possibility of the Substantial Philosophy lapsing into the forgetfulness of mankind, however important his continued blows may be to its rapid onward progress. Substantialism is already so thoroughly imbedded in the very mental constitutions of its more than 25,000 adherents that no fatality happening to its founder can now stop its onward march. Live it must, and spread it will, till, like the little stone that was cut out of the mountain without hands, it shall fill the whole earth. There is already too much young scientific blood infused into its arteries and veins to allow it either to die or become weak.

Even though the older elements among our scientific professors and investigators may discard and oppose the new departures involved in Substantialism, which is only what might have been expected, since it was ever thus, it matters little, so far as the general result is concerned, as their places are constantly being vacated to be filled by young aspirants, whose ambition will be for new paths of research unchained to old theories, and with a single eye for the truth as it is in nature. Soon the old prejudiced opposition will have entirely disappeared from the stage, when the great revolution now starting will realize the mighty expectations of its friends—when college after college, and university after university will fall in line in such rapid succession that it will be as difficult to keep their record as it now is for astronomers to keep an accurate list of the newly-discovered asteroids. It is safe to believe that in one or, at most, two generations from now, no college or university in the civilized world will consent to be so far behind the age as not to have incorporated in its curriculum the leading principles of the Substantial Philosophy as now unfolded in these volumes.

As a basis for hope and a glowing anticipation of the future on the part of every friend of Substantialism, it is surely encouraging to know, as I happen to do by actual correspondence, that there are already firm and active converts to this new philosophy in nearly every section of the inhabited globe—South America, Australia, China, Japan, India, South Africa, New Zealand and nearly all parts of Europe! No such showing was ever made by a new and radical departure in science, philosophy or religion within the same period of time since the world began; and, as Dr. Swander said in one of his recent masterly papers, neither Christianity nor Mohammedianism had made anything near the number of converts, that the Substantial Philosophy has made, within a corresponding period of time.

The reason for this marvelous success at the very start of the revolutionary work is that the principles of Substantialism seize upon man's inbred and unquenchable longing for immortality, and his innate tendency to skepticism upon all supernatural or occult questions. Tens of thousands of thinking men accept the Christian religion on faith, but interspersed at

the same time with doubts and fears, owing to the great lapse of time since the alleged facts occurred, and also to the inexplicable mysteries and difficulties of a supernatural character involved in it. These honest souls yearn intensely for some additional basis of intelligent belief that will form a connecting link between the simple faith of religion and the absolute knowledge of scientific facts and experiments. This connecting link the Substantial Philosophy furnishes to every intelligent man and woman who will study its teachings. It demonstrates in a hundred ways that the immaterial is the real of existence, and that the invisible, incorporeal entities everywhere surrounding us in nature are as demonstrably substantial and objective existences as are the material bodies which our eyes can see or our hands handle. If there is any doubt as to this fact let us look at the force of cohesion, which the old theory places in its category of molecular-motions, but which Substantialism places among immaterial but real substances. Were the force of cohesion for an instant withdrawn by the Creator, as Dr. Hall so ably urges in his editorial in the May MICROCOSM, all material bodies would crumble into impalpable powder and then pass off into the various gases. This illustration distinctly shows that the gross forms of matter are in reality made up from a combination of the immaterial forces, and that their sensuous existence would be an impossibility were it not that the incorporeal, but real and substantial, forces of nature were in readiness to lend their aid.

The Substantial Philosophy also demonstrates that within us is a real substantial organism, an exact counterpart of our physical structure, but as truly a veritable, objective entity as are the muscles, blood, and bones of the physical man. This view has been assumed by others before Substantialism was thought of, but it remained for the Substantial Philosophy to seize upon this beautiful confirmatory *fancy* of religion and make it a philosophical *fact* by absolute scientific demonstration. This the new philosophy does in so many ways, added to the innumerable other and corresponding phases of its teachings, that no Christian man, however he may have heretofore doubted the supernatural, need have any further misgiving after becoming an intelligent convert to the Substantial Philosophy. While the thoughtful scientific man is thus confirmed in the faith of religion in a broad sense by his knowledge of Substantialism, he sees by the further investigation of its principles that if it be not true as a system of scientific belief, there can be no hereafter for man, no God to adore, and no soul that can be made immortal. The conflict of this age is the uncompromising war between religion and materialism. Religion alone, as now universally believed in and taught (and I speak of religion in the sense of *theology*, as held and taught by all churches), can never meet and overturn materialism, because the science of the schools instilled into the minds of all the clergy is essentially and ineradicably materialistic in its tendency. How can a minister, as Dr. Hall has so frequently urged in these pages, meet a materialist and demolish his arguments, believing, as he himself is taught to do, that all the forces of Nature are but the mere molecular motions of material bodies, and that such a thing as an *immaterial* substance is a chimera?

What proof can he ever show to the skeptic that life-force, mind-force and spirit-force may not also be the molecular vibrations of brain and nerve particles, which motions necessarily cease to exist when the body dies and when those molecules cease to move?

Plainly, nothing but the Substantial Philosophy (which shows by infallible scientific proofs that all force is substantial, even including sound-force, the least likely of all) can ever meet these difficulties, crush out materialism, and confirm the Christian believer in an intelligent hope of a future life.

That is the chief mission of this glorious philosophy, and we may rest assured that it is irresistibly destined to accomplish the work whereunto it has been sent. To this end the substantial appeal has gone forth inviting all thinking men, but especially ministers of the gospel, to look into the claims of this fundamental and revolutionizing doctrine, that their Zion, now languishing for that vital energy needed to lengthen her lines, strengthen her stakes, and extend her borders, may be rejuvenated with the infusion of the blood of the Substantial Philosophy.

NEW YORK.

THE BIBLE ESSENTIAL TO SCIENCE.

BY REV. J. J. SMITH, A. M., D. D.

Although the Bible was not written in the interest of Science, and is in no sense a scientific work in the realm of physical phenomena, yet, nevertheless, it holds an essential place in all true philosophy. It is the only book that satisfactorily and authoritatively solves the great problem of the Universe; and thus forms the only true basis, the only intelligent foundation upon which Science can build a solid and enduring temple. This it does, by leading us back to the First Great Cause of all things, the Creator of our globe and all of its vegetable and animal forms of life. In this sublime account of the beginning of all things by the fiat of the Almighty, there are no low, puerile, improbable, and contradictory statements, hypotheses, and conjectures, such as meet us at almost every step in the godless theory of evolution. But, on the other hand, the Mosaic story of creation fully accords with reason, by furnishing an adequate cause for all things, a cause which readily harmonizes with our intuitive conceptions of a Creator. The very first chapter opens up before us a long vista in the hoary past, reaching away back to a period where the torch of Science has never shone and where it never can. Take away the Bible, and not only that period, which is so essential to be understood by scientists, would necessarily remain unknown, but all nature would be involved in impenetrable mystery; a darkness so dense that no keen-eyed physicist could pierce it would rest upon all natural phenomena throughout the universe. This is distinctly acknowledged by some of the more candid of the evolution fraternity.

"If you ask me," says Tyndall, "whether science has solved the problem of the universe, I must shake my head in doubt." Again he says: "Behind, and above, and around all [scientific knowledge], the *real mystery of this universe lies unsolved*, and, as far as we are concerned, *is incapable of solution*." ("Fragments of Science," pp. 92, 93.)

Herbert Spencer, when speaking of the impenetrable mystery connected with the origin of the universe as seen by the light of evolution, or rather when confounded by its darkness, says:—

"Be it a fragment of matter, or some fancied potential form of matter, or some remote and still less imaginable cause, our conception of its self-existence can be formed only by joining with it the notion of unlimited duration through past time. And as unlimited duration is inconceivable, all those formal ideas into which it enters are inconceivable, and, indeed, if such an expression is allowable, are the more inconceivable in proportion as the other elements of the ideas are indefinite. So that, in fact, *impossible as it is to think of the actual universe as self-existing, we do but multiply impossibilities of thought, by every attempt we make to explain existence*." ("First Prin. of Phil.," p. 36.)

Here it is most distinctly affirmed that evolutionists, having rejected the Word of God, are most profoundly ignorant of the origin of the universe and of those forces that are everywhere seen in nature. What encouragement has any one to go to them for counsel or knowledge respecting the greatest physical problem that can possibly engage the mind of man, when they themselves tell us that they know nothing about it, that the very best they can do is to form unreliable and unsatisfactory conjectures? Such is evolutionism.

Now let us turn away from all this darkness, mystery, and nonsense, to the Bible. How great the contrast! How grandly Moses, in accounting for the origin of all things, under divine illumination, launches out beyond the domain of science—beyond the stars, sweeping up to the very heavens; recognizing and enthroning God as the creator of the universe, and thus filling the archæan period (so blank and barren to evolutionists) with thrilling wonders.

