THE MICROCOSM:

THE ORGAN OF THE

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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FOUNDER AND EDITOR.

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The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
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IS SUBSTANTIALISM THE REMEDY?

BY THE ASSOCIATE EDITOR.

That modern skepticism, in its boldest and most defiant attitude—materialistic atheism—is on the increase and everywhere confronting us, is sadly realized by all believers in a conscious and personal future life. So aggressive has this phase of unbelief become, and so pernicious are its effects as opposed to the real mission of the church, that not an ecclesiastical body of any denominational form convenes of late but the question of scientific materialism, and its bearing upon the cause of religion, is introduced for discussion, and urged upon the attention of the clergy.

The members of such conventions are earnestly admonished to fortify themselves and the cause they represent with the strongest and most effective arguments against such growing tendency to modern skepticism.

The late pan-evangelical conclave in the United States, appealed as a body to the scientific philosophers of the churches to study nature, and help to bring out of the still unexplored depths of science, new arguments, if possible for combating agnostic materialism, and by which the appeals of Christianity to the consciences of men in behalf of a personal hereafter, might be reinforced and abetted.

The Southern Presbyterian Assembly, which met more recently in Philadelphia, was agitated from centre to circumference with the same vital question of how best to meet and paralyze the materialistic monster as it comes forth in the shape of Darwinian evolution.

This modern phase of departure from the Bible account of creation, has recently been thrust, as a fire-brand, into that able body of church dignitaries by one of their prominent ministers and college professors. In their denominational capacity, they thus ask for conclusive evidence, if it can be produced, against this dangerous and alluring scientific innovation: and we hope that the delegates to that great assembly will consistently hold themselves in readiness to accept the desired information when it shall be offered to them without money and without price.

Still later, at the triennial general convention of the Episcopal Church of America, Bishop Whipple, of Minnesota, in his opening sermon, made a similar appeal to the wise men of the Church to come to the help of the Lord against the mighty forces of materialistic darkness. He appealed to the bishops and clergy present to bring all their intellectual resources to bear in assisting to stay this torrent of atheism which is working such havoc among the scientific thinkers of the times.

This appeal of Bishop Whipple produced a responsive tremor of approval in the mind of every bishop and clergyman present, and has been echoed by a sympathetic chord in the heart of every clergyman throughout the land, whatever his denominational fealty may have been.

In response to this same sentiment, the letter of the Rev. Dr. Jas. A. Buck, Rector of St. Paul's Church, Washington, D. C., printed elsewhere in this number, was written and sent by that venerable clergyman to all of his ministering brethren of that church, thereby to put them into possession of the very weapons needed for counteracting the advances of modern materialism.

As will be seen by those who shall read his letter, he refers the bishops and clergy to Substantialism as containing the very arguments evolved from nature and science, by which so to strengthen and reinforce the broad claims of theology as to silence if not destroy the chief batteries of the opposition.

The question now is, will the Substantial Philosophy, in the religious aspects of its teaching, furnish the requisite helps for silencing these batteries of materialistic infidelity? Is Substantialism, in other words, the true remedy for the evil tendencies of the times, concerning which all recent ecclesiastical conventions are making appeals to the brightest intellects of the church, and to the ablest defenders of her cause?

We firmly believe, if Substantialism does not effectually meet and answer the scientific phase of materialism, and furnish demonstrable proof of the substantial nature of the soul as a conscious and intelligent entity capable of personal immortality, then nothing that is known to science or philosophy will meet this case.

Compared with the direct and positive proofs drawn from the very nature and observed phenomena of the physical forces, which Substantialism has so clearly unfolded and brought to bear against materialism, the old arguments of analogy, on which theologians have formerly relied as proof of human immortality, are but as sounding brass and tinkling cymbals.

The whole of that great work—Butler's Analogy—if boiled down into a dozen pages, would be as chaff contrasted with the sound wheat of scientific truth, placed along side of the fundamental and demonstrated teaching of the Substantial Philosophy which assures us *that every force of nature, physical, vital, mental and spiritual, is a real substantial though immaterial entity.*

It was upon this original generalization that Dr. Hall based his great departure from the modern motion-theories of science as set forth in all our text-books, and as taught in all our schools and colleges. It was this same broad classification of all things that exist, or that are capable of producing an effect, *as material and immaterial substances*, which laid the foundation walls of Substantialism deep in the imperishable mortar of true natural analogy. This single discovery,—by which universal existence was for the first time properly classified; by which all force from gravitation, even down to the vital and mental energy which moves the pseudopodia of the moneron is shown to be an immaterial substance; by which even sound, heat and light, as forces of nature are proved to be real and substantial entities instead of wave-action; and by which every motion-theory of science, at a single blow, has been subverted and overturned,—was and is beyond all comparison the greatest scientific discovery that has been made since books were written, and compared to which Newton's discovery of the law of gravitation is a pigmy along side of a giant.

On this very point I have just received a letter from that able reviewer, Mr. Jesse H. Butler, of Los Angeles, Cal., in which he says:

"Dr. Hall's work [The Problem of Human Life] has been a great benefit to me mentally. Although I had received much light on the problem of a future state previous to reading his work, yet his philosophic mode of reasoning was the most convincing to me of anything I had read, compared to which Butler's Analogy always tended to make me skeptical. I have stated in my 'Review of the Problem of Human Life,' and firmly believe the statement, that this book alone will hand its author down to posterity as a star in the intellectual heavens not surpassed in brilliancy even by that of a Shakespeare."

The value of that original conception of the true nature of force, as one of the two grand divisions of universal substance, and as really substantial as matter itself, will most probably not be fully appreciated by the present generation. It is not to be expected that the founder of the Substantial Philosophy shall live to reap the full fruition of his work. But the work itself will not only live after he has gone hence, but must in the very nature of all absolute truth live on and expand forever.

At present this true conception of the nature of all force, *per se*, involves not only the complete reconstruction of modern physics, by which harmonious explanations of natural phenomena may at all times be reached and easily verified, but grandest of all immediate results, it unfolds the true nature of man as an intellectual and spiritual being, having an internal, vital, mental and spiritual organism as complete in all respects as is his corporeal structure, thus logically and rationally fitting him for a conscious and personal existence hereafter.

One year ago this month, I had the honor of presenting to the readers of the MICROCOSM several considerations upon this very phase of the Substantial Philosophy, in which I attempted to show that by no possible argument known to analogical reasoning outside of Substantialism can the position of modern materialistic science be successfully attacked. I showed by unquestioned proof that Prof. Hæckel's basic assumption against the possible existence of a Supreme Being and against the possible existence of the soul or spirit of man as a substantial entity, was fully supported and justified by the current teaching of science, as set forth in our text-books and as advocated by the professors of physical science in all our colleges, not excepting our theological seminaries.

No one is so poorly informed as not to be aware of the fact that the leading forces of nature, such as heat, sound, light, and even magnetism, are taught in all our schools as mere modes of motion of material particles, and furthermore that the idea of these forces being substantial entities in any possible sense, is regarded as too absurd to be considered for a moment.

Prof. Hæckel with a mind saturated with infidel philosophy and German logic, was not long in concluding that this universal defi-

nition of force, *per se*, as but the motion of material molecules, was the death blow to all religious philosophy; for if the forces of heat, light and sound could produce the observed effects on our sensations and upon material bodies as but the motions of matter, why, he asks, may not mental force, vital force, psychic force and spirit force also be mere modes of motion without, in any sense involving objective or substantial existence?

Surely, Hæckel is unanswerably right. If light-force, for example, as the mere vibration of material ether, which is so near a nonentity as to be without the slightest proof of its existence, can produce not only sensuous effects upon our organisms but even chemical effects upon material bodies, then why may not the complex motions of our brain-particles —matter that really exists—constitute the various forces of vitality, mentality, etc.?

And further, insists the eminent German professsor, if sound, as a natural force, consisting of mere motion, ceases to exist as soon as the vibrating air-particles come to rest, then manifestly mind-force and life-force, consisting of analogous vibratory motions of brain-particles, must cease to exist as soon as these brain-molecules come to rest at death!

Thus irresistibly does Prof. Hæckel prove that *death ends all*, and that, too, by the very science now universally taught, even in our religious seminaries, colleges and universities. No wonder that the founder of Substantialism deemed it as fundamentally essential to the work he was about to establish, vehemently to assail the wave-theory of sound as the mother of all the other and more recent motion-theories of science, and as the real foster-mother of atheistic materialism—the very worst and most dangerous form of modern unbelief.

This invincible logic of German atheism and agnostic materialism had been boldly thrust into the teeth of the clergy for several years before the Substantial Philosophy was thought of, but without eliciting the slightest reply that seemed even to see the real point of that terrible argument against religion, and against all hope of a future life. Those who did catch a glimpse of the fatal point of analogy rubbed their eyes, closed the "History of Creation" and turned away with a shudder of fear mingled with bewilderment at the resistless force of the logic, faintly hoping that there were some way out of the difficulty, and that some one would yet arise to bring order out of this apparently disastrous confusion.

Not one thought did such nonplussed religious philosophers give to the fact that possibly the motion-theories of force, as taught by present science, and from which Hæckel's irresistible deductions were drawn, were without the least foundation in truth. It never occurred to the sagest of those religious critics to doubt the truth of the wave-theory of sound, the undulatory theory of light, or the doctrine of heat as a mode of motion. And, of course, accepting those theories as true there was manifestly no possible escape from Hæckel's logic, nor any conceivable reply to his most rational analogical deduction that life was also but the vibration of brain-molecules, and soul but a mode of motion that necessarily ceases to exist at death when brain-particles cease to vibrate.

Hence, the scientific and religious importance of the advent of some one competent to take this materialistic bull by the horns and hurl him with broken back from the scientific arena. That one in the fullness of time made his appearance, and to the consternation of the materialistic hordes made proclamation of the Substantial Philosophy as the true and only scientific remedy for materialism. At this announcement, in which all the motion-theories of science were repudiated, and all the forces of nature were declared to be substantial, broad-minded Christian philosophers, who had felt the real point of Hæckel's analogical javelin, were thrown into ecstacies of rejoicing. They now saw for the first time a broad highway cut through the tangled and before unthreaded materialistic jungles, and consequently were most lavish in their praises of the new departure in science which had so unexpectedly brought light out of darkness and order out of confusion.

The religious press throughout the land, and of all denominations, joined with the individual clergy and rung with the notes of triumph, that the materialistic enemy had been overthrown, and that the atheistic horse and his rider had been cast into the sea.

As a single example of this almost universal song of deliverance, here is what the Rev. Dr. L. W. Bates wrote to the *Methodist Protestant*, of Baltimore, Md., on reading the very first copy of the "Problem of Human Life" that ever was sold:

"This is the book of the age, and its unknown author need aspire to no greater literary immortality than the production of this work will give him; and thousands of the best-educated minds, that have been appalled by the teachings of modern scientists, will 'rise up and call him blessed.' Hitherto it has been the boast of atheistic scientists that the opponents of their doctrines have never ventured to deny or to solve the scientific facts upon which their theories are based. But our author, accepting these very facts, unfolds another gospel; and Tyndall, Darwin, Haeckel, *et al*, are mere pigmies in his giant grasp."

But now comes the sad and pitiful part of this narration of events. Startling and invaluable as were the discoveries which inaugu-

rated Substantialism, and which demonstrated its grand principles as the complete overturn of the motion-theories of physical science, and with them demolished the hitherto unanswerable deduction of materialism that the soul was but a mode of motion, yet it is a deplorable state of fact that a vast majority of the clergy of all denominations, and nearly all of the college professors, persist in standing aloof from these conservative principles, and refuse to accept the protecting shelter of this only possible breast-work against the deadly fire of Hæckel's materialistic guns.

They seem to prefer, for reasons which I shall not venture to guess, still to advocate the untenable motion-theories of the physical forces, and thus by every principle of natural analogy to signal Prof. Hæckel in his impregnable citadel to blaze away at their soul-less bodies to his heart's satisfaction, and that they will take the consequences of his grape and canister, rather than change an iota from the scientific traditions of their predecessors.

Better, these helpless theologians seem to say, for us to take the consequences of no reply at all, even to such invincible analogical arguments as those of Prof. Hæckel, and trust to the Bible alone, than to submit to the innovation of a new religio-scientific theory which audaciously ignores the highest and most venerated authorities, however conclusively and however clearly such theory may annihilate materialism.

But wait; another generation is coming on apace to correct the mistakes of the present, and the rising thinkers who will assume charge of the engines of scientific progress, will soon whistle off the agnostic brakes and receive from the conductor of the train of Substantialism the responsive shout:—"Let her go——!"

A QUESTION CONCERNING SOUND VELOCITY.

New Alaxandria, O., Oct. 28, 1889.

REV. J. I. SWANDER, D. D.

DEAR SIR,—Steele, in his "Physics," p. 127, says: "Mallet found that in blasting with a charge of 2,000 pounds, the velocity of sound was 967 feet per second, while with 12,000 pounds it was increased to 1,210 feet per second." Parry, in his "Arctic Travels," states that on a certain occasion the sound of the sunset-gun reached his ears before the officer's word of command to fire, proving that the report of the cannon travelled sensibly faster than the sound of the voice.

Now, one of Dr. Hall's strongest arguments is based on the assumption that all sounds, loud and soft, high and low, travel at the same rate. But if the above statements be true, his statement in the "Problem" concerning the rate of sound-travel will not hold good. How do you explain this faster travel of loud sounds according to the new theory? I am not trying to defend the wave-theory. I am a Substantialist, and as such I am seeking to have my faith confirmed in all the essential tenets of that philosophy.

Yours very sincerely,
DAVID DODD.

REMARKS BY J. I. SWANDER.

First of all we will state both the position and the predicament of the wave-theorists in their false and awkward relation to the law of the transmission of sound through the atmosphere. In addition to what Mr. Dodd has shown by his quotations from Steele's Physics to be the teaching of the old theory, we quote further from "Steele's Fourteen Weeks in Philosophy." On p. 155, Prof. Steele, after admitting that all sounds travel at the same rate of speed "under ordinary circumstances," adds: "It has been said that the heaviest thunder travels no faster than the softest whisper. *This is not verified by careful investigation.*"

The careful investigations to which he alludes are in those instances a few specimens of which are cited by Prof. Steele and quoted by Mr. Dodd from that author's book on Physics. Prof. Steele is thus found to have been in the most unscientific distress as he wriggled in the meshes of contradictory testimony which the wave-theory involves, and is obliged to lean upon without any ability to harmonize the conflicting claims of such "respectable" bosh.

In his manifest perplexity, the professor, like the Indian's tree, became so straight as to lean a little the other way. He virtually says that the truth of science is "not verified by careful investigation." He affirms that sounds of all pitch and intensity travel at the same rate of speed and that it is not true that the loudest thunder travels no faster than the softest whisper. Prof. Tyndall is more shrewd, but just as hopelessly swamped in the quagmires of his false theory. As quoted by Dr. Hall, in the November MICROCOSM, Tyndall says: "Assuredly, no question of science ever stood so much in need of revision as this of the transmission of sound through the atmosphere."

Here, then, we have the position and the predicament of the wave-theorists as represented and confessed by Professors Tyndall and Steele. They are as follows:

1. All sounds travel with the same velocity in a like medium of conduction.
2. The truth of the above formula is not verified by careful investigation.
3. The whole business "*is in need of revision.*"

Now, what is radically wrong with these wave-theorists in their hopeless attempt to remove the absurdities and harmonize the contradictions which their theory involves in the one little matter of sound velocity? First, their theory is out of all harmony with the facts of nature. Starting from an imaginary point of a false compass, they, of course, fail to make the proper distinction between sound and air, and, also, between the law of the velocity of sound and the very distinct and different law by which air, as a conducting medium of sound, travels before the impulse that moves it along.

At this point in our remarks we can be of no more service to Mr. Dodd than to call his attention to what has been written on the subject. In doing so we assume and assert that the "Problem" by Dr. Hall, and the consequent "Substantial Philosophy" by ourself, as one of his disciples, and with his unqualified

indorsement, will be found to cover, not only the point raised by Mr. Dodd, but also any other question which can be reasonably raised within the proper purview of acoustical science. These books were not written until after the spending of years in earnest study and careful investigation of the subject, in its relation to all the known facts that bear upon the proper solution of all the diversified questions which it essentially involves.

Dr. Hall, in "The Problem of Human Life," p. 266, says: "If a gale is blowing twenty miles an hour, with a temperature of sixty degrees Fahrenheit, sound, which travels in still air 1,120 feet a second, would move against this current but 1,091 feet a second, because the air itself moves in the opposite direction, 29 feet a second, which must necessarily be deducted."

Assuming the essential correctness of the above statement, it follows that when sound moves *with* the current the velocity of the current is to be *added* to what would have been the velocity of its travel in still air. It makes no difference whether the air be put in motion by the force that ordinarily causes the wind to blow, or by the sudden generation of gas, as in an explosion of a powder magazine, or the blasting of a rock with 12,000 pounds of powder, as in the case related by Mallet.

On page 185 of our "Substantial Philosophy," the law of sound conduction is given, so far as it relates to sounds of different pitch and different intensity: "The velocity of sound is the same in a given medium, whether the sounds be soft or loud, high or low, simple or complex. The velocity of all sounds in air is about 1,120 feet in a second, at the temperature of 60 deg. F. If colder, a rearrangement of the air particles takes place under the action of cohesive force, causing sound to travel slower. This fact of the uniform velocity of all sounds in air at a given temperature is verified by listening to the playing of a band of music at a distance, all the sounds, however varying in intensity and pitch, reaching the observer in perfect time."

On page 211 of our book, the question of sound-velocity is treated in its relation to the travel of the medium by which it is conducted. Both the law and the reasoning thereupon are given in the following language: "It is evident in strict science that so much must be added to or deducted from sound velocity, as will correspond with the bodily movement of the conducting medium, either with the sound or in the opposite direction. To illustrate: As sound travels in still air at 60 deg. at a velocity of 1,120 feet a second, it is manifest if the air itself were traveling in the same direction, in a breeze of thirty feet a second (or about twenty miles an hour), that we would have to add these thirty feet to the real velocity of sound as measured from one fixed station to another, making it 1,150 feet a second instead of 1,120. But if we change stations, and send the sound against the breeze, we must necessarily deduct the thirty feet a second from the actual velocity of the sound, making it only 1,090 feet instead of 1,120. So it would be with electricity traveling through a wire by an analogous law of conduction at, say 1,000 miles a second. If by any means we could cause the wire to move one mile a second at the same time, this mile of travel would have to be either added to or deducted from the velocity of the electricity, according as the wire moved either with or against the electric current."

As stated above, neither Tyndall, Steele, Parry nor Mallet was able to distinguish between the moving of the sound and the moving of the air which had been sent off by the sudden generation of powder-gas. And it is astonishing that they were thus blinded to the obvious facts in the case. They all seem to have had their eyes filled with some of those infinitesimal atoms of ether-jelly which had been manufactured to order for the general purpose of producing molecular motion. It does seem that a real smart school-boy would have made the necessary distinction, if not led astray by the sophistry of undulatory nonsense. An ordinary Hottentot could at least be taught that 12,000 pounds of powder would generate more gas, and consequently send off the air at a more rapid rate of speed than could be produced by the burning of only 2,000 pounds of that explosive substance. And it is altogether probable that if one of those tufted top-knots of Cape Colony had been present, he could have told Capt. Parry that the sound of the sunset gun reached his ears before the sound of the officer's word of command to fire, because *the sound of the officer's voice was not in the direct line of the air current that was sent off by the discharge of the gun*, carrying the sound of the gun's report at a higher rate of speed by adding the velocity of the moving medium to the speed of ordinary sound velocity in still air. Indeed, the commanding officer may have stood on that side of the gun directly opposite from Parry, which would clearly account for the later arrival of the sound of the word of command, according to the law as given above from p. 211 of "The Substantial Philosophy."

The great mistake and consequent difficulty with many earnest students of the new and true theory is the fact that they either have not supplied themselves with the literature of the new philosophy, or have not read and studied it with sufficient care and thoroughness. While the new theory is easier to understand than the old, because it is true and the old false, it is also more difficult of clear apprehension than the old, because it requires its students to pass into that immaterial realm of being of which the undulatory acousticians are not willing even to dream.

The prevailing tendency of modern investigation is to substitute the outward, the material and the merely phenomenal, for the inward, the immaterial and the truly real. The above assertion will hold just as true in the realm of religion, as in the lower sphere of physics. Indeed, this tendency seems to be more alarmingly on the rampage at present than in former days. Our fathers have told us how they and their fathers made search after the deep things of God. With Bible and catechism in hand, they pressed their inquiries to that point of mental and experimental agony when their earnest spirits found relief in groans too deep for utterance. All this has been measurably changed. Religion has been made cheap and easy by the superficiality of modern methods. There is now no considerable diving after the invisible entities and pearly truths which are to be found only at the bottom of God's deep sea of Revelations. So, too, in the pretended study of His works. The general mind is being educated to take an easy surface view of things. Thus error becomes a convenient substitute because it is hard for the untutored mind to form a proper concept of immaterial entities, and hold

them in their proper relation to all relevant facts.

Our young friend, David Dodd, is measurably an exception to this general and pernicious tendency. He has evidently been hard at work. His efforts are also in the right direction. His case calls for continued patience and perseverance along that line. "Then shall we know, if we follow on to know the Lord" as he reveals himself in his words and works. His works must be studied from the proper standpoint in order to a correct understanding thereof. That standpoint is the Substantial Philosophy. From this point of view, the survey is made in the "Problem of Human Life," and the literature which is the outgrowth of the principles planted in and by that book. In this literature Mr. Dodd, and others having similar inquiries to make, will find all that has been written upon the subject, and probably all the light that they may need upon the question of sound travel, as well as upon all other questions that can be reasonably raised within the entire domain of physics, so far as the facts and laws of physics are now revealed to the observation and reasoning powers of man.

Fremont, O.

PRIZE ESSAY NO. 1.
THE PROBLEM OF WEIGHTS.

BY PROF., D. JAMES.

The weight of a material body depends upon several circumstances. It varies with atmospheric density, with latitude, and with elevation. It is not uniform at the same place, during one day, if the atmospheric temperature varies, since density depends upon temperature. A body is heavier in a hot rarefied atmosphere than in a cold dense atmosphere. Elevation decreases the density of the air and increases weight, if the decreased effect of gravity and increased centrifugal force do not counterbalance the diminished atmospheric buoyancy. A body at the equator weighs considerably less than at the poles, because it is further from the centre of the earth, and because the centrifugal force modifies gravity.