Even Rousseau, the French infidel, in one of his serious and candid moods, said: "The majesty of the Scriptures strikes me with astonishment. Look at the volumes of all the philosophers, with all their pomp; how contemptible do they appear in comparison with this! Is it possible that a book at once so simple and sublime can be the work of man?"

Besides clearing up the mystery of the universe by enthroning God as the Creator of all things, look at its marvelous adaptation to man's intellectual, social and moral nature. What superior maxims and rules for private, domestic and public life are found in the Proverbs of Solomon, and the teachings of Christ and His apostles! What perfect gems of moral instruction are found in the parables of the good Samaritan, the returning prodigal, the widow and the unjust judge, the lost sheep, etc. What poetic strains of enraptured thought, what sincerity, what fervency and devotion, are exhibited throughout the Psalms of David! For simplicity, beauty, purity and power, the Bible stands peerless and alone.

The accomplished scholar and jurist, Sir William Jones, declared that "the Scriptures contain, independently of their divine original, more true sublimity, more exquisite beauty, more important history, pure morality, and finer strains both of poetry and eloquence, than could be collected within the same compass from all other books that were ever composed in any age or in any idiom."

Through its hallowed influences, what iron

chains of sin have been broken! What bonds of friendship formed! What vast renovations in society have been achieved! It has lifted up savages to civilization, and laid foundations for free governments. Who can tell how many sorrowing hearts it has soothed? How many burdened souls it has released? How many asylums it has reared for the relief of suffering humanity? How many millions of hearts has it quickened into tenderness and sympathetic responses? What untold numbers of benevolent impulses it has sent thrilling through all the social ranks of society?

Can it be that evolutionists can bring themselves to surrender this book which alone solves the great problem of the universe, and lays the foundation of all philosophy, and in its place accept darkness, and mystery, and guesses, and the most absurd speculations? This they have deliberately and most madly done. But what is stranger than this, if possible, they are compassing sea and land to make us proselytes to their stupid and absurd vagaries. They boldly insult our intelligence by laboring to have us give up this blessed Book which contains the biographies of the most illustrious personages that have ever lived; which contains the most marvelous prophecies, the most astounding miracles, the most wonderful revelations, the sublimest songs, the most heartfelt prayers, the purest precepts, the most perfect models of virtue, the most unrivaled beauty of composition, the best maxims of wisdom, the most consistent examples of piety, instances of the strongest faith, the broadest benevolence, the warmest love, the purest emotions, the grandest heroism, the most elevated piety, and the most divine and perfect theology that are to be found anywhere this side of heaven.

PATERSON, N. J.

SUBSTANTIALISM AND THE CHRISTIAN MINISTER.

BY REV. F. HAMLIN.

Entering the cemetery a few days ago to perform the last service over the remains of a young man who died saying "Safe in the arms of Jesus," I was audibly repeating those beautiful words, "I am the resurrection and the life," etc., when I was profoundly impressed with this sentence: "*He that liveth and believeth in me shall never die.*" A new light shone upon them, and under its rays "the Substantial Philosophy," as taught by that original thinker, Wilford Hall, appeared to me more reasonable and vital than ever before. Two or three thoughts will suggest the trend of my meditations.

1. This passage surely teaches that the body is not the man.

To say that there is no physical death to the believer in Jesus Christ is contrary to observation and needs no proof, and consequently if to the believer there is no death, then the body is not the man who believes. That the reference here is not to the death of the body appears if we consider that the phrase in John ii. 28, translated never is everywhere else in Scripture thus rendered, and in no place "not forever," which latter term might have referred to the body of a man. This phrase occurs in John iv. 14; viii. 51-52; x. 28; xiii. 8; 1st Cor. viii. 13; and in each place is equivalent

to never, like the Hebrew *עליו לא* (Psalms lv. 22: Prov. x. 80), with an emphasis on the negative, *surely not, in no wise, by no means* (see Winer, p. 407, on the form of the double negative in Greek). Hence we see that while in the words, "I am the Resurrection," etc., the Christ threw light and hope upon the fact of physical death; in the phrase, "He that believeth in me shall never die," he was teaching that the real Man is immortal; and, therefore, the body is not the man. To deny the truthfulness of this teaching is to practically reject the Bible and plunge into infidelity, on the plea that the Bible is not the word of God. Now,

2. This doctrine of the immateriality of the real man is fundamental in the Christian System.

The deservedly famous Dr. Thomas Young says: "Nor is there anything in the unprejudiced study of physical philosophy that can induce us to doubt the existence of immaterial substances. We see forms of matter, differing in subtilty and mobility, bearing the names of solids, liquids and gases; above these are the semi-material existences which produce the phenomena of electricity and magnetism, and either caloric or a universal ether. Higher still are the causes of gravitation, etc. *And of these different orders of beings the more refined and immaterial appear to pervade the grosser; and we have no reason to suppose that even the presence of matter in a given spot necessarily excludes these existences from it.*" etc. It would almost appear that the human soul (the real man that "shall never die") was the subject of his thought when he wrote the words above quoted. And how significant are the words of Clerk Maxwell in his reply to the Bishop of Gloucester: "There is an unseen ether, and out of this worlds and atoms must have come," if we place them beside that bold statement of Joseph Cooke, "This invisible universe may be eternal and infinite." Now, when in addition to the foregoing we consider that the philology of the Old Testament, according to Gesenius, Fierst and Terry, teaches that creation itself was but a bringing forth, and forming from that which already existed as an invisible, yet real entity, we insist that the existence of the Substantial, and doctrine of Soul Immateriality, are not purely matters of Revelation through the Word, but also of Revelation through Nature as well. Nor are we surprised to hear the recently ascended Dr. Whedon say a short time before he died, "Resurrection is the reunion of a conscious soul to a body *by it vitalized*," which implies the entitative, potential existence of the Unseen and Substantial. Now we must not for a moment forget that the triumph of materialism means a corresponding defeat of Christianity, for if there be no immaterial existence, there is then no *soul* to save, and no *Jesus* to save it; and if we eliminate these two words from the vocabulary, Christianity is a myth.

3. This being true, how shortsighted and foolish is the Christian minister who, controlled by prejudice on the one hand, or by feeling on the other, withholds his influence and his support from any man who seeks to confirm the teachings of God's word by appealing to the teachings of God's world. It is a fact that many men engaged to-day in preaching the Gospel, not only refuse to subject old theories to that thorough and impartial examination which the interests of truth demand, but are

ready to condemn, without even giving them a fair hearing. honest investigators, who are as really inspired of God by the Holy Spirit, to throw light upon the relation of the seen to the unseen, as were the prophets to write concerning the coming Messiah. I verily believe that the ministers of these United States have it in their power within the next year to deal materialism a blow from which it would never recover, by rallying to the support of the Substantial Philosophy, and to the aid of its founder, Wilford Hall. Surely it is significant that just at this time, when the thought of the nation is drifting and shifting, now toward theistic truth, and now toward atheistic error, there should appear upon the scenes a hitherto unknown David, who, single-handed, challenges the Goliath of materialism to combat, but waits in vain for his appearance upon the field. Oh, that the ministers of the Lord Jesus would awake from their slumber, and improve this golden opportunity! It does appear to me that, led part way by this Moses, Israel's priests might ere long stand on the other side of the sea in charge of another Joshua, and while the hosts of infidelity were sinking beneath the waves, they might shout, "Sing unto the Lord, for He hath triumphed gloriously, the horse and his rider hath He cast into the sea."

Next to the Word of God, no book is so much needed by the cultured, intelligent young men of America to-day as "The Problem of Human Life, Here and Hereafter." And it is the duty of the clergy to know its contents themselves, and then in every conceivable way seek to place it in the hands of the multitude. Let this be done, and we will ere long find no Beechers spending their last days in unconsciously poisoning the minds of men, and disseminating teachings which, when the teachers are dead, will, under the dawning of new light, be a cause of mortification to their friends. Brethren in the ministry, let us hold up the arms of this man upon whom God has put the fearful yet glorious responsibility of "*letting his light shine.*"

PEEKSKILL, N. Y.

IS DRUG MEDICATION A SCIENCE; AND HAS IT BEEN A BLESSING OR A CURSE TO HUMANITY?—No. 3.

BY MRS. M. S. ORGAN, M. D.

Having in our last article shown, by the avowed testimony of the highest medical authorities, that drug-medication is not a science, we will now proceed to substantiate their testimony by facts based upon the recognized principles and demonstrated laws of nature.

The fundamental dogma or principle upon which the whole fabric of drug-medication is built, is, that drugs—dead, inert, inorganic matter—act upon the living system; that by inherent affinities for certain structures and organs of the body, they act upon or make impressions on them. Take away this basic principle, and the whole superstructure would be demolished beyond all hope of resurrection. And yet, strange as it may appear, this dogma, born amid the superstitions of the dark ages, in ignorance of physiological and chemical law, has for more than 2000 years been accepted theoretically and practically by the whole med-

ical profession; its falsity never having been discovered, or its claim to be a law of nature questioned or investigated. Had the falsity of this premise been discovered, the civilized portion of the human race would to-day possess a much stronger vital force, and consequently a much higher intellectual and moral development; for just in proportion to an individual's or nation's physical normalcy, will be their mental and moral attainment.