A New Orleans cotton broker proposes, this season, to sell to Liverpool cotton buyers, by New Orleans weights, 100,000 bales of cotton, 500 lbs. each. The Liverpool merchant will sell it to factories by Liverpool weights. They will have two advantages, viz., that city is nearer the center of the earth, and, of course, gravity is greater, and the centrifugal force is much less than at New Orleans, which facts will permit a gain. The denser and more buoyant atmosphere at Liverpool, will be a disadvantage to the merchants there. The New Orleans broker suffers loss from two disadvantages, and gains by one advantage. His greater centrifugal force and greater distance from the earth's center, materially diminish the weight of his cotton, while the rarity of his atmosphere is slightly in his favor.

The broker, and through him the cotton planter, would like to see an approximate statement of his losses by difference of weights in the two cities. Liverpool is 23½° nearer the pole than New Orleans. This difference must produce a considerable difference in the effect of centrifugal force at the two cities.

Will some scientific reader of the MICROCOSM "ventilate" this question?

Weight and its fluctuations would prove an interesting subject, if handled by an astute Substantialist.

Vossburg, Miss.

PRIZE ESSAY, No. 2.
Substantial Government, No. 3.

BY REV. D. OGLESBY.

The money question is the least understood of all questions.

It seems so simple that everybody thinks they know all about it, and hence never investigate it. And it is because it is not understood that the masses throughout the civilized world are writhing in one vast quagmire of debt and usury.

When the question of making the greenbacks a legal tender was being discussed in the Senate in 1862, Mr. Fesenden in a speech said: "Mr. President, nobody knows much on the question of finance, not even those who are most familiar with it; for, sir, I declare to-day that in the whole number of learned financial men that I have consulted, I never have found any two of them who agree, and, therefore, it is hardly worth while for us to plead any remarkable degree of ignorance when nobody is competent to instruct us, and yet such is the fact. I can state to you, Mr. President, that on one day I was advised by a leading financial man, at all events to oppose the legal tender clause. He exclaimed against it with all the bitterness in the world. On the same day I received a letter from a friend of his telling me we could not get along without it. I showed it to him and he expressed his utter surprise. He went home and the next day telegraphed to me that he had changed his mind and now thought the legal tender absolutely necessary; and his friend who wrote to me, wrote again that he had changed his mind, and they were two of the most eminent financial men in the country."

It does not follow that because men handle money, or that they are great scholars, or scientific men, that therefore they understand this question. It is a question that requires the most profound thought and patient investigation in order to understand it in all its relations to society.

Conceding fully the wonderful logical powers of the editor of the MICROCOSM, and without intending to give offense to the weight of a feather to the editor, and weighing fully our words, we are satisfied he has never thoroughly investigated the money question, and this conclusion is forced on us by reading the "remarks" in reply to our last essay on substantial government. The whole drift of his reply is to show that money is property. I had demonstrated that money was an "ideal thing," a "creature of law" the "flat" of government, and hence not property. Why should the doctor argue against a demonstrated fact; especially after admitting that I was correct in these words: "Mr. Oglesby, of course, is right as to the fact that neither paper, gold nor silver is money, and that either one of these substances, whatever their intrinsic value, is only money in consequence of the government stamp impressed on it." Here the doctor admits all we contend for, viz., that the money quality or function is the authority of law, or "flat" of government impressed on any substance capable of receiving an impression.

Is the fiat of government "property boiled down?"

When the government makes a thousand dollar bill out of one or two cents worth of paper, where is the property about it? It is not necessary to follow and refute all the positions of the doctor in detail, as he abandoned the property idea in the above quotation. For all his talk about the $100 horse trade, and getting $100 for a bushel of wheat, or giving $10,000 for a "good mule" are based on the position of property money which he so unwittingly surrendered. My plan, viz., that the government should furnish all the money necessary to the people at cost of issuing and handling, the doctor says "we confess we can not understand." I am satisfied the doctor told the exact state of his mind, for in all my writing on this question for ten years, I certainly never was so misunderstood by any one before. He seems to think that I proposed for the government to make the money and sell it for the cost of the paper used. Hence, he rings the changes on "fiat" money, and getting $100 dollars of it for "a bushel of wheat." I really supposed that everybody knew that there was no money in the world but "fiat" money, no matter what it is made out of. Secondly, I really supposed that when the government made a dollar, that everybody knew that it was worth one hundred cents. Now my "plan" or "position" is, that the government furnish to the people this money, for its face value and cost of making it. This is exactly what the government does for the national banks. Why not treat all of us poor mortals the same way? Are bankers better than other men? The government furnishes them the people's own money at its face value, and one per cent. to pay for printing the blackbacks, and the people have to pay this favored class from six to twenty per cent. usury in order to do business.

Is there any justice in that? It is oppression of the masses by the money-mongers in order to grind out usury. And if the masses understood the money question they would very soon hurl into oblivion this infernal system. But money-mongers control the government, and don't want any money in circulation that don't draw interest or usury, which is the same thing. They hate greenbacks worse than they hate their father the devil, because greenbacks don't draw usury.

I was astonished and pained to note that the doctor brought in the parable of the talents to justify usury.

He says: "The servant who had an eye to business, and looked upon his money as valuable property to be dealt in, put it out at interest," etc., "was commended by his lord," etc. The impression sought to be made on the mind of the reader, and which I fear was made, is, that Christ commended usury. Who was it that commended this servant for practicing usury taking? It was his master, the nobleman. He admitted to the one that hid his talent, that he was an "austere man," that he did "take up what he laid not down," that he did "gather where he didn't sow." In short, he admitted that he was a thief and made his money by robbery. Is it not refreshing and consoling for usurers to know that the practice of usury is "commended" by robbers as "frugality and industry."

This parable was not given to teach men how to do business with each other. It refers wholly to the relation of man to his God, and not to his fellow man. "The kingdom of heaven is *as* a certain nobleman," etc. Our God made us and *owns* us. We belong to him, are his *property*. Hence he of right demands of us to use our "talents" for him.

The slave-holder claimed *all* the labor of *his* slave, and to make this parable sustain usury as right, is to take the ground that human slavery is right.

If you would know the manner of doing business which Christ, the Lord, commends, turn to Luke vi., 31–35 verses.

Richview, Ills.

REMARKS BY THE EDITOR.

We do not know that this discussion of the nature and character of *money* will be regarded as highly useful by our readers; but we must indulge our excellent contributor with this last shot at his hobby-target of ten years' standing, accompanied by these parting remarks.

We did not and do not dispute his definition of money, as consisting entirely of the value incorporated in it by the government fiat through the authoritative stamp impressed thereon, whether that currency be gold, silver, copper, nickle or paper.

The material substance used as currency, and which bears this stamp of the government, may or may not have any intrinsic value outside of its money producing stamp; but we concede and always believed that its value as money, and as the financial and commercial equivalent of every kind of property, consists alone in this authoritative stamp impressed upon it by the government.

Of course, therefore, we agree fully with all our contributor says as to what really constitutes money. But he goes altogether too far in claiming that because we agree with him in this particular, we have therefore given up the real and only point in controversy between us, namely, the property-character of this government stamp which we call money.

Mr. Oglesby no doubt understands the intrinsic nature and character of *money* as here explained, but he seems to be entirely oblivious to the true meaning and character of *property*. He seems to shut his eyes to the fact that a government stamp which stands as the equivalent of any kind of property in the markets of the world is of necessity and intrinsically as much property as is any article it will buy.

Should we ever be led to insist and to harp upon any such idiosyncracy and to fight all opposition to it for ten mortal years, as if it were an essential phase of social science and political economy, when it manifestly presents a worthless distinction without any essential difference, we should not blame our intelligent acquaintances for looking upon us as a crank in the most objectionable sense of that term.

Why, all the dictionaries of the world define

money as *property*, simply for the common-sense reason that money, of whatever nature, which bears the stamp of the government, represents every kind of property known to commerce. Webster defines property: "*Possession* held in one's own right: An *estate*, whether in lands, goods, or *money*."

If our friend Oglesby has in his "possession" any considerable quantity of money, and if he really believes it is no part of his "estate" or "property," he can send these mere government stamps by express to 23 Park Row. We will not have the slightest scruples in receiving such consignment as genuine "property," and will cheerfully pay the express charges.

We are the fortunate owner of four United States patents for valuable improvements. Will Mr. Oglesby deny that these patents are property on the whimsical caprice that their only value consists of the government stamp placed upon them? He forgets our illustration last month of the paint and canvas which would cost but a dollar, and which become actual property of the commercial value of thousands of dollars simply by having the ideal fiat of a Reuben's brush stamped upon it.

If our friend is so fortunate as to be the possessor of a home, he undoubtedly regards it as actual property; yet it is only property by virtue of certain stamps and ink-marks made on a piece of paper which he keeps locked up in his safe. Surely this title deed, which secures to him his home, is as much property as the land which it guarantees and makes property; and if this be true it follows that both the land and the deed no more constitute property than did the government stamps (greenbacks) which he paid for them as their equivalent.

But like all fantastical and untenable notions this no property idea of money is inherently self-contradictory. Let us prove it. Last month Mr. Oglesby insisted that "the true policy is or should be, for the government to furnish to the people the money needed to make exchanges, *at cost of issuing and handling*."

Now, after seeing the absurdity of the government flooding the country with its fiat-greenbacks at less than one cent on the dollar (the actual cost of paper, printing and handling), he shifts his position and says as in the foregoing essay:

"Now, my plan or position is, that the government furnish to the people this money *for its face value and cost of making it!*"

Quite a somersault. A man who disparages other men as knowing little or nothing about money, announcing the fact that he has studied and written upon the subject for ten years, should not have precipitated himself into such an unfortunate escapade as the above. Besides, as all three of his money articles show, he is a mortal opposer of usury or even as it seems of any interest whatever for the use of money; yet he would have the government, according to his revised "plan" or "position," not only to charge the poor people with the "face value" of the money they may want to use in their business, but in addition the "*cost of making it!*"

Well, this beats Shylock himself. Our government is not nearly as bad as Brother Oglesby would have it on his "plan," since Uncle Sam lets us have all the money we want at its actual "face value" and throws in the "cost of making it" gratis.

The very fact of admitting that money has a "face *value*" admits it to be *property* in the true sense of that term. The real *value* of a thing is its necessary property-character and nothing else. The fact that a painting, a deed for land, a patent, or a government greenback has a real value consists alone in the fact that it is so much property. The idea of government selling money at its "face value" and still money being only a "shadow," as our contributor represented it last month, seems preposterous. Our government is not dealing in *shadows* but in real substantial entities, and if Mr. Oglesby should buy from the United States Treasurer $1000 in greenbacks at its "face value," we have not the slightest doubt but he would look upon that purchase as $1000 worth of actual property, even if he did not pay the extra bonus for the "cost of making it," as he thinks government would have a right to charge.

His denial that Christ commended the enterprizing servant who used his money as property and thus increased his possession, is strange, to say the least. He seems to prefer the testimony of the slothful servant who deliberately, slanderously and impertinently accused his noble master of dishonesty as an excuse for his own laziness and want of enterprize.

THE NEW VOLUME BEGINS.

Volume VII. of the MICROCOSM now greets its thousands of subscribers with many self-congratulations upon the successful completion of its predecessor—Volume VI.

That Volume was commenced under the most unfavorable financial circumstances that could well have been imagined. These circumstances need not here be restated in any detail.

By the fault of others, into whose hands we had mistakenly entrusted the publication of our journal, the *Scientific Arena*, which had succeeded Vol. V. of the MICROCOSM, came to

an inglorious end near the close of its second volume, alone from journalistic inexperience, business incapacity and a punctilious disregard of advice from those who knew better. But let it pass.

Driven to the financial wall, our case was desperate if not very nearly hopeless. The sale of our books, which was our only resource, had nearly been destroyed through the unnecessary failure of our journal and loss of confidence on the part of our former friends, till not enough money was coming in to meet the current expenses of office rent, thus leaving us without even means for the reproduction of volumes of our works as they became slowly exhausted upon our shelves.

Finally, by this forced, unexpected, but now fortunate release from a contract that had nearly starved us to death and apparently had brought our labors to a disastrous end, we found ourself once more free from a tyrannical restraint, though with only our naked hands and restless brain, and with a few sets of our Scientific Library remaining to be sold.

This incubus of three years' duration thus lifted from us, we were ready to make another start. But this could only be done by the use of a little ready money with which to issue the first number of the revived MICROCOSM, which we had proposed and forecast, as the talisman that was again to spread the sails of the good ship Substantialism.

This ready cash we did not possess, nor was there a soul in New York with sufficient confidence in our work, which had so incontinently failed, to advance us even $100.

Our only resource or hope then was to appeal to our old subscribers and induce them to purchase our remaining books even at cost, and thus allow us once more to place before the world the claims of the Substantial Philosophy.

This we did in a "Candid Statement of Facts," in which we gave all the details of the disastrous mismanagement of the *Arena*, and the unfortunate results of collapse that followed.

A few noble friends who loved the cause for which we had so long been battling, and who were not willing to see the flag of Substantialism ignominiously go down without another fair engagement with the enemy's ships under their black flag of materialism, came grandly to our aid, ordered sets of our books, wrote us cheering letters of encouragement, while several of the more enthusiastic substantialists volunteered loans of cash to put the new volume of the MICROCOSM on its feet. All these friends are now very dear to our memory.

The result was, our journal was started under the most favorable prospects, considering the fact that many of the old subscribers had lost confidence in our probable success on account of previous failure, and would not even venture a fifty-cent subscription to save the cause which they regarded as lost, lest by some peradventure that paltry amount should be sacrificed.

Suffice it to say the new volume began its work successfully, and has kept it up to the finish, which occurred last month. Those who doubted its ability to live through the year will now probably have the nerve to subscribe, if not, the MICROCOSM will go on without their assistance, the same as it has done the year previous; for never, since the first number of the first volume of this journal went to press, has the financial prospects of the paper been so good as on sending forth this Seventh Volume greeting.

Already subscriptions are pouring in beyond the capacity of half a dozen clerks properly to arrange and dispose of, many clubs of 25, 50 and even 100 taxing their powers of endurance. Let them come. [See our extraordinary terms to clubs in last month's issue, a copy of which will be sent free to any address.]

We make no flowery promises concerning the present volume as to its contents, except to say that each subscriber will, no doubt, receive the full value of his subscription if he will find time to read even a portion of what its monthly numbers shall contain.

Our readers will observe, as they have already observed during the last half of Vol. VI., that we have a small business matter just now to occupy a part of our attention in the shape of our Health-Pamphlet, the financial outcome of which can not fail to redound to the future of Substantialism.

It is true that this phase of our journal has temporarily taken a portion of the space which otherwise would have been given to scientific investigations. Most of our readers, however, generously concede to us this opportunity to lengthen our borders and strengthen our stakes, on the principle that the end, if lawful, justifies the means. But should any one be so selfish and mentally contracted as to object to this auxiliary enterprise, he is at entire liberty not to read the present volume at all, but to step aside while the train passes on, so as not to be pulverized by its substantial wheels.

Praying that the truth may triumph and greatly advance its hold upon the world through the ministrations of the MICROCOSM during the coming volume, the editor hereby transmits to each friend of the cause the benediction of Substantialism.

BROWN-SEQUARD'S ELIXIR ONCE MORE.

BY THE EDITOR.

A New York *World* correspondent at Paris, France, has recently had a long interview with this eminent physiologist whose supposed discovery for prolonging life recently created such a furor in this country.

In this interview Brown-Sequard made no concealment of his chagrin at the wretched fiasco his American friends had made of his discovery, and flatly intimated that the cause of failure, and even of fatality, as in the case at Dayton, Ohio, was in consequence of the learned M. D.s of this country using the partially putrid flesh of animals from which to extract the vital juice for their hypodermic injections.

He reiterated his unequivocal and unshaken confidence in the value of his *vital tonic*, as he prefers to call it, and says that he has repeatedly tried it upon himself, when very feeble and emaciated, and with the most beneficial results.

He declared that a few injections of the vital juice extracted from certain portions of the guinea-pig had more than once rejuvenated him so that he could endure twice as much fatigue, and work twice as many hours without being obliged to stop for rest.

He told the correspondent that he was now seventy-two years old, and intimates that but for his discovery of these sub-cutaneous injections, his life would not have been thus prolonged.

Now, we do not deny but that there is a kernel of true philosophy and correct reasoning in Brown-Sequard's claimed discovery, so far as the result of the hypodermic injection of certain vital extracts is concerned. Neither do we deny the facts he gives as to the improved vitality he himself has experienced by means of such additions to his vital circulation. But we do firmly believe that any such beneficial results as he describes are obtained at too great a vital cost, and with altogether too much risk of dangerous consequences, for ordinary practice in the hands of the average experimentor.

He admits that unless the vital essence employed for his subcuticle injections is extracted from healthy and freshly killed animals, it would be a risky operation for general practice, and he laments that butchers are not as conscientious as they ought to be as regards the time since their food animals had been brought to the shambles.

The truth is, Brown-Sequard's discovery is but a retrograde modification of the old and well-known process of the transfusion of blood from a healthy man or animal directly into an opened vein of a person suffering under an excessive lack of vital circulation. Manifestly the process of transfusion is by far the more rational of the two, since the vital essence of the animal in the shape of living blood has had to pass through no chemical manipulation, atmospheric exposure, or change whatever, before mingling with the circulating fluids of the patient; whereas the animal essence, obtained by boiling or other chemical process of extraction, must necessarily contain other ingredients from the animal's flesh in addition to its vital principle, with the added danger of actual impurities from the atmosphere and the vessel used, that may superinduce blood-poisoning and other deleterious effects, as in the case of the man who was killed at Dayton, Ohio.

The employment of sub-cutaneous exhilerants and excitants, as well as of deadly poisons, is as old as rattle-snake bites, and is now practiced more extensively than many are aware of by those addicted to the morphine habit—these mono-maniacs caring little for the pain of the puncture of the flesh by the syringe compared to the exhileration the drug produces.

So it appears there was not a thing new or original in Brown-Sequard's claimed discovery, except his mistaken supposition that by crushing the muscular tissues of the guinea-pig's organs which secrete the vital germs, and extracting the animal essence therefrom, he was really obtaining and administering the vital germs themselves! A more whimsical and ridiculous error was never conceived by a man making any pretense to physiological knowledge. As well have crushed a portion of the muscle of the foreleg, or any other part of the animal's body.

Had Brown-Sequard proposed the sub-cutaneous injection of the vital germ-cells themselves after their secretion, there would have been a good deal more original scientific sense in his theory. Let him change his plan at once and adopt this suggestion, and he need not bother about giving us credit.

Another seriously objectionable feature about the Sequard method of hypodermic injections, as well as against the process of blood-transfusion, is the most painful incision of the flesh necessary to such injection and transfusion. The wound thus produced, in order to secure an opening to a vein, or for the injection even of a teaspoonful of his elixir under the skin of the arm or leg, is often such as not only to cause intense pain, calculated to counteract any curative effects, but often to produce an after ulcer of a serious character, especially if the surgical part of the operation is not conducted with the utmost cleanliness of the instrument and materials used. Surely, if anything in the universal art of healing is contrary to nature and out of harmony with common rationality, such a

hideous process of opening the flesh with a knife, thus causing a bloody and painful wound, must be so regarded.

Whatever beneficial effects may possibly accrue from the mingling of the vital and essential germs of animate being with the vital force of the human organism, in order to enhance our general fund of vitality, and thus add to human longevity, it is certain that Brown-Sequard has got decidedly on the wrong trail.

We have studied this very subject for years, even before Brown-Sequard's name had been mentioned publicly in connection with his guinea-pig extract, and we feel sure, from experiments we have made upon our own organism, that the real advantages of all his claimed discoveries and experimentation with very much in addition, can be reached without any of the painful and dangerous contingencies involved in his crude and unscientific barbarism.

We fancy, and without boasting, that we have already done enough in the scientific field to create at least a suspicion in the minds of the tens of thousands of intelligent persons, who are now using the physiological treatment set forth in our Health-Pamphlet, that what we state in this connection in regard to the Sequard discovery may have some foundation in fact, and consequently that it may be worthy of a passing consideration by the reader.

Whether or not this be so, we have no hesitation in saying to the friends of the MICROCOSM that in addition to the health-discovery, first formulated and fully set forth in our pamphlet, we expect to announce something in the near future, in the same general line, as the result of our more recent personal experience, that will more than double all the advantages yet attained, and which will no doubt realize the full dreams of Brown-Sequard without incurring any of their dangerous and otherwise objectionable features.

For the present we are in the midst of a system of careful experiments upon ourself and taking notes, with one only besides ourself in the secret. As we patiently waited during forty years of experimentation on the practical development of our original system of hygienic treatment, before feeling sufficiently assured of its success to venture the issue of our Health-Pamphlet, so we now feel justified in waiting a few months longer for certain physiological denouements in our own person, before proclaiming to our friends what we conscientiously now look upon as our final step in the true philosophy and rationale of the renewal of youth, and the greatest possible prolongation of life under our present civilization.

In the meantime let the drug-vending enemies of our Health-Pamphlet, who feel that it is rapidly causing their traffic in poisons to slip from their fingers, wince and gnash their teeth. They might as well try to stop a Swiss glacier with a bamboo walking stick, as undertake to check the progress of the treatment thus started, with its utter repudiation of drugs, as set forth in that pamphlet.

It is only a question of a little while, in the judgment of many of our best educated and most unprejudiced physicians, who have become disgusted with the administration of poisons, when drug medication as a profession will be substantially doomed. When this epoch shall occur, and when the new treatment for disease shall have come into universal and intelligent practice, with the final talisman of human rejuvenescence and longevity for its abettor, as here hinted, we may reasonably look for the elevation of the race, both physically and mentally, to a much higher plane than anything heretofore known. This may not be the millenium spoken of in Revelations, but it will no doubt answer very well as its precursor.

REV. DR. BUCK'S LETTER TO THE CLERGY.

Washington, D. C., Nov. 16th, 1889.

Rev. and Dear Brother,—I write you this personal letter to call your attention to a matter which I believe to be of cardinal importance to the Church and to the general cause of religion throughout the world.