The plain, positive teaching of nature is in direct and unconditional antithesis to this basic premise of drug-medication. *Medicines, which are drugs—poisons, dead, inorganic matter—do not act upon the living system in any way, in any sense or condition whatever. Under all circumstances, and in every condition, it is the living system which acts upon the drugs, and this action is always one of antagonism, and therefore an exhaustive, injurious, and very often fatal action.* Search the wide universe of Nature in every department of vegetable and animal life, and you will find that it is the determinate, undeviating law, that, in the relation between living, vitalized matter and dead or inorganic matter, it is always the living matter which is active, and dead matter that is passive. It is only through the *innate*, transcending power of vital force that organic forms result—the power to completely counteract, overcome, and suspend inorganic affinities and destroy inorganic aggregations and arrangements; to so act upon dead matter as to bring it into organic arrangement and establish organic constitution; and it is through this inherent power of vitality that the supremacy is constantly maintained over inorganic matter. Living structures alone possess the *inherent* power to act; all drugs, and all inorganic matter are passive, their only property being inertia, the constitutional capacity to remain forever quiescent until disturbed by some moving force. The only action that pertains to non-vitalized matter is a mechanical or chemical one; and it is solely upon the theory of chemical action that medicines are administered for the cure of disease. Let us investigate this theory from a true philosophical basis. What is chemical action? It is simply the accretion and separation of the atoms of dead matter. When two inorganic substances which have an affinity for each other come in contact they combine, and from this combination—this action—a new substance results; a substance essentially different from either the original substances. This is all that there is, or possibly can be, of chemical action. Do any such action and result occur when drugs are taken into the living system? If ipecac has an affinity for the stomach, and acts upon it, then most assuredly it must combine with it. If alcohol has an affinity for the brain and acts upon it, it must combine with it and form alcoholate of encephalon. If calomel has an affinity for the liver, and acts upon it, it must combine with its constituent elements, and the result would necessarily be an individual without a liver; for evidently, such action would terminate in the destruction, complete and entire, of the structure. Chemistry is limited entirely to the inorganic world; it takes cognizance of the combination and decomposition of dead matter. There is no chemical action in the constructing, recuperating, or developing process of vitality; it is only when vitality surrenders its control, that

inorganic or chemical affinities can come into action. We have text-books and learned essays upon organic chemistry, but this is only a misnomer for physiology—for the action of vitality in transmuting proximate and primordial elements of matter into living forms—a thing radically different from chemical action.

Through invisible, immaterial forces which pertain to the inorganic world, dead matter acts on dead matter; and this is chemistry. Living matter acts on dead matter, and this is vitality. Living matter transforms usable things—food, air, water—into its own substance; this is the nutritive process—physiology. Living matter acts upon medicines, drugs, poison, contagions, miasms, infections, etc., to resist and expel them through the channels of the body best adapted for the purpose under the circumstance; and this process is pathology, disease, the *vis medicatrix naturæ*.

Emetics do not act upon the stomach. When an emetic is introduced into the stomach, the vital instinct—the director and controller of all the organic functions—at once recognizes it as a non-usable substance, a poison, an enemy, and directly dispatches the diaphragm and contiguous muscles for help, and through the concentrated effort of these forces the offender is expelled. For a medicine to act as an emetic, it must necessarily stay upon the stomach; but then if it should stay upon the stomach, would it be an emetic?

Cathartics do not act upon the bowels; but the *vis medicatrix naturæ*, ever faithful to the interests of the body, pours out serum to protect the delicate lining of the intestinal canal from the irritant, and then banishes it through this deterring organ.

Diaphoretics do not act on the skin, but are simply sent off in that direction for expulsion.

Cholagogues do not act on the liver, but are sent to that emunctory, as the most efficacious outlet for getting rid of the irritating and obstructing material.

And thus we might go on through the whole *materia medica*, which is arranged and classified on the basis of the different effects of different medicines: these effects being all attributed to the action of drugs upon the living system—to the impression which each particular drug makes upon the different parts, organs, and structures of the body, through special elective or selective affinities.

This theory of an affinity existing between drugs, or any inorganic substance, and the living system, is false in every sense—directly contrary to the teachings of Nature.

The relation between living matter and dead matter is constitutionally one of antagonism. Vitality overpowers and destroys inorganic affinities, transforms even the ultimate elements of dead matter, forces them into organic structure, and subjects them to entirely different affinities and laws.

Upon the death of organic forms—when vitality relinquishes its claim, inorganic affinities at once assert their authority; disintegration—decay—immediately supervenes; chemical forces come into play, and matter returns as by a more deeply impressed instinct to its more primitive and inorganic form.

Thus, throughout the boundless realm of Nature, in all her subdivisions, we find that in the relation of living and dead matter, it is ever the living matter which is the active principle, and dead or inorganic matter which is passive; under no condition whatever is there

an exception to this law. It is the fiat written by the finger of Creative Power.

If medicines possess any *inherent* power to act upon the human system—and they *cannot act* unless they *do*—why will they not act upon it and produce the same effects when vitality has become extinct, as when vitality reigns? Why will not ipecac produce emesis when introduced into the stomach of a dead person? Introduce into the stomach of a dead person the largest quantity of medicine allowable by the pharmacopœia as an emetic, and there will not be the most infinitesimal action. Why not? Why should not emesis result if ipecac or any other emetic acts upon the stomach? The mucous membrane, the muscular, cellular and serous coats, the absorbents, nerves, and blood-vessels are all there intact, and just as susceptible to the action of drugs as when vitality animated them. The only reason is because no medicine *does* act upon the stomach, and there being no vital force resident in the body, there is nothing to resist and expel it—nothing to produce action and effect. Dead matter cannot act, it can only be done unto. And the true philosophy of emesis is, the vital intelligence recognizes the emetic as too formidable an enemy to be taken up by the absorbents and carried into the circulation, and therefore, with all possible dispatch, ejects it from the stomach; for the vital force—the *vis medicatrix naturæ*—expels all drugs—extraneous, poisonous, and non-usable matter—in the most accessible way that it can accomplish it with the least wear and tear to the system.

This is the true philosophy—the scientific rationale of the *modus operandi* of all medicines. Drugs occasion the action, but the action itself is all on the part of the living system. If an individual should swallow a few shot or a few pebbles, would there not be a decided action induced; would there not be violent straining, cramping, retching, vomiting? Here is cause, action and effect; and it would be just as rational, just as scientific, and just as true, to assert that it was the shot or pebbles which acted upon the stomach and produced these effects, as to assert that drugs acted upon the stomach or upon any part of the system and produced effects.

Alcohol is classified as stimulant, nerveine, narcotic and caustic, according to the quantity administered, the condition of patient, etc. It is, perhaps, used more frequently than any other drug, and is mingled with more than one hundred and fifty official preparations of the pharmacopœia. Let us administer a dose of this medicine to an individual of moderate constitutional vigor. In a few moments there is an intensified action of the whole system; the pulse is accelerated, respiration quickened, the skin flushed, and the whole nervous system in a state of abnormal excitation.

Is all this disturbance produced by the action of alcohol on the system, as the whole medical profession claim? Not by any means. Alcohol is an inorganic substance—dead matter—and therefore by the testimony of the most indisputable authority—the *laws of nature*—it *cannot act*. It is true that alcohol is the cause of the action, but a thing which occasions an action, and the action itself are radically different things.

When alcohol is taken into the living system the organic instinct immediately describes the presence of a foe, and instantly marshals all the forces of the body into line, and defensive

war at once commences. The absorbents take it up and pass it into the circulation, and through this medium it is sent to the lungs, skin, kidneys—to every eliminating organ of the body to be ejected in the shortest possible time. And this abnormal action, this organic war, this waste of vitality in the expulsion of the alcohol, is recognized by the medical profession as a vitalizing, energizing, and strengthening process, due to the inherent action and virtues of alcohol. In this, as in the relation of all drugs to the living system, they have subverted the order of Nature—placed the action on the wrong side.

It is an all-important consideration—a *vital issue*, what *kind* of an action is induced in the living system. The action of the system in transforming food and water into its own substance, is a normally *constructive* and therefore *strengthening* and *developing* action. The action of the system in expelling drug-poisons, non-usable substances, etc., is an abnormal, pathological, and therefore *destructive* action.

Let us try another experiment with alcohol. Let us place a drop of it on the eye of a living individual; in a few moments there will be pain, heat, redness, swelling, inflammation; and inflammation is action. Of what? Of alcohol? No; but of the blood-vessels. Alcohol is the *cause* of the action, and the action is the determination of blood to the eye; directed there by the vital intelligence to protect the structures from the irritant—alcohol. Try this same experiment on the eye of a dead person, and not the least inflammation will occur. Why? Because there is no vitality to act upon it—to resist and expel it.

What potent power, what intrinsic force does alcohol—does any drug possess that it should act upon the living system, any more than upon the vessels in the apothecary shop? Does change of place change the nature of drugs? To settle this question in regard to the action of drugs, you have only to test their power to act upon the body of a dead person.

The medical profession have, in the treatment of disease, ignored the law of vitality; they have committed the unparalleled scientific blunder of regarding dead, inert, inorganic matter active, and living, vitalized, organic matter passive in their relation to each other—mistaking the action of the living system in its efforts for protection, for that of drugs; and on this false premise, their whole healing art is predicated. Their fundamental premise being wrong, all the theories growing out of it must be wrong, and the practical application of them must necessarily be injurious and fatal.

NEWBURGH, N. Y.

SPECIMEN PRESS NOTICES.

Dozens of kindly notices, similar to the following, could be copied had we room for them:—

(From the *Christian News*, Glasgow, Scotland.)

"We have been asked repeatedly who is the author of a volume referred to in our columns recently, called 'The Problem of Human Life Here and Hereafter,' and where it may be had. The volume is indeed a remarkable one, to be read with thought. It will repay such. The author is A. Wilford Hall, Ph. D., New York, who is evidently well up in science and theology, and is an exceedingly able controversialist. He has written this massive volume

of 524 pages with double columns, and is the editor of a monthly magazine called WILFORD'S MICROCOSM. He is an advocate of what is called the Substantial Philosophy, and his views are far-reaching, suggestive, and of the utmost importance at the present hour."

(From *Southern Ky. Republican*, Somerset.)

"We commend WILFORD'S MICROCOSM to the attention of all thinking men. It occupies advanced ground on all religio-scientific topics that are embraced in its discussions, and furnishes abundant food-thought for the religionist and the scientist. The ablest theologians of the country are among its contributors, and every line that the journal contains from month to month is worthy of critical examination. It is pre-eminently the publication for ministers, and they can learn much of the occult things connected with their profession when viewed through its interpreting pages. Published by Hall & Co., 28 Park Row, N. Y."

(From the *Jetmore [Kansas] Advance*.)

"Dr. Wilford Hall, the great Christian philosopher of New York, has associated with himself the learned Dr. Henry A. Mott, and together they will pursue a course of scientific investigation. The Substantial Philosophy of which Dr. Hall is the founder is, in our mind, the philosophy of the future. We never did believe the theory of Evolution, Spontaneous Generation, or the Wave-theory of Sound. We have read the 'Problem of Human Life' a number of times, and have found nothing in our course of reading that will compare with it as a profound, logical, and conclusive book."

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As this number completes the volume, those who wish to take advantage of our present low prices of books, and extraordinary offers of premiums, should act at once if they are intending to do so. The "Problem of Human Life," which is now sent prepaid by express or mail for \$2, and the present volume of THE MICROCOSM, including all back numbers, sent free as premium, will not be thus sent after the new volume commences. The next volume cannot be given as a premium with our books, nor can subscriptions for it be taken toward our great Encyclopedia offer, which see elsewhere. Our books will be sent in quantities at wholesale for cash with the orders, or C. O. D. at the present unparalleled low prices. Circulars will be sent to those wishing such information.

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28 Park Row, New York.

ERRATA: In Mrs. Organ's article on Drug Medication, last month, page 340, for "Dr. Heule," read *Henle*. For "Bidiat's," read *Bichat's*. For "Dr. Bastrols," read *Bostock*.

We take occasion here to remind our contributors that in writing proper names, such as those of persons, places, etc., they should be written as plain as if printed, for the obvious reason that nine times out of ten there is nothing in the context, as in the words of an ordinary sentence, to aid the compositor in determining the true orthography.

WILFORD'S MICROCOSM.

23 Park Row, New York, September, 1885.

A. WILFORD HALL, Ph.D., LL. D., Editor.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least, as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

"A METALLIC OR MINERAL GOD?"

The Rev. Dr. Stone, our able contributor, of Omaha, Nebraska, is still in mental trouble, about one phase of the Substantial Philosophy, which denies the creation of the universe out of nothing, but prefers the old supposition that "all things are of Him," were "made of things that do not appear," and that these "things eternal" are the "invisible things of God." To put the doctor's difficulties in all their force before replying to them, here is his letter *verbatim*:—

OMAHA, July 14th, 1885.

"A. WILFORD HALL, PH. D.

"DEAR SIR,—I am sincerely seeking light. I see many things in the theory of Substantialism that are in its favor, but yet I cannot see (as is claimed by its advocates) that it is fatal to materialism. If all this material universe is a *condensation of the "exterior substance of the Deity,"* that substance is matter, or by some means it is changed into matter, that I cannot explain. Gold, platinum, mercury, lead, copper, iron, and rock, are all matter. When, and how did they become matter, if the exterior substance of God is not matter? And if God is the only self-existent, eternal entity in the universe, everything must be condensed from his substance, according to this theory.

"If there is any way of escape from this difficulty. I am sure you can point it out if any one can, and until I can see my way out of it I shall be forced logically to believe in CREATION OUT OF NOTHING, for certainly matter in succession must have had an origin. I am very reluctant to trouble you, but I must dissent from the doctrine of Substantialism, or have more light on this point. I dare not worship a *metallic or mineral God*, and I cannot see how I can suppose him to be anything else with this theory. 'Who by searching can find out God?'

"Yours truly,

"MARSENA STONE."

The difficulties of Dr. Stone are more imaginary than real, as he will see when they come to be analyzed; and when he shall allow his mind to come right down to the real problems he has raised he will find that the same difficulties precisely, only vastly more glaring, confront him in the supposed creation of *metals and minerals* out of nothing that confront the Substantialist in supposing them to have been synthesized from the immaterial substance of God's exterior nature. Besides, as we shall try to show, the Substantialist has the advantage of him in subscribing to a conceivable idea—the creation of one thing out of another, however difficult the task may be to finite comprehension—as against the self-evident impossibility on its face of creating *metallic and mineral* bodies out of absolute *nothingness*. Let us face the difficulty fairly and squarely as Dr. Stone has presented it. We want no dodging of issues and will have none in THE MICROCOSM.

We admit first of all, and believe as firmly as does the doctor, that no man by searching can find out God, or in other words, that God is infinite in his essence, attributes, and perfections, and that we cannot and must not try to measure his ability to work or perform acts of creation by our own puny and finite capabilities. But still the fact of our having been made in his image, capable of reaching rational conclusions,

does seem to vest us with the inherent right to determine mentally the simple matter of impossibility in such a self-evident question as the supposed making of something out of nothing. Not to have this right of forming a rational conclusion, even as relates to the attributes of an infinite God, would be for us to be obliged inherently to admit it possible with God *to exist* and *not to exist* at the same time, or to admit it possible for him to create out of nothing another God equal or superior to himself, and then himself to cease to exist; for surely if he has the power to create anything out of nothing he must have the power to return anything that exists back into nothing, even *himself*, since he must not be limited according to Dr. Stone.

If we call a halt here and conclude that it would be absolutely impossible for God *to exist* and *not to exist* at the same time, or for him to annihilate himself, or to create another Deity equal to himself, then we at once open the floodgate of mentality to fix a limit even to the action of the Deity, finite as are our own powers, and infinite as are his; and by the same gauge of our own inherent rationality, Substantialists think (and think they have a right to think) that it is impossible, in the nature of things, for something to be made out of nothing, even by an infinite God.

But leaving this preliminary experiment of reasoning, let us come right to the real difficulties and objections presented by Dr. Stone, as they seem to bear against the Substantial Philosophy. But before attempting to explain them we would say that this matter of creation, either out of nothing or out of God's substance, has nothing to do with the fatal bearing of the Substantial Philosophy against materialism. If he wants to investigate that phase of Substantialism, let him read carefully the leading editorial in last month's MICROCOSM, in which that question is definitely treated.

The doctor's first and chief objection is, that if material bodies were condensed, created, or synthesized out of a portion of God's exterior substance, then the substance of Deity must have been *matter*, or material substance, and God must therefore, according to Substantialism, be constituted of metals, minerals, etc., and hence the doctor thinks that he would be obliged to worship "a metallic or mineral God," should he become a Substantialist, which he very properly does not want to do! Let us see. Dr. Stone believes that all metallic and mineral bodies were "created out of nothing," *without that nothing having been constituted of matter previous to such act of creation!* This being so, might it not be possible for God to create metallic and mineral bodies out of a portion of his own actual substance without that substance having been *matter* previous to such act of creation? Thus, by simply shaking it, the edge and point fall off the doctor's main difficulty.