Our beloved Bishop of Minnesota, in his able address before the recent convention in New York, called the attention of the clergy to the great necessity of meeting the prevailing scientific objections to religion and thus of counteracting the rapidly growing tendency to agnosticism and materialistic infidelity.

No intelligent observer of the drift of modern philosophical and scientific education, even in our religious colleges and universities, but must note the pernicious tendency to a general skepticism concerning the vital and essential truths of our holy religion, based on the supposed evidences of modern science. That such skeptical drift of thought is rapidly growing and already menacing the Church in its mission of converting the world, all the clergy with whom I have conversed, are pained to acknowledge; while all are equally convinced that no efficient scientific means within our reach should be spared to meet and counteract this tendency.

That this materialistic trend of thought based on supposed scientific data, can only be met successfully by counteracting scientific and philosophical truth, can hardly be questioned by a logical mind.

I am glad to say to you and to the clergy at large, that I have been so fortunate as to become acquainted with a system of scientific doctrine and philosophical reasoning, which, in my judgment, goes further toward meeting and counteracting modern infidelity, than all other lines of argument that have hitherto been employed.

The new philosophy, formulated by A. Wilford Hall, Ph. D., LL. D., of New York, is known as "Substantialism," and while it is in

strict accord with the philosophy of religion and the evidences of a future life, it meets skeptical science on its own grounds, accepts all its verified facts, and then proceeds to reconcile those facts with the existence of God, the immortality of the soul, and the truths of revealed religion.

After years of careful investigation in the line of this new philosophy, I do not hesitate to believe that it is capable of doing more for the spread of Christianity among the masses of thinking people than all other systems of scientific and philosophical teaching put together. All it needs is an intelligent comprehension and recognition by the clergy, and an unprejudiced co-operation on their part, in making it known to the masses.

I take the liberty of sending to you a few marked copies of the MICROCOSM, Dr. Hall's paper, and the "Organ of the Substantial Philosophy," in which this doctrine is discussed. Particularly would I call your attention to an article in the first number of the current volume, from the pen of young Mr. Rogers, the associate editor, who is a student in the Virginia Theological Seminary.

I will be glad to have you look into this new method of meeting skeptical and agnostic science on its own ground, and with its own peculiar weapons. In this way alone do I conceive it to be possible to make any appreciable headway in staying the current of materialism, which is so disastrously affecting the rising generation. Sincerely yours,

JAMES A. BUCK, Rector of St. Paul's Church.

A SPECIMEN OF KIND WORDS.

We take the liberty, on our own responsibility and without consulting the Editor, of giving to the readers of the MICROCOSM the following letter from Rev. A. B. Markle, which is only a specimen of hundreds received each week from those who have carefully studied the teachings of Substantialism, and have learned from personal experience to appreciate the value of this new departure as a defence and confirmation of revealed religion from the plane of natural philosophy. This appreciation is growing among the clergy of all denominations and gives the founder and his friends ground for much encouragement.—ASSOCIATE EDITOR.

San Diego, Cal., Oct. 31st, 1889.

DEAR DR. HALL,—I see by the *Standard* that you have passed the 70th mile stone of your life's journey with that degree of strength that bids fair to carry you beyond the four-score limit. We unite in thanking the Heavenly Father for thus keeping you, and pray that you may long be spared to finish your work.

We are glad to hear that you were remembered by your friends in so beautiful a gift, one that will be valued by you for the love and esteem it represents, and that will some day, far distant we hope, be held sacred by those to whom it descends, for the memories it will bring of the one they learned to revere and love, not alone for the grand work he has done, but for himself.

You will not deem this an attempt at flattery, for you have long since risen above that; but please accept it as the testimonial of one who has been, by your words and works, made stronger in the hope of immortality.

Your sincere friend,

A. B. MARKLE.

THE CRISIS AT LAST REACHED.

We take no little degree of pleasure in printing in this first number of Vol. VII. of the MICROCOSM, the introductory article of a series of reviews of the "Old and New Theories of Sound" now to appear regularly in the *English Mechanic and World of Science*—one of the oldest and ablest scientific journals of London.

This series of reviews is by the pen of no less distinguished a writer and scientific investigator than George Ashdown Audsley, F.R.I.B.A., author of numerous books, including that renowned work "The Ornamental Arts of Japan," which Charles Scribner's Sons of this city sell in the best binding for about $400.

We are glad to feel that at last the new departure in acoustical science, which has been almost entirely unrecognized in England since its first publication here, a dozen years ago, has won to its aid and defense such a masterly pen as that wielded by Dr. Audsley. Surely, Professors Tyndall and Helmholtz will no longer feel warranted in assuming the dignity of silent contempt for the "Substantial Theory of Sound" when their compeer in every sense of the word thus kindly but decidedly invites them to the investigation.

Our readers, as well as all professors of physical science in this country and throughout Europe, will intently watch the progress of these essays from the pen of that eminent British author and scientist as they shall appear in the *English Mechanic*, and as we will reproduce them in these columns from month to month. Here is the Introductory, and we speak for it a careful reading:

Acoustics: A Review of the Old and New Theories of Sound.—I.

BY GEORGE ASHDOWN AUDSLEY, F.R.I.B.A.

Introductory.

Some apology may be deemed necessary on my entering upon such a subject as that of the Theories of Sound in the columns of a scientific journal; and to the ordinary intelligent reader, and, more especially, to the English student of the Science of Acoustics it may, at the outset, appear presumption on my part, and a waste of paper and ink, to discuss a subject which such scientists as Professors Helmholtz and Tyndall have written so clearly and lectured so eloquently upon. How long, after I have entered upon the consideration of the *new theory of sound*, the reader will hold this opinion remains to be seen. In Europe, and, indeed, until very lately, throughout the whole civilized world, these professors have been looked upon as the high priests of Sound; and although the theory they teach is as ancient as the time of Pythagoras, and has numbered amongst its many disciples the great Newton, there can be no doubt that the names of Helmholtz and Tyndall will forever be indissolubly and most prominently connected with it. In what estimation their advocacy and clearly-enunciated opinions will be held by the coming generations of scientists I shall not at this point venture to predict. When my present review is completed, it is highly probable that some of my readers may find themselves in a position to form a tolerably accurate idea on the matter.

For many years past my studies in the Art of Organ Construction have led me in a very natural manner into the study of the Science

of Acoustics, especially into that branch of it which is more directly connected with the production of sound in organ pipes and musical instruments generally. The desire to obtain the fullest scientific information on this interesting subject soon made me conversant with the opinions and theories of all the great European acousticians and physicists; but, whilst I hardly dared, even to myself, to question the theories and arguments of such apparently profound thinkers, I was compelled to admit that they brought no feeling of satisfaction to my mind, or accounted in any reasonable manner for the observed behavior of organ-pipes and orchestral instruments. There was always something wanting, something left unaccounted for and unexplained. The pages of all accepted authorities were read and re-read in the hope that I had overlooked some missing link, some fact that would send a ray of light into what, to my mind, was a very shady place. I read and searched in vain, disgusted with what seemed to be my own stupidity.

As regards the production of sound in organ-pipes, I had before me the clearly-expressed opinions of Professors Helmholtz and Tyndall, Mr. Herman Smith, and Herr Schneebeli, and also before me I had veritable and varied organ-pipes producing their musical tones, yet nothing appeared satisfactory. That tones, and beautiful tones, were produced by the pipes of all sizes, shapes, and classes was obvious; but, unhappily, that all the apparently learned and very dogmatic theories concerning the modes of their production failed to account for what my ear recognized was equally obvious. Careful calculations in degrees of temperature, numbers of vibrations, supposed lengths of *sound waves*, pressures of wind, and natures of materials, instead of clearing away the fog raised by these theorists seemed to make it more London-like in density and opacity. I felt it was a true case of "the blind leading the blind."

It may be here observed that at the time above alluded to I persistently and very naturally viewed all acoustical phenomena through the medium of the *wave-theory of sound*, and in the light thrown upon the subject by the teachings and the apparently exhaustive researches of all the Continental and English acousticians; and now I can not wonder at the difficulties which beset my path of investigation, and the eminently unsatisfactory results of that investigation. Over and over again there flitted before my mental vision a picture of sound as a substantial reality, as something created within the sound-producing object, and sent forth from it under certain specific conditions, just as we recognize light, electricity, heat, and odor to be sent forth from their proper sources. Now, although I frequently reasoned thus, and felt how greatly such a hypothesis would aid one in accounting for and understanding the observed facts in sound-creation and propagation which seemed so unaccountable and hopelessly difficult of solution under the old *wave-theory*, I could not at that time bring myself to such a pitch of unbelief and opinionativeness as to throw aside as false and valueless the results of the great Newton's labors and Laplace's appendix thereto, and to close for ever, so far as I was concerned, the pages of the apparently profound and essentially dogmatic works of Professors Helmholtz and Tyndall, and the other well-known Continental savants.

Time works wonders; and now that a more profound thinker, more astute reasoner, and more trustworthy guide has arisen in the scientific horizon in the person of the greatest American scientist, there need be no hesitancy in this matter; and the writer, for one, has finally rejected the old *wave-theory of sound* as insufficient, essentially fallacious, and absolutely absurd.

I can quite easily imagine that to the English student, saturated with the teachings of Profs. Helmholtz and Tyndall, the concluding words of the last paragraph may seem altogether too strong, and to be unwarrantable under all circumstances known to him—in fact, such an impression would be quite natural on his part—but I must ask him to suspend his judgment until he has read the entire review I shall have the gratification of laying before him in these pages. Let him, in all fairness to the scientists on both sides, approach the consideration of the *new theory of sound* with a perfectly open and unprejudiced mind, with his reasoning powers untrammeled by antique beliefs and unsubstantial calculations, and his memory free from the records of misdirected experiments; and then let him take pen in hand and verify all the startling calculations which shall be submitted to him in the course of this review. If he has an earnest desire to reach the truth and to sweep from his mind all errors planted there by old-world fancies and fallacies, I do not hesitate to predict that he will end in using stronger language than the above in his condemnation of the *Wave-theory of Sound.*

The *new theory of sound* may be said to have been formulated within the last few years only, having been first given to the world by its founder, Dr. A. Wilford Hall, of New York, in the year 1877. Now many earnest investigators are wanted in the new field, and it is in the hopes of enlisting such that I venture to pen this essay. It is hopeless to expect such men as Profs. Helmholtz and Tyndall to throw to the winds their clearly and persistently-enunciated opinions, and their convictions based on years of study, misdirected as they may have been, even should they become personally convinced of the impossibilities of the theory they have so long taught. Now younger men, free from prejudices born of the schools, must take the field, and by their united labors and investigations create the true Science of Acoustics on a new and logical foundation. How long it will be before the present treatises on the *wave-theory* of sound are placed on the shelves of our libraries amongst the physical treatises of the Middle Ages depends upon the unprejudiced investigations and the acumen of the students of the *New Theory.*

Speaking of this theory, about which I shall have much to say in the latter part of this review, its originator remarks: "The truth is, the novelty of the corpuscular hypothesis constitutes the principal objection to its acceptance. We have been so constantly through life habituated to consider nothing as substance unless corporeally tangible that the mind naturally hesitates in conceding the substantivity of anything which eludes the senses as palpable material, or which will not submit to chemical analysis. But the world is growing, and, despite the efforts of would-be science to keep it in its swaddling-clothes, seems destined to grow on till its present scientific raiment shall not only have become too small for it, but shall have also become so ludicrously thread-

bare and rent that true philosophy and science will be ashamed to look upon its semi-nudeness. In view of this encouraging tendency of the world to grow instead of retrograde, the writer proposes in a humble way not only to add what he can to the fertilizing and fructifying elements which may tend to accelerate its growth, but to lend a sartorial hand from time to time in helping to replenish its now scanty and tattered wardrobe." Dr. Hall places his finger on the greatest difficulty which will beset the acceptance of his new theory, but nothing of importance has ever been achieved in this world without difficulty, and he and his disciples need not despair. How thoroughly in the matter of sound he carries out the proposition contained in the closing sentence of the above quotation I shall have the pleasure of laying before many an English reader.