But this is not all. Dr. Stone and others of like faith have urged against us, that if we hammer a piece of rock to break it, we necessarily hammer the Deity, according to Substantialism, because the rock was originally formed of his substance. Does the doctor believe that in hammering a piece of rock to break it he is necessarily hammering and breaking a piece of *nothing*, because the rock was originally created out of *nothing*? Does he believe that all material bodies of necessity remain immaterial *nothing* because they were originally

created out of immaterial *nothing*? Manifestly Dr. Stone does not claim that metallic and mineral bodies necessarily continue to be that out of which they were created; for they surely do not continue to be *nothing*, because they were originally, according to his faith, made out of *nothing*! If he were to weld two pieces of iron he would not believe he was really welding two pieces of *nothing*, because the iron was created out of *nothing*. Neither does a Substantialist believe that by crushing a piece of mineral he is crushing a piece of the Deity, because mineral bodies originally came from his immaterial exterior substance, as did all other material existences. Clearly, if all material bodies could be created out of immaterial *nothing* without such *nothing* being *matter*, or without its having a previous material existence, we see no good reason why all material bodies could not have been created out of the immaterial substance of Deity himself without that substance being *matter*, or having a previous material existence. The cases are precisely parallel in point of logic, as well as common sense, with the decided advantage in favor of the Substantialist, inasmuch as it is vastly more rational to suppose that God could create material bodies out of an immaterial *substance*, of which the universe was full, than out of immaterial *nothing* with *nothing of the kind in existence out of which to create them!* According to all human conceptions, if not according to all divine conceptions, it would be an easier task even for an infinite God to do a *conceivable* than an *inconceivable* thing—and surely it would be a more difficult task to change immaterial *nothing* into solid *matter* than to accomplish the same result with immaterial *something*, because in the latter case the creative process would have less distance to go to reach the change! Do you see, doctor?

In reply to these stunning counter-difficulties, the doctor would naturally say that the moment the metallic and mineral bodies under God's creative power were produced, they necessarily would cease to be any part of the immaterial *nothing* out of which they were made. That certainly would be sound reasoning, provided that *matter* was really made out of *nothing*, as he teaches. In like manner reasons the Substantialist: the moment a material body or substance was synthesized or created out of God's immaterial, substantial essence, it ceased to be immaterial substance, and at the same time it just as truly ceased to be a part of God as does Dr. Stone's material substance, as soon as it is created, cease to be a part of *nothing*.

Pantheists, not enjoying the light of the Substantial Philosophy, regard material bodies as actually now constituting a portion of God's being, because they must have emanated from him in the first place, and hence, in worshipping material nature, they believe they are worshipping God. Dr. Stone agrees with the Pantheist, at least so far that if metallic and mineral bodies came originally from the exterior and immaterial substance of the Deity, then God must really now be constituted partly of metals and minerals, and consequently that in worshipping such a Deity we would be worshipping "a metallic or mineral God!" We trust, however, that the cautious and considerate doctor now sees that if it is clearly possible for God to create metals and minerals out of immaterial *nothing*, as his faith teaches, it ought to be more than possible for him to create the same material

bodies out of an immaterial *something*; and that if such creation of metals and minerals out of *nothing* does not necessarily imply their remaining any part of *nothing* after creation, then their creation out of God's immaterial substance does not necessarily imply their remaining any part of such substance or any part of God after having been created.

Hence, the doctor may at once dismiss his fears about being required to worship "a metallic or mineral God," should he be initiated into the Church of Substantialism. We have no such a "Hardshell" confession of faith as that. We will guarantee to stand between him and all harm as against such pantheistic idolatry. We will teach him, after he shall make the good confession before many witnesses by acknowledging our position frankly in *THE MICROCOSM*, that God was the primordial, self-existent and only entity in the universe prior to the commencement of creation, and without anything else, or any "*nothing*" else, except his own substantial being, out of which to form the universe of animate and inanimate—material and immaterial—entities that were to fill it.

When the doctor shall come to understand the Substantial Philosophy better, he will learn that it does not tolerate or allow of a belief in any competitor of the Deity from eternity—not even *nothing*—out of which material substances could possibly be made, as does the creed to which he now subscribes. Surely if *nothing* is sufficiently real to be changed by any possibility into matter, and if this *nothing* from eternity constituted no part of God's self-existent being, then the "*nothing*" advocates must believe in a serious and *bona fide* self-existing competitor of the Deity from eternity. There is no escape from this. But we will try to teach the doctor, as soon as he shall accept the new philosophy, that no possible competitor or existence, or even non-existence, out of which anything could be created, can be tolerated as an article of faith in the creed of Substantialism. We will teach him that this infinite, omnipotent, omniscient and omnipresent Deity, who was without a competitive or rival existence of any kind or character, could no more create such a rival, or tolerate its competitive existence, to usurp his authority or divide his glory, than he could create something out of nothing. And hence, as our venerable brother will learn when he shall come to sit under the droppings of the substantial sanctuary, the doctrine of the eternity of matter, or the eternity of anything except God is a purely materialistic and pantheistic fallacy, which is rationally explained away alone by the theory of the creation of matter out of God's exterior but immaterial being, which the Substantial Philosophy was the first to enunciate, elaborate and make harmonious.

We do not need to account for the origin of substance, therefore, any more than to account for the origin of God. Something substantial had to exist from eternity without an origin, and, consequently, something that was self-existent, since it is just as inconceivable that substance could originate itself as that something could be originated out of nothing. To deny that God was a self-existent substance would be to make him nothing, and thus absolutely to deny his existence; but as the doctor believes that God from all eternity was substance, or substantial, he has only to believe that the being or essence of God embraced,

prior to the creation of matter, all the substance there was in the universe, and of whatever grade, without matter having yet come into existence, and as soon as he grasps this consistent proposition, he will have taken the initial lesson in this important department of Substantialism.

In the next stage of this new dispensation of the Substantial Philosophy Dr. Stone will have to learn that from all eternity the body, so to speak—the exterior substance—of the Deity was constituted of the substantial but immaterial force-elements of nature, out of which all the present manifestations or forms of force emanate, and that these less refined substantial portions of God's immaterial essence were employed in the work of creation, and out of which he synthesized the material elements, such as oxygen, hydrogen, nitrogen, carbon, etc., and from which, by processes of inscrutable chemistry, known at present only to God, were condensed along different lines of concentration, the very "gold, platinum, mercury, lead, copper, iron, rock," etc., which the doctor mistakenly supposed still to constitute a portion of God's being, according to Substantialism.

When Dr. Stone shall have also learned this lesson from the Substantial catechism of the new philosophy, he will be invited to come up higher, where he will take the next beautiful degree in the Free Masonry of Heaven's substantial arcana, namely, that after these grosser creations of the material universe had taken place, the synthesizing process was carried to the vital and mental powers of the vegetable and animal kingdoms, and which received their entitative forces from out the lower vital and mental grade of elements constituting God's being; and that finally when the intellectual, moral, and spiritual faculties and powers of men and angels had to be provided for, they were synthesized by a less radical change and by a more direct process from the higher elements of God's mental and spiritual nature, being breathed into their nostrils by the Deity himself, as their own mental and spiritual breath of life.

We have thus, in all candor and sincerity, endeavored to give Dr. Stone the light which he says he is seeking, and thereby to lead him, step by step, through the gates into the city. We have endeavored clearly to show him that on the same principles of reason and logic by which "metallic and mineral" bodies could be created out of *nothing*, without that *nothing* having been previously constituted of *matter*, just precisely so could metal and mineral bodies have been created out of God's substantial essence without that essence having previously, or at the time of creation, been a material substance. And while Substantialism thus consistently shows that material bodies are no more now necessarily a part of God's immaterial being than they are now necessarily a part of immaterial "*nothing*," according to Dr. Stone's view, it parts company forever with the "*nothing*"-theory of creation, by believing it more rational, consistent, and easy, even for infinite power and wisdom to create matter out of *something* than out of *nothing*, especially when there was no necessity for using "*nothing*" as a manufacturing material, universal space being filled with God's substantial being.

We cannot, therefore, believe that Substantialism is dangerously heretical to the most orthodox mind, for including the doctrine that

certain physical and inconceivable things are impossible with God in the very nature of things, particularly when the Scriptures teach the moral impossibility for God to lie, a thing that is entirely conceivable as a physical act.

Thus does the new philosophy aim to adopt the more rational view of any and every problem which comes under its investigation, while it calls upon such intellectual giants and accomplished scholars as the Rev. Prof. M. Stone, D.D., to abandon their improbable views of science, philosophy, and religion, and enlist at once in the interests of a dispensation of advancing thought which we most conscientiously believe, with some of the best minds in this country, is destined sooner or later to regenerate the world, and at the same time to form a substantial basis for Christian union and practical Christian co-operation.

NEWTON'S GREAT FORMULA—THE RELATION OF DENSITY TO ELASTICITY.

(Concluded from last month, page 845.)