After all is said and done, I can easily imagine a fond lingering towards the old love in the minds of numerous students of Acoustics, especially as that love has been fostered and blessed by the high priests whose names are as household words to every acoustician; but let them take heart of grace and step freely from the old bonds, however pleasant, to the arms of Truth. To throw aside all the eloquent and apparently conclusive teachings of such high priests is by no means a light task. As Prof. Henry A. Mott, Ph.D., LL.D., one of Dr. Hall's eminent followers, remarks:—"To attack a theory which has been upheld for 2,500 years, and which has been and is sustained by the greatest living scientists, is certainly a very bold undertaking. The nature of the undertaking should not, however, deter truth from asserting itself, or deter any scientific man, with sufficient individuality and independence, from exposing the fallacy of the same, if such fallacy can be shown to exist. It is the duty of every man to do his own thinking, and not allow others to think for him. The old saying,

> "'The name is but the shadow, which we find
> Too often larger than the man behind,'

is too true to be overlooked. Great names often carry with them too much authority, and it requires a well-balanced mind to properly attach the correct importance with which in many cases such names deservedly merit. To accept, therefore, the present theory of sound as correct because it is sustained by 'great names,' and because on the authority of such names it is pronounced correct, without exercising any individuality of thought to inquire into its merits or demerits, would be only to impede the progress in search of truth, and not only to impair the value of scientific deductions, but at the same time limit the progress of science." I commend to my readers' very serious consideration the words I have just quoted.

In the following series of articles I propose, in the first place, to give as clear and concise a digest as possible of the present widely-accepted *Wave-theory of Sound*, as set forth in the treatises of Professors Helmholtz, Tyndall, and Mayer, and the writings of other eminent scientists, and during the progress of that digest I shall enlarge somewhat upon and pointedly direct the reader's attention to certain salient matters and results inseparably connected with the theory as taught by them, asking him to attentively follow my remarks, test there and then their logical bearing and accuracy, and carefully store them up in his memory for future use or reference.

In the concluding articles I shall do my best to give as clear and concise a digest of the Corpuscular* Hypothesis, and shall present sufficient facts and figures to enable any intelligent reader to decide which theory is worthy of acceptance. I know that those facts and figures will create astonishment in his mind; but I can promise him he can easily verify them as I have done. Truth fears no test or investigation.

(To be continued.)

OUR PRIZE-ESSAY CONTEST.

We had expected to give the decision of the judges this month in awarding the three cash-prizes as promised in the first number of Vol. VI. But for want of time for consultation the award of the first prize only has been unanimously agreed upon up to going to press. That has been awarded to Mrs. M. S. Organ, M. D., for her essay on the Source of the Sun's Heat in the April number.

The second and third prizes will be announced in the next number. The first cash prize, $30, has been sent to Mrs. Organ.

We now repeat our offer of a similar list of cash prizes for the present volume—$30, $20, and $10—and on the same terms as contained in No. 1, Vol. VI, which will be sent free on application.

Special Offer to Ministers, Postmasters, Lawyers, Editors, Dentists and Professors.

[From Sept. MICROCOSM.]

"We have so much faith in the intrinsic merits of our Health-Pamphlet and the treatment unfolded therein, that we now propose to any *clergyman* who will order it at the regular price ($4), and who will give the treatment a faithful test for one month, that if not satisfactory he shall have the privilege of returning the pamphlet and receiving his $4 by return mail, without any reduction for our trouble and expense. This surely ought to satisfy the most skeptical and wavering.

But it is understood that such minister must not only agree when ordering the pamphlet not to show it or reveal its contents outside of his own family, but must, if he returns it, send a like written promise never afterward to use the treatment or permit it to be used by his family."

The foregoing special offer is now extended to postmasters, lawyers, editors, dentists and college professors. See our "*Extra*" MICROCOSM, telling all about the philosophy of the new treatment. Sent free on application. Address the Editor.

☞ Publishers of newspapers are asked to read Dr. Andsley's opening gun to Tyndall, Helmholtz, and other great scientists on page 12. Should any editor want this series of articles for his readers we will furnish them monthly as they appear in the MICROCOSM if so requested.—Editor.

☞ See our most unprecedented club-rates for the MICROCOSM last month, page 187.—Editor.

*In his later writings the founder of Substantialism has entirely abandoned the use of the term *corpuscular*—which he had borrowed from Newton—and now uses the much more appropriate word *substantial* instead.—ASSO. EDITOR.

OUR LITERARY PALÆONTOLOGY.

This page, in last month's MICROCOSM, has created almost a circus among our subscribers. That number had no sooner been mailed, with scarcely time, as we thought, to reach our subscribers, when correct answers to our "test" puzzle began to pour in upon us almost to the consternation of our sub-treasury, as it simply meant that we had been caught napping, and that our offer of a bound copy of Vol. VI. of the MICROCOSM to each subscriber who would send us the correct solution by the first day of the present month, was likely to cost us several thousand books, at the retail price of one dollar each.

The first mail after the paper had reached our nearest subscribers brought back two correct answers—one from Dr. William Taylor, treasurer of the Pa. R. R. Co., at Philadelphia, and the other from the Rev. C. W. Camp, Rector of Grace Church, Lockport, N. Y.; the latter assuring us that he had solved it, all except one word, in fifteen minutes, and that word, "genius," did not take him but a few minutes longer. This was certainly very good work.

Since those two opening guns of the contest, solutions have more than rained; they have simply poured in upon us, sometimes a hundred or two in a day, a majority of which proved to be correct.

We shall now proceed, as fast as the proper examinations can be made, to mail to the successful contestants the bound volumes in pursuance of our promise last month, several thousand copies having just been prepared for that purpose.

Subscribers by the way, who receive the bound volume, will greatly oblige us and do much good, if they will hand out their loose numbers of Vol. VI. to their intelligent neighbors for examination.

We here reprint the "test" puzzle precisely as it appeared in the November number:

No e er ro f f e l l t a y e i s ca be
a-ke ha f r ne o be a le to ore ast nd
wo k o t rom he fr gm ta y nd s el ton-
let rs of o ds, th co le e th gh a d im
of he ri r. It i ke ea ng ew en he
li es.

And here is the solution for those who were not able to work it out, as well as for those who were:

"No better proof of real literary genius can be asked than for one to be able to forecast and work out, from the fragmentary and skeleton-letters of words, the complete thought and aim of the writer. It is like reading between the lines."

We now take occasion to say that notwithstanding the large number of correct solutions sent in, nearly one-half of the attempts (lucky for us) were failures in some one of the words. A large majority of these failures were in using the word "greater," "clearer," "nearer," or "severer" instead of *better*, the second word in the problem. A little close observation will show any one that neither of these four words will exactly fill the bill without encroaching upon the proper spacing. Other failures were in using "merits" for *genius*, and "vim" for *aim*, neither of which conveys the true idea, while m in place of g consumes too much space. Many also who are not "subscribers" and consequently not eligible, sent in correct solutions.

On the whole the new puzzle as an intellectual recreation and educational pastime has proved a success, having been entered into by all classes of readers, including ministers, doctors, lawyers, teachers, printers, etc., many clergymen declaring that they had not spent a more enjoyable hour with their children for years than while working over our new palæontological problem.

Several kind-hearted friends have expressed sympathy for us in the unavoidable depletion of our exchequer, because we had mistakenly made the problem so easy. These friends have earnestly advised us not to offer the one dollar in cash for each successful solution of our next problem as we had purposed doing this month, or otherwise we would run a great risk of bankrupting the MICROCOSM.

We honestly thank these friends for the interest they take in our pocket-book, but as our word is out we will be obliged to take the risk of losing a couple of thousand dollars, if need be, to give each *subscriber* to the MICROCOSM a chance for a crisp, new one dollar greenback by working out and sending to us, *without any assistance*, a correct solution of the following paragraph by New Year's day.

We will add for our subscribers' encouragement and assistance that this skeleton contains at least half the letters in any word, and considerably more than one-half of all the letters of the complete paragraph, arranged in their proper relations to each other, and at their exact distances apart as they should be when evenly spaced for the appropriate words, the same as the problem which was given last month. In other words, this skeleton would contain 287 letters when complete, with only 113 letters here left out.

This paragraph, for obvious reasons, is a new one, and like its predecessor composed for the occasion, but properly constructed so as to convey a consecutive idea. Here it is:

-T e m n w o n e n i n l l a d e i r t e y
d r u s n o h e e s v s n t o l h e e r o a-
t n o i s e l o e n, u t h e o n i g u n h-
m n o h e c i l l a . T d y o e r n l l
r p e t a e w o l a e o e r o y u , on-
f o m n o n i t d i e n a t e n , u t
c - p o t i e i s w h h e i g e s i t e e t f
s o e t n a i i l z e o m n i y.

This literary palæontologic skeleton will be reprinted next month precisely as above, and immediately below it the complete paragraph, with the dropped letters filled in, will be given.

We will also print the name and address of each successful contestant received up to the 28th inst. Let each one therefore keep a copy of his or her attempt for comparison with the real solution as it will appear next month. Don't mar this page by cutting out the skeleton, but keep the MICROCOSM for reference.

Let it be remembered, in seeking for the real solution, that no word except the right one will exactly fill the allotted space and at the same time make complete sense. We suggest this as an important aid to those who shall attempt to work out these problems.

Next month we shall probably present a new problem with an offer of still larger cash prizes for all winners. It will depend somewhat upon the financial results this time.

Write short letters always, and if the solution is sent with other matters let it be written out on a separate slip of paper, with the name and address of the contestant, to be filed.

Those who did not see last month's MICROCOSM, and who may wish to learn all about this new art of *literary palæontology*, its origin, etc., can have a copy free.

OUR HEALTH PAMPHLET AN UNPARALLELED SUCCESS.

No such triumph in the healing art has ever before been recorded. We dare not even state the true facts in regard to the astonishing demand for this drugless remedy lest our words should be regarded as fiction. Suffice it to say, we are more than satisfied with the result of the last six months' work. We can spare only this single page of this first number of Vol. VII. for a few testimonials out of fully 2,000 that have been volunteered. Read this sample, and then send for our "*Extra*" if you have not seen it. It contains the complete philosophy leading up to this discovery. Sent by mail *free*.

Rev. Emerson Jessup, New Haven, Conn., writes, Nov. 20:

"Dear Dr. Hall,—After four years' acquaintance with your philosophical writings, and having come to believe in your judgment and integrity, I was prepared in advance to accept your hygienic discoveries as containing something of value. But now, after having used your treatment for the past four months, I can simply testify that it is all and even more than you or your most enthusiastic patients have represented it to be. No money could deprive me of its advantages. I feel it should be in every family in the whole country.