Thus does every turn of the scientific vise tend more and more to squeeze the breath of life out of this basic principle of the wave-theory, since the most sanguine advocate of undulatory acoustics, if pinned right down to it, would admit the current theory of sound to be totally false if this law of the relation of density to elasticity, as formulated by Newton, were shown to be incorrect. Yet Newton himself absolutely proved it to be incorrect by showing that, according to the known density and elasticity of the air, sound should travel with 174 feet a second less velocity than is actually observed at a given temperature! Tyndall admits the fact of this enormous discrepancy ("Lectures on Sound," p. 27), and so do all writers on acoustics.

Newton, after admitting it, tried to explain it by supposing the air-particles to be solid, and that through these solid particles the pulse passes instantaneously, while its entire time of travel is consumed in passing through the vacant spaces between the solid particles! Reader, this is no slander upon that great philosopher, as the "Principia" will show, page 368. But so unsatisfactory, not to say trivial, was Newton's attempted explanation of the discrepancy, which had so signally proved his formula of density and elasticity to be false, that all scientists of his time and subsequently had to suppress their feelings of ridicule when referring to it. Finally, Laplace, evidently mortified at Newton's fiasco, seriously attacked this discrepancy of 174 feet per second between the observed and calculated velocity of sound, and, as if to travesty Newton's laughable explanation, supposed that the sound-pulse, in passing through the air, generated heat, by pressing its particles together, sufficient to augment the elasticity of the air *one-sixth* over its normal elasticity, thus to add the lacking *one-sixth*, or 174 feet to the velocity of sound, and in this way to make it agree both with the formula and with observation! Strange as it must seem to any thoughtful student, this childish solution, as the merest makeshift for a scientific explanation, has been adopted into the text-books on sound as now taught in all the schools. Tyndall and Mayer have both indorsed it and incorporated it into their books as an established part of the sound-

theory, rather than to take Newton at his word that his formula was a self-demonstrated fallacy by just 174 feet a second, and that therefore the whole theory based upon it must necessarily be false. Why in the name of reason could not Laplace and Tyndall and Mayer see that no two sounds, even if the wave-theory be true, can produce exactly the same degree of condensation or amount of heat in the air, and consequently that no two sounds of different intensity can add the same amount of elasticity to the atmosphere by which to augment the velocity of sound? The amount of condensation, and consequent heat, the theory tells us, depends entirely on the *loudness* of the sound, which in turn depends upon the *width of swing* of the sounding body, and somewhat upon the number of swings produced in a second, upon which pitch also depends. Yet this solution of Laplace requires all sounds to be of the very same extent and force of swing in order to add just *one-sixth*, or 174 feet a second, to their velocity, by the amount of heat they generate and the amount of elasticity they add to the air, whether their condensations are as powerful as those of a Krupp gun, or as trifling as those of a mosquito's wing—whether the amplitude of swing is a quarter of an inch, or the sixty-four thousand millionth of an inch, as proved by Capt. Carter—whether sixteen or sixteen hundred of these condensations and discharges of heat (as in different pitches of tone) occur in the same second!

This preposterous solution of Laplace, designed to help out the equally preposterous formula of Newton, on which the equally preposterous wave-theory of sound could only hope to rest, if it lived at all, has at last been definitely put into figures by Prof. Mayer, of Hoboken, New Jersey, and the actual amount of rise in temperature of the air, caused by a given sound passing through it, has been calculated, all apparently as if to expose to still further ridicule both the formula of Newton and the solution of Laplace. He positively tells us (Article on Sound in "Appleton's New American Encyclopedia") that the note C, in passing through the air (and that, too, without any reference to its loudness and its consequent condensing and heating power!) raises the temperature of the condensed half of the air 1-679th above its ordinary temperature, alone by the mechanical force of thus squeezing the air-particles together. Yet this foremost physicist of America was so led astray by the blinding influence of an established theory of science that, in perpetrating these harmless looking figures, he unwittingly attributed to a stridulating insect, which fills four cubic miles of air with its "condensations and rarefactions," a *mechanical squeezing power on the mass of air permeated by its sound, of more than 5,000,000,000 tons!* This calculation can be easily made and verified by a beginner in mathematics, as may be seen carried out in detail in the "Problem of Human Life," at page 188 and onward.

As the "condensed half" of each wave, according to Prof. Mayer, is thus heated, while the other half of each wave is equally cooled, by rarefaction (see Appleton's Encyclopedia), it would of course only require *two locusts* of the same size and pitch of tone to stridulate half a wave-length apart (so that the condensations from one insect might fall into the rarefactions of the other) to heat the entire atmosphere 1-679th; while four similar locusts would de-

monstrably double this temperature of the whole atmosphere thus permeated; and hence it follows that 1358 locusts, one-half of them stridulating half a wave-length from the other half, would actually raise the summer temperature of 90° to 180°F. Nothing in science can be clearer than this. Will Professors Mayer, Rood, and Stevens, therefore, be kind enough to figure out, by their mathematical formulas of undulatory acoustics, and let us know just how many able-bodied locusts it would take, according to the solution of Laplace, to set the woods on fire? We want this information for *THE MICROCOSM*, as several of our rural subscribers are writing to us this summer complaining about these seventeen-year locusts.

Such is a fair specimen of the prodigious absurdities involved in this formula of density and elasticity, gravely laid down in Newton's "Principia," exposed and overturned by Newton himself, made a laughing-stock by his attempted explanation of solid air-particles, made still more ridiculous by Laplace's attempted solution of heat and increased elasticity, and finally laughed out of countenance by Prof. Mayer's self-stultifying figures, giving the exact rise in temperature by a certain sound. Indeed, so thoroughly pitiable is this whole effort to make the wave-theory appear consistent, that when you ask its ablest defenders about the heat solution of Laplace, and how it is that all manner of sounds happen to add just one-sixth to the air's elasticity, they are reminded that just then they have an urgent engagement (significantly looking at their watch), and have no time to talk further! When Dr. Mott recently put this knotty question to the able professor and critic with whom he was corresponding, he replied: "That is one of the weak points of the wave-theory of sound. I have never been satisfied with that *heat* notion; and my impression is, that acousticians will have to find some better explanation of the facts than that!" This is surprisingly frank, and deserves a long mark of credit. But why wait any longer for another explanation, since the "heat" solution and the solid particles have to be abandoned? If acousticians have hunted in vain during two hundred years for a rational solution, after Newton had demonstrated the formula of density and elasticity, on which the wave-theory exists, to be radically false, and to contradict all observation, why not, as the simplest method of cutting the Gordian knot, abandon the theory itself, and instead of still waiting and searching for new explanations (after the two most probable ones had failed) by which to overcome demonstrated facts, try to find a new theory that requires no such puerile and contradictory formulas and solutions? May we not be permitted modestly to suggest the Substantial Philosophy?

We have thus presented our argument against the foundation principle and mathematical formula upon which the present theory of acoustics rests. We therefore repeat our question, as put in the May *MICROCOSM*, since sound cannot possibly go through water, at the velocity observed, by elastic pulses, it being only 1-10,000th as elastic as air, and 1300 times as dense; and since sound cannot possibly go through air by elastic pulses, Newton himself having overturned the law of density and elasticity, on which the pulse-theory rests, by 174 feet a second, why should there be any further objection to the substan-

tial nature of sound as one of the recognized physical forces, since sound, according to the Substantial Philosophy, requires no formula of elasticity, or density, or compressibility or mobility, or fusibility, or combustibility, or anything else, to determine its velocity of travel any more than it requires such formula for determining the travel of the substantial currents of electricity through various bodies? Scientists may just as well commence preparing the winding-sheets for their favorite theory of wave-motion, for quibble about it as they will, and agonize over it as they may, this elasticity-and-density formula of Newton has been its death.

THE TEXT-BOOK ON SOUND.

Much inquiry is received at this office concerning the above-named book—when it will be ready, etc. A word of explanation is therefore needed.

When Dr. Mott joined the substantial crusade of *THE MICROCOSM* against the wave-theory, it developed a new epoch in the controversy, as it had been regularly progressing in these pages for more than three years. His high standing as a scientist, and his favorable position as a member of prominent scientific societies and associations, at once called the attention of leading professors to the new departure in natural philosophy, with various suggestions and criticisms of a higher order than any that had been previously presented. These new criticisms and difficulties urged against our arguments, especially on the sound question, it became necessary to investigate and answer, and this involved, both on the part of Dr. Mott and myself, a reconsideration of some of the positions previously taken, a lopping off of some weak arguments, and the more complete fortifying of our invincible positions, in order that the very gates of hell should not be able to prevail either against Substantialism or in defense of the wave-theory.

As the new difficulties were being critically examined into, and the principles and phenomena involved in the various objections so explained as to harmonize these solutions and the Substantial Philosophy, it is but frank and honest to state that many discussions of these same matters in the "Problem of Human Life," and even in the earlier issues of this magazine, were necessarily found to be defective, and in some instances actually erroneous, the writer at that early date not having the mental instigation of these sharp, critical objections to spur him into the close analytical thought required for such fine work. What else was there to have been expected under the circumstances? The whole matter of assuming the forces of nature to be substantial entities instead of modes of motion, and especially of calling in question the truth of the accepted theory of sound as the key to the Substantial Philosophy, was entirely new to science, not a syllable having been written previously in that direction, and the originator of this revolutionary departure had not, therefore, the slightest aid in his radical work by such experiences and investigations on the part of others. That errors, therefore, should not have crept into those earlier voluminous discussions of so novel a subject, when no special spurs for close watchfulness had yet

been sprung upon it, would have been a subject for marvel. We are only glad and thankful, in retrospect, the work accomplished, that so few of those earlier positions and calculations require now to be modified, while the fundamental arguments, upon which the entire superstructure of Substantialism is based, stand unaffected except to be actually strengthened and made the more harmonious by the correction of such oversights as referred to. We thus particularly call attention to this matter at the close of Volume IV., that future investigators may be apprised of the true reason for any real or apparent discrepancies, though they in no way affect the principles of Substantialism as now formulated.

The reinvestigations of these early discussions and conclusions thus made necessary by new discoveries, criticisms, and objections, have necessarily involved a delay in attempting to put together a suitable text-book on physics, including sound and other related theories of science, as it was important, in the highest degree, that such a work should be as thorough as possible, with nothing after its publication to be taken back or modified if it could be avoided. In deciding upon this delay Dr. Mott is in complete accord with our own views.

The new points and difficulties on the sound question, and on various analogous matters pertaining to the nature of force in its bearing upon the Substantial Philosophy generally, which have been thus sprung and mutually discussed since Dr. Mott's invaluable accession to the cause, have been of untold advantage in the future successful prosecution of this warfare. We cannot speak in too strong terms of the value which Dr. Mott's services directly and indirectly have been to the regenerating work of Substantialism. We can also say in truth that the new difficulties and critical objections which the doctor's accession has instigated on the part of eminent scientists, have only confirmed us in the absolute correctness of our original attack upon the current sound-theory, as the key to the Substantial Philosophy, and Dr. Mott fully agrees with us in this conclusion. The vain attempts of the most distinguished living physicists to defend and explain the contradictory and impossible teachings in the old theory, and with whom Dr. Mott has been in extensive correspondence, but add strength to our joint convictions that the case is already utterly hopeless for wave-theorists. Among these eminent physicists may be named especially Prof. Stokes, F. R. S., who now fills the very chair occupied by Sir Isaac Newton in Cambridge University 200 years ago, and who is now generally considered the ablest living mathematician and physical investigator in Great Britain. His letters to Dr. Mott evince the most complete helplessness ever witnessed in his attempts to grapple with the objections we have urged against the wave-theory; his replies, in fact, running into such confusion of ideas as to render them at times almost unintelligible. This, however, is but an example of the learned failures on the part of other scientists who have in like manner essayed to defend the wave-theory against the assaults of Substantialism, showing conclusively that the new philosophy has nothing to fear in the future from the greatest opposing minds the world can produce. Dr. Mott unhesitatingly declares that the single argument against the current theory of acoustics, which we presented on "The Stridulating Locust" in the July number of this

volume (at page 818) completely annihilates that theory and of itself demonstrates sound to be a substantial force, even if there were not another consideration opposed to it. We refer to that argument here, and thus emphasize it again, as the fourth volume closes, because we simply know that it has silenced the batteries of wave-theorists forever, and they know it also wherever they can be induced to read it. All, therefore, that any Substantialist need to do in the future, to shut the mouths of gainsayers on the sound controversy, is to place that argument before them.

The text-book, when it shall appear, will of course contain the above-named argument, with an elaborate consideration of the air-pulse phenomena, on which that tuning-fork and locust position rests its invincible claims. The text-book would have been seriously incomplete had it been issued before that argument against the wave-theory had been reached, and which seemed to take just so long before it could culminate, simple and self-evident, as it is after it is once presented. It was so with the "Finishing Demonstration" (vol. 3, pages 90-154), showing the almost infinitely slow motion of the prong or string, while still sounding. These crushing arguments, it seems, were not to be reached, with all our years of previous study and discussion, till the crisis had arrived in the controversy when they became absolutely necessary to meet a given want. Call us an enthusiast, a religious fanatic, or what you please, we believe as firmly as we do in the existence of a God that there has been the hand of Providence plainly visible in this entire controversy by which the Substantial Philosophy has thus been finally established beyond the power of man to overturn. Let its friends therefore rejoice, its opposers take warning, and God have all the praise.

Other matters, still, are gradually developing of equal importance to the discoveries named, and which will find a place in the coming text-book. Many of them will be as much needed, no doubt, for its perfection and usefulness as are the arguments already reached. Let our readers possess their souls in patience, and as soon as the work is ready due notice will appear in this magazine.

END OF VOLUME FOUR.

Another *Microcosmic* year has joined the three that have preceded it. Our editorial efforts during the volume now closed, though not by any means perfect either in manner or results, have been satisfactory even to ourself, as severely as we are inclined to criticise every article we write. In retrospect, the various arguments in defense of the fundamental principles of the Substantial Philosophy which have been presented in this volume by our contributors as well as from our own pen, we believe the work has been progressively and invincibly done, that its effects will reach into the ages to come, and that it will there furnish young investigators with the weapons of offense and defense by which Substantialism may successfully challenge and meet every foe.

Many of the subjects discussed in the various numbers of this volume have no doubt, and necessarily, been too abstruse for some of our readers, especially those who have not been

accustomed to critical scientific investigations; but as the foundations of the Substantial Philosophy are laid and had to be laid deep in the principles of physical science, it became an absolute necessity, in demonstrating the substantial nature of all force, including sound-force, light-force, heat-force, etc., regarded by modern science as but various modes of motion of material particles, to follow these theories of motion into their occult recesses and obscure hiding-places, and by analyzing the most intricate phases of the various questions involved, leave no possible loophole for their future escape. We are entirely satisfied to leave this volume substantially as it now is in the hands of its readers as the permanent record of our fourth journalistic campaign, believing, imperfect as it is, if it is carefully studied that no well-informed Substantialist need come out second best in a contest with materialistic atheism.

The future of the Substantial Philosophy, as a system of scientific and religious truth, being thus reasonably assured, it remains for its friends and advocates to lose no opportunity to strengthen the grand edifice by every possible additional fact and argument that can be drawn from science and religion, and to ornament the structure itself as well as beautify its surroundings with every embellishing analogy that nature, art, science, literature, and religion can furnish, till the world shall acknowledge its inimitable grandeur and the church shall accept its excellent aid as a boon sent down from heaven.

To this end the fifth volume of *THE MICROCOSM* will commence immediately (the first number to issue October 1st), under the proprietorship and energetic management of young men who are not only ardent Substantialists and very capable journalists and business men, but who have gone into this work with sufficient enthusiasm to cause them to set apart their lives to its ennobling mission. They ask and deserve the support of every reader who has taken the previous volumes of this magazine, and they deserve the encouragement of tens of thousands of other names on their subscription lists, and will no doubt receive them, as the new volume progresses and proves itself worthy of support.

By reference to the prospectus printed on the second page of cover, the terms of the new and enlarged volume will be there seen. It will cost about twice as much to furnish it as the present volume has cost, and it will therefore be the cheapest periodical at its price (\$2 a year) now published. Dr. Mott, the managing editor, will give his best efforts to make it a literary and scientific success, as he expects to grow up with it journalistically, and be identified with its destiny for life.

Our own disposition toward *THE MICROCOSM* is so well understood that it requires no pledge whatever as to the aid we propose to render in sustaining and building up the "Organ of the Substantial Philosophy." Our very life is wrapped up in the pages of this magazine, so intimately and sacredly has every fiber of our being been identified with its destiny since its first inception four years ago. It shall not, and must not, slacken in its onward progress for enlightening, blessing and elevating mankind, if any effort of ours can add to its successful career.

Our contributors who have so nobly wielded the battle-ax of Substantialism during the four previous volumes have cheerfully and

enthusiastically enlisted for the coming campaign, at least so far as we have heard from them: and with the experience and substantial training they have enjoyed in the past in contending for the faith once delivered to Substantialists, there can be no fears but their blows for progressive and aggressive truth will be even more telling during the coming volume than ever before.

Let every reader of this volume, therefore, whose eye has caught a glimpse of this closing appeal, and before he shall lay away this 12th number of volume four, take \$2 from his pocket and inclose it in a registered letter, or, if convenient, buy a bank draft or P. O. Money Order, and send it to *THE MICROCOSM PUBLISHING COMPANY*, 28 Park Row, New York. If he has not \$2 to spare, let him send \$1 for six months' subscription. Or, what is still better, let him get five friends to subscribe for the year, inclosing the \$10, and receive the entire fifth volume free as a premium. When it is a fact, as we can show from scores of letters, that single articles have frequently been valued as worth many times the year's subscription, what must the value of the entire fifth volume be, with its 576 pages, packed with the most important general information? Let every reader answer this question for himself, and then act accordingly.