"Sincerely yours, Emerson Jessup.

"270 Martin street."

Nickles Hullar, Bastress, Pa., writes:

"A. Wilford Hall, Dear Sir,—I write to express my gratitude to you for the good done me by your health-treatment, but my words fail to express the depth of my feeling. I had been suffering with consumption for three years, two of which I was entirely unable to do any kind of work, and was given up by the doctors as beyond hope. Indeed, I myself had come to despair of life and had made my preparations to die, when a friend of mine and a reader of the MICROCOSM, J. W. Smith, called my attention to your treatment and persuaded me to send for the pamphlet. I have now been using it faithfully for four weeks, and see so much change in my case and feel so much better that I am convinced I am going to get well. I am getting quite strong and expect soon again to be able to begin work. I now have an excellent appetite, whereas before I had none whatever. I am gaining in flesh, and the old symptoms are fast disappearing. Let me say in a word, I owe it all to you. Gratefully your friend,

"Nickles Hullar."

Mr. A. Law, Madelia, Minn., writes, Oct. 22:

"Dear Dr. Hall,—I write to express my gratitude for the knowledge and benefits I have received from your Health-Pamphlet. I have for many years been troubled with severe pains over the region of the kidneys and recently with malaria in my general system. A month's use of your remedy has given me a freedom from these troubles and a buoyancy of spirit that I have not known for years. Though sixty-five years of age, I can now work all day; though before it was with difficulty I could stoop or rise; and although tired at night I sleep and rest well, and feel refreshed in the morning as in early years. You surely deserve all the success you are reaping for having put this marvelous remedy within the easy reach of the afflicted. Yours Respectfully,

"A. Law."

Eld. T. Munnell, Carthage, O., writes Nov., 21:

"Dear Dr. Hall,—My brother has been afflicted with chronic diarrhœa for fifteen years, so much so that he became truly a 'walking skeleton,' scarcely able to go two squares for his mail. After procuring your pamphlet and using your treatment for a short time, he writes me to-day. 'I am now well of my dreadful disease, Bless the Lord, O, my soul, and forget not all his benefits . . . .' November MICROCOSM has been read. Your editorial on the 'Peculiarities of Wave-Motion' is the best thing yet produced.

"Yours truly, Thomas Munnell."

T. A. Boone, Wadesboro, N. C., writes, Nov. 16:

"Dear Dr. Hall,—I inclose a letter I have received from C. M. Richardson, of Leona, Texas. When he came to Wadesboro, *his physician said he would be dead in ten days*. This letter speaks for itself. Yours truly,

"T. A. Boone."

Here are Mr. Richardson's salient points:

"Dear Brother,— * * * * First I will say that I had a splendid rest last night, and I feel much refreshed this morning. I certainly feel very thankful for the great blessing of restored health which I have received since coming to N. C.; and I assure you that these happy results are almost entirely due to the use of Dr. Hall's treatment which you put into my hands five weeks ago. I was then very weak and much prostrated with lung trouble. I have for six months received the best medical attention but seemed to get no better till I commenced with the new treatment. From its first application my strength began to return and my system to build up, with a general improvement in my health, till I now feel almost as well as I ever did in my life. I have not taken a dose of medicine since that time, and have gained *nine* pounds in flesh. I hope you will continue to call the attention of the afflicted to this treatment, as you will thereby relieve much suffering and no doubt save many lives. I believe that I owe my life to that remedy, *and I declare that to be deprived of it, all the wealth of the world would be no consideration.* * * * * Your friend and brother.

"C. M. Richardson."

[This letter, remember, was not written to us, and hence can not be construed as an attempt at flattery. The price at which Mr. Richardson values the Health-Pamphlet, is but an echo of what hundreds before have said. Yet a neighboring M. D. of his, by the name of Briggs, gnashes his envious teeth at the rapid decline in the drug business, and wailingly beseeches the people to quit paying $4 for Dr. Hall's remedy when they can subscribe for his paper for half the amount! Did you ever? Poor Briggs, he is evidently in a bad way; some one should give him a Brown-Sequard injection under the fifth rib.]

Robert L. Stephens, Linneus, Mo., writes, Nov. 14:

"Dear Dr. Hall,—Inclosed find check for five more pamphlets which make fourteen I have ordered for the afflicted hereabout. The people are becoming thoroughly stirred when they see invalids who have been in bed for months, and some for years, walking the streets praising the Health-Pamphlet and blessing the name of the man who has given it to the world. One man by the use of your treatment has gained sixteen pounds within the last thirty days, and he surely needed every ounce of it. For my own part, the tombstones, graveyards, and coffins, that so long have haunted my dreams, have gone from my mind.

"Yours faithfully, Robert L. Stephens."

W. N. Littell, Exira, Iowa, writes:

"Dear Dr. Hall,—Your pamphlet came to hand all right, and to say that I am well pleased with it is to put it mildly. Three of my family used the treatment the first night after it came, and all were delighted with the result. My wife is so enthusiastic over your marvelous discovery that while I am writing these lines she has come to watch me and exclaims: 'Hurrah for Dr. Hall!' I now believe that a few more applications will make me a well man. I told our doctor about it and he said if it was as valuable as described you ought to be crucified between two thieves for not making it known long ago.

"Yours in Christian hope, W. N. Littell."

Jennie Claypool, Pineville, Oregon, writes, Oct. 24th:

"Dear Dr. Hall,—Although I was one of the first to order your Health-Pamphlet in this place, I have so far, I am ashamed to say, neglected writing you of the great benefit it has been to me. Prior to using your treatment I had been for ten years a sufferer from gastritis [inflammation of the stomach], but after three months application of your remedy I am well and can eat whatever I please without the fear of consequences. I have broken up an attack of typhoid fever in its second stage with only two applications of your remedy. I was parched with fever, and my arterial system seemed one enormous pulse, when I applied to myself a single treatment which in fifteen minutes threw me into a perspiration so profuse as to saturate my night dress as if it had been dipped into water. I consider sickness wholly unnecessary for any one who uses your treatment regularly and intelligently. You are at liberty to print this statement for the benefit of others, should you feel so disposed. Very truly and gratefully yours,

"Jennie Claypool."

☞ We want an intelligent and enterprising agent for our Health-Pamphlet in every town and city in the whole country.—Editor.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
Address all communications to A. WILFORD HALL, 23 Park Row, New York.

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THE ORIGIN AND NATURE OF SOUND-FORCE.

BY THE EDITOR.

This phase of the Substantial Philosophy has received no little consideration on our part during the last dozen years, or since the "Problem of Human Life" was first given to the world.

From the very incipiency of Substantialism we were convinced of the truth of its central and cardinal proposition, that every force of nature, as a phenomena-producing cause, must in the very necessities of true science and of the relations of cause and effect be a substantial entity or an objective existence.

At first, when driven by the inherent logic of things to assume this position, we naturally met with difficulties in trying to reconcile such a radical assumption with the existing theories of science, which teach that some of the most conspicuous natural forces, as causes of observed phenomena, are the mere *motions* of material particles. Particularly is this view maintained with reference to the forces of sound, heat and light, as set forth in all the text-books and as taught in all the schools.

To have admitted for a single moment the correctness of the assumed basic facts of the current motion-theories of science, namely, that the forces of sound, heat and light were but the motions matter, and that there was nothing substantial about them as phenomena-producing causes, would have been to abandon the entire Philosophy of Substantialism which from the very start we had mapped out as of universal application.

To concede to science as at present taught, the truth of the position that any force could be but the *motion* of material particles such as air or ether, would be to make force an *effect* and not a *cause*. Surely no one is so superficial, after his attention has been called distinctly to the subject, as not to see that the motion of matter, which is intrinsically inert, can only be the effect of some applied force which is its moving cause.

To suppose force of any kind to be the motion of matter, and at the same time to be the cause of such motion, was to our mind an absurdity, though it glared at us from every page of our physical text-books; and it was no easy task to invent or discover a system of natural philosophy or scientific reasoning which would harmonize such inconsistency and thus bring order out of confusion. For plainly, as the motion-theories of science had presented the subject of force, the whole question seemed to us but a jumble of incoherent and self-contradictory statements.

To assume force of every kind or character to be a substantial cause, and the motion of matter under all possible circumstances to be its effect, seemed at once the entering wedge for the solution of the whole mystery. But how was it possible to regard the physical forces as substantial entities or objective things, especially the force of sound which produces the sensation of hearing? This was the serious obstacle which met us at the very start.

We saw but little difficulty in assuming magnetism and electricity, for example, to be substantial or objective things, since it was self-evident that the physical effects produced by these forms of natural force, such as the displacing and lifting of ponderable bodies, could by no possibility be accomplished except by some real substantial cause. To suppose otherwise, as we reasoned, would be at once to fly into the face of all philosophy and even of common sense.

But at this point a concomitant difficulty struck us. If these forces are substantial, and at the same time can penetrate, pervade and occupy other bodies at the same time and without any displacement of their material particles, as is the case with magnetism, how about the supposed law of the impenetrability of matter, or the impossibility of the double occupancy of the same space by two material bodies at the same time?

Of course this had to be met and reconciled with our new departure, or good bye to Substantialism. But the task of unlocking this scientific door was easy with the key already discovered and in our possession: Universal substance we assumed in the very rationality of entitative existence, must involve *immaterial* as well as *material* substances. Hence the idea of that grand classification was for the first time sprung upon the world, namely, of making two departments of the existing entities of the universe by dividing them into material and immaterial substances,—placing all tangible and ponderable objects in the first division, and all the forces of nature, whether physical, vital, mental or spiritual, in the second.

This fortunate thought, though somewhat difficult to grasp at first, soon brushed aside that whole difficulty involved in the idea of two actual substantial bodies occupying the same space at the same time, since now the most impervious steel can be wholly occupied, pervaded and penetrated by the *substantial* forces of heat, magnetism, electricity, gravity, cohesion and sound in every part and particle of the matter composing it, and at the same instant of time.

Simple as this solution of the problem was, yet even after it has been explained the most prominent physicists of this country, including such men as Prof. Stevens, of Brooklyn, N. Y., declare that it is impossible for them to conceive of such an idea as the existence of an *immaterial substance.* They thus boast of their own stupidity, and laugh at the thought that any intelligent investigator of physical science should harbor such an unscientific idea, as that any substantial entity can exist that is not ponderable matter! Yet these same shallow physicists, while proclaiming the law of the impenetrability of matter, will see a bar of iron permeated with magnetism and lifted bodily in opposition to gravity, and instead of making this magnetic force an immaterial substance, reaching out with its invisible fingers and interlocking with the cohesive force of the iron thereby to lift it, they assume with Sir Wm. Thomson, the foremost scientist of Great Britain, in his memorable address before the students of the Midland Institute at Birmingham, that this whole physical effect of lifting the distant bar is produced by the rotary motion of the particles of the steel magnet!

But we intuitively wander from our subject of discussion as we are led into the exposure of these absurd phases of modern science.

Having classified the substantial entities of the universe into material and immaterial substances, we were confronted with the problem as to whether or not a single one of these natural forces could be maintained as but the motion of material particles, as taught in all the colleges of the world. If a single form or manifestation of force could thus be shown to be but the vibratory motion of material molecules, we saw at a glance a broken link in the chain of Substantialism, and that as a philosophy of consistent and universal application, it was a failure at its initial step.