SUBSTANTIALISM TAKING SHAPE—A NEW UNIVERSITY PROPOSED.

We are glad to be able to inform our readers, in this closing number of Volume IV., that a movement has already been started for crystallizing and centralizing the Substantial Philosophy, in the form of a new university, to be based on the recent departures in science as taught in these volumes, and to be located at some suitable place, preferably near New York City.

The idea of a university, to be founded upon the basis of Substantialism, is not by any means an idea of our own conception or suggestion. It originated in the mind of one of the staunchest friends of the new philosophy in the United States, and one of the most experienced educators and able organizers of educational institutions anywhere to be found.

This gentleman does not hesitate in declaring his conviction that the revolutionary discoveries in science, involved in the Substantial Philosophy and unfolded in this magazine, afford a more appropriate and solid foundation for a great institution of learning than has ever before been presented to the world; and he believes that all that will be needed to concentrate the working elements of a very successful university around these radical departures from the beaten paths of science, will be the active and energetic co-operation of the friends of Substantialism throughout the world.

He holds that the establishment of a permanent seat of learning upon a mere money appropriation donated by some millionaire, as so often done, and however advantageous such appropriations may be, bears no sort of comparison, for future promise and hope, to such a grand intellectual and educational basis as the Substantial Philosophy must of necessity constitute; and he does not doubt that, should a well-planned university be properly inaugurated, even though it should start on the most

modest and unpretentious scale, it would at once tend to inspire a degree of enthusiasm on the part of Substantialists throughout the country which would surely tell in the way of material aid from the wealthy, and, by enlisting the sympathies of all classes of independent thinkers, must soon insure its growth to magnificent proportions.

Once let the principles of Substantialism, as they bear upon the living questions of science, philosophy, and religion, be fairly rooted and grounded in such a centralized form as here proposed, and he claims that young men from the various colleges, who have become discontented, if not totally dissatisfied, with the theoretical modes of motion everywhere taught for science, would soon catch the distant scent of something more like enduring substance here to be systematically taught, and would flock to the educational shelter of the new university from all points of the compass like intellectual doves to the windows of a philosophical ark of safety.

Efficient materials for the professorships of such an institution, men of ripe scholarship and of broad experience in educational work, and of already earnest convictions for the great truths and principles of the Substantial Philosophy, could, he believes, be summoned, at the beating of a drum, from the various other schools and colleges, and even at moderate pay at the start, more than enough to fill effectively the chairs of a score of such universities—men who, with the weapons of their scientific warfare already forged to their hands, could command and enforce the unconditional surrender of opposing professors, should any such be found, in other colleges.

Such a revolutionary start in organized educational work as here foreshadowed, would soon spread the news of the Substantial University, he believes, to other schools far and near, and thus exert such an influence over them as soon to convince their managements that within the broad curriculum of university and college education there was at last found something more enduring and substantial to teach young men for science, philosophy, and religion than the mere vibratory motion of material molecules; and so thoroughly does he believe in the regenerating power of the new philosophy over the minds and souls of all who come under its influence, that within a few short years, or decades at most, he does not think there would be found a single college or university in this or any other civilized country where the basic elements of the Substantial Philosophy would not be substantially inculcated.

Now the question is, and it is one which comes home to every substantialist, can such an institution of true, progressive learning be established and supported? The originator of the idea of such a university (whose name, with the full meed of honor, will appear in due time) believes firmly that it can be done, and that no practical or serious difficulty lies in its way. And after giving the most careful consideration to his reasons for thus believing, as set forth in elaborate private correspondence, we do not hesitate in fully sharing his convictions.

It is therefore with no small degree of pleasure that we throw out these preliminary hints concerning the proposed university, in order to elicit the views of the friends of Substantialism *pro and con*, if there shall be any *con*, and thus prepare the way for more definite action

in the near future, should the enterprise finally meet with general favor among substantialists.

We may also add that, having personally presented the details of the project to a dozen or more of the earnest friends of Substantialism, in whose business judgment we have the fullest confidence, there was not one of them but heartily approved of the proposed university, believing it to be the only proper and legitimate way of domiciling and centralizing the Substantial Philosophy in a veritable home of its own, as a preliminary step to extending its beneficent influence throughout the world.

We frankly confess that a very short time ago we had not the remotest thought of living to see any such movement as this placed on foot, and we can but express our deep gratitude at such unexpected progress of the Substantial cause. And should it please the All-wise disposer of human events to allow of our sojourn here long enough to witness the dedication of such an institution of learning to the cause of Substantialism, then, indeed, would our cup of happiness be full. May His providence so dispose the hearts of the rich in this world's good things, that they may be inclined to render material aid in hastening this Substantial year of jubilee, so devoutly to be wished.

THE FLORIDA STATE UNIVERSITY.

The Editor Honored with "LL. D."

We take pleasure in calling the reader's attention to the advertisement of the above-named University, to be found on the fourth page of the cover of *THE MICROCOSM*. Aside from the business and journalistic courtesy which prompts this notice, we are placed at the present writing under personal and very special obligation, and even gratitude, both to the Regents of the University and to its distinguished Chancellor, Dr. John Kost, from whom we have just received a letter informing us that by a unanimous vote they had recognized the editor of this magazine by conferring upon him the honorary title of "LL. D." The fact that this honor was a complete surprise, being unsolicited and wholly unlooked for, makes its reception all the more pleasant to contemplate, not from any feelings of mere personal gratification, but from a sense of satisfaction in knowing that the work we have been doing in the interests of science and religion is beginning to be recognized in this substantial and practical manner.

To the Chancellor and the Board of Regents, both in their individual and associate capacity as representing the Florida State University, the editor hereby tenders not only his own gratitude, but that of every substantialist who reads *THE MICROCOSM*, for this distinguished mark of appreciation. We make the acknowledgment in this public manner that our numerous friends in Florida and throughout the South may make a note of it.

PROF. HAND ON THE MOON.

We are sorry that we have not room in this number of *THE MICROCOSM* for Prof. Hand's difficulties on our moon problem. He suggests what seems to be a serious objection to our

view, and which he presents in his usual unique manner, so as to make it the more impressive. We have written a reply to the objection, and in doing so have shown his difficulty not only to favor our view, but actually to present the most crushing consideration against the old theory of the relation of the moon and earth to their common center of motion that could be framed into language. It will appear in the next number, being the first of Volume V.

DEATH OF MR. OLMSTED.

We are pained to record the death of the Rev. M. N. Olmsted, the author of the "Walks and Words of Jesus," of which our readers have purchased so many copies. He was a noble Christian man, and an example of an indomitable Christian worker. He was seventy-three years old, and had been for some years retired as a superannuated Methodist minister, after having served forty years in the active ministerial work of that church. He has been a constant visitor at THE MICROCOSM office since its commencement, and never entered its sanctum but with a smile and a cheerful greeting which were often calculated to lift a load of care and sometimes sadness from the busy editor's heart. Indeed when we felt the saddest we longed the most for the light of his encouraging face and words to divert our thoughts from care and suggest some new ideas, of which he was always full, to relieve monotony. He died at his home in Mount Vernon, N. Y., of overwork, during the extreme hot weather, on July 26, 1885, leaving an aged widow, who has our deep sympathy, as well as that of the hundreds who knew her and her noble husband only to love them.

OUR ENCYCLOPEDIA OFFER A GREAT SUCCESS.

[From last month.]

Our readers have no doubt noticed that we are making the most unparalleled offer in valuable books ever made to the reading community. We actually offer to give as a premium a complete set of *Appleton's New American Encyclopedia* (second hand, but almost the same as new), sixteen large volumes, leather bound, which originally cost \$96, to any person who will purchase for cash at retail price \$50 worth of any of our books, including, if desired, subscriptions to THE MICROCOSM, volume IV., at \$1 each. Our books are: "The Problem of Human Life," cloth, \$2; "Walks and Words of Jesus," cloth, \$1; "Pocket Webster's Dictionary," cloth, 85 cents; "Universalism Against Itself," cloth, \$1; first three volumes of MICROCOSM, bound in cloth, \$3; present (4th) volume, in numbers, \$1.

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ARTICLES LEFT OVER.

We have many articles crowded over, which it was impossible to print in this number. Among them was the third article of Dr. Taft, on "The World Saved Through a Nation;" also articles from Rev. T. Nield, Rev. Joseph Smith, J. R. Hoffer, Esq., Rev. Prof. Stephen Wood, L. Clay Kilby, Esq., Prof. La Fetra, Prof. I. N. Vail, Prof. J. R. Sutherland; a series of articles from John C. Duval, etc., etc. These will appear as opportunity offers in the coming volume.

The first opening article in the new volume (next month), by special request of the publishers and Dr. Mott, will be from the pen of the editor in review of the distinguished Prof. Tait, of the University of Edinburgh. This article will be followed by a telling paper from the pen of Dr. Swander.

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