This view of the situation led us to a careful examination and comparison of the different forces or phenomena-producing causes, and to determine if any such missing link in the substantial chain really existed. Of course it was evident that the one form of force which seemed most self-evidently to be but the motion of matter, was *sound.* No scientist ever questioned it nor has any one ever supposed sound to be a substance of any kind except one or two superficial writers, who imagined that it might be the particles of the bell, for example, that darted off through the air when the instrument was struck. But as no immaterial conception of such substantial sound-force then existed, or any idea except the material constituents of the sounding body,—the idea of immaterial substance not having entered the minds of the sagest investigators,—such gross material conception naturally died out with the mind that conceived it, as did the material light-corpuscles of Newton die out, even while he still lived.

Plainly then, as we assumed, if sound, the most obvious and unquestionable of all the motion-theories of science, could fairly be shown to be an immaterial substance analogous to electricity, while as clearly demonstrating from this motion-theory itself that the vibratory action of air-waves as sound was the veriest myth and fallacy of science, no further evidence would be needed as proof that every other form of force must likewise and necessarily rank as an immaterial but substantial entity.

Hence, in our first work on the subject—the "Problem of Human Life"—we gave large space to this fundamental question of the nature of sound; and although the general foundation of the substantial theory of all the forces and of Substantialism as a system of natural, vital, mental and spiritual philosophy was then and there correctly laid, we are free to confess that owing to the entire novelty of the discussion and its radical departure from all previous science, some of our calculations and many forms of expression of an erroneous character were unfortunately overlooked, though they have generally been corrected in our later writings.

Prominent among these errors which have

since been corrected, was the concession to the wave-theory that sound was accompanied by incidental air-waves sent off from the vibrating instrument. As set forth in the leading editorial in the August number of Vol. VI., such an idea as that air-waves or atmospheric pulses of "condensation and rarefaction" are sent off even for a single foot from the most powerful sounding body, is now regarded by the writer as entirely untenable and irrational.

That which makes a string, a diaphragm, a flame, or any other sympathetic body move at a distance from a sounding instrument, is the substantial but immaterial sound-force itself, striking the sympathetic body in pulses agreeing or at least partly agreeing with its own vibrational number or tentional capacity to vibrate.

The differences between theoretic air-waves, according to the current theory, and pulses of sound-force according to Substantialism, is this: the air-waves are supposed to be purely mechanical in their operation, striking any and all objects in their way with the same force according to resisting surface. On the contrary pulses of sound-force are supposed to act on no material object that is not in vibrational sympathy with them, any more than substantial rays of magnetism will act on a piece of wood or other body not in magnetic sympathy.

There is no more necessity of assuming air-waves or pulses of any material substance to be sent off from the vibrating instrument to beat against the tensioned string, diaphragm, or flame to cause its motion, than there is of assuming that the magnetism which lifts the distant iron bar does it through some action exerted upon it by the connecting atmosphere or by the "rotary motion" of Sir William Thomson's moleules of the steel magnet.

If the immaterial but substantial force of magnetism can produce physical displacement of a ponderable body at a distance, why can not substantial but immaterial sound-force do the same under a different law of nature?

Unlike magnetism, sound-force, like substantial electric force, needs a material conducting medium in order to travel. Hence, remove the air from a receiver and sound produced inside will not be heard, unless it has some other material body to conduct it to the outside air.

The natural element of all force necessarily exists in limitless quantities in the force-reservoir of nature, but in a crude, so to speak, or undefined condition. Various processes in nature are ordained by which to liberate the different forms of natural force. Sound-force is liberated by means of mechanical vibration or tremor.

While the quantity or loudness of sound-force thus liberated depends generally upon the amplitude of vibration of the sounding instrument, it depends much more upon the sonorous nature or quality of the sounding body itself. It never in any degree, however, depends upon the amount of atmospheric disturbance which the sounding instrument incidentally generates, nor upon the air-waves it sends off in the form of supposed condensations and rarefactions.

This is the great and fundamental error in present acoustical science. The vibrating fork, for example, can produce no possible effect upon the free air in the shape of condensed pulses even an inch from the vibrating prong. Why should it? Its swiftest motion or when sounding the loudest, as demonstrated frequently in our writings, is but a few inches in a second, and its slowest motion while still sounding audibly has been shown to be at the rate of less than one inch in two years! See MICROCOSM, Vol. III., page 154. How is it possible for such very slow velocity of the moving prong to send off a condensed pulse, when the free air is so mobile as to yield and take its place behind the moving body vastly easier than to be condensed at all?

The nature and quality of the vibrating body itself, as a sound-liberating instrument, has almost everything to do with the quality and loudness of the sound produced, while the air-waves which such vibrating instrument is supposed to send off and which, according to received science, constitute all there is of sound, exist only in the imagination of our great physicists and are copied almost automatically in the class-rooms by college professors because they will not go to the trouble of thinking for themselves.

As an illustration of the sound-producing quality of one of the most effective classes of instruments, and one the least understood by physicists, we may refer to confined columns of air, such as those of organ-pipes and other so-called wind-instruments. Any means of causing a suitable vibration of the column, such as a broken or partially interrupted air-jet impinging upon an opening to the chamber, will cause such air-column to liberate sound-force of a peculiar and most intense character. Especially is this true where the air-column is thrown into vibration by the compound action of an air-jet and a vibrating reed, as in the clarionet.

A tuning-fork, whose sound is scarcely audible unless in close proximity to the ear, if heavily struck against a pad and held at the open mouth of a tube whose air-chamber is of the same vibrational number, will by synchronism of its sound-pulses sympathetically

throw the air-column into vibration, which in turn at once liberates more than one hundred thousand times as much sound-force as was produced by the fork alone, as can mathematically be demonstrated, estimating the cubical space which the two sounds will fill. We need not make the calculation; any one can do that when he is informed that the sound of the fork alone can not be heard more than eight feet away, while that liberated by the column of air can easily be heard 500 feet in all directions.

And here incidentally another overwhelming argument against the wave-theory is uncovered. As the tuning-fork's supposed air-waves, as a mere mechanical effect can not produce in the air-column of the tube greater mechanical action than was possessed by the actuating waves, it is plain that the thousands of times greater quantity of sound-force emitted by the tube does not consist of air-waves at all!

But even this is not the worst phase of the difficulty for the wave-theory. It is known by actual measurement that any sympathetic action in one fork produced by another in unison, is reduced hundreds of times in amplitude below that of the actuating fork. It is but reasonable, therefore, to infer that the sympathetic vibration of the air-column is reduced in like proportion; yet this enormously smaller vibration of the column of air liberates from the force-element of nature a hundred thousand times more sound-force than does the fork with its vastly greater action on the outside air, all owing to the better sonorous quality of the air-column for liberating sound-force. What, then, becomes of the mechanical wave-theory under the crushing force of this argument?

If the quantity or loudness of sound did not depend chiefly upon the sonorous nature and quality of the vibrating body, and in no degree whatever upon the amount of atmospheric "condensation and rarefaction" produced,—a fact which modern science has entirely ignored,—then it is plain that all vibrating bodies producing equal mechanical effect upon the air and consequently which send off air-waves of equal theoretic amplitude and number, should invariably produce the same intensity and range of sound, if there is a grain of truth in the wave-theory; whereas it is a fact, of which everybody except our great physicists seems to be aware, that the most powerfully vibrating bodies, such as tuning-forks heavily bowed or struck, and with all the theoretic air-waves they must produce and send-off, will not, as repeatedly shown, liberate enough sound-force to be heard eight feet away in a still room, simply because such fork does not possess the sonorous quality needed to combine with vibration in order to liberate sound-force from its universal foundation.

On the other hand, the vibratory tremor of a certain species of locust well known to entomologists, with a thousandth part the mechanical action on the air produced by a tuning-fork, as we have repeatedly urged, and with a tremulous movement scarcely visible to the naked eye, sends forth sounds that can be heard more than a mile in all directions, simply because in connection with its slight vibration it possesses the additional sonorous quality essential to the elimination of this form of force from its natural element.

Thus it follows incontrovertibly, and no physicist dares to call it in question in open controversy either by the pen or voice, that sound is in no manner or degree dependent upon the wave-motion of the air produced by the sounding body. This single argument against the wave-theory of sound we have presented over and over in the earlier volumes of the MICROCOSM and in the *Scientific Arena*, and have offered there and then to renounce the whole Substantial Philosophy if any physicist either here or in Europe would answer and set the argument aside. But *mum* has been the word ever since.

We are happy, however, to know that silence is no longer to be golden upon the subject of acoustical science with the great physicists of Europe. They now have a Nimrod on their track, with his gun and torch, in the person of the distinguished author and physical investigator, George Ashdown Audsley, F. R. I. B. A., who in a personal letter to us declares his intention to follow them to their hiding-places and force them into broad daylight upon this subject before the great colleges and other educational institutions of Great Britain. He proclaims his fixed determination to champion the cause of Substantialism in England, so far as relates to the sound-question, and not to cease if it takes his entire life-time till the present false science of acoustics shall be ruled out of British colleges and substituted by the substantial theory of sound.

We would be glad on many personal accounts to live long enough to see Dr. Audsley accomplish this beneficent work. But whether or not we shall do so, of one thing he can rest assured, that while we do live he shall have the best efforts of our pen to aid him in forcing into its last lair and then smoking out the proud British and German lion of false science.

[See elsewhere Dr. Audsley's second article which we copy from the great London magazine, the *English Mechanic*. See also a com-

munication from Dr. Audsley to the MICROCOSM explaining a novel and remarkable acoustical machine from Dr. Kœnig, of Paris.]

GIORDANO BRUNO.

BY J. I. SWANDER, D. D.

There was recently a remarkable occurrence at the market-place in the city of Rome. The occasion was the unveiling of a bronze monument to the memory of a man who is said to have had an expression of unmeasured distance in his eyes. The statue had been erected by an English National Association in co-operation with one more international in its character. On the 9th day of last June the significant effigy was ceremonially exposed to the gaze of the public, and for the admiration of the assembled thousands who had congregated around its base. Witnesses to the grand display were present from various parts of Europe. Thousands of banners were floated under the sunny skies of Italy, while philosophers, politicians, negative protestants, free-thinkers and infidels vied with each other in extolling the character of a man whose immortality is more dependent upon his martyrdom than upon any principles of truth he may have discovered, announced or advocated in the stormy and eventful years of his life.

Giordano Bruno was born near the city of Naples, a little before the middle of the 16th century. It was fortunate for his acquired reputation as something of a philosopher that his birth was preceded by the lives and labors of such positive characters in history as Copernicus, Magellan, Zwingli and Luther. The seed-thoughts which these men and others had sown for the revolution of the world and the reformation of the Church, having found a partially favorable recepticle in the native aptitude of his mind, began their unfortunate germination in the dubious light and insalubrious atmosphere of a Dominican convent. Therefore, as might have been expected, the product was an exuberant growth of speculation, confusion and doubt. Dissatisfied with the society and the scholastic teachings of the convent at Naples, he rambled over the continent of Europe, returned, in 1592, to Italy, suffered seven long years of imprisonment, and, on the 17th of February, 1600, received the unmerited immortality of martyrdom.

The Italian philosopher was possessed of an inquiring mind, complemented with more than ordinary strength of intellect. With a native thirst and love for truth, and an insatiable desire to know the source, as well as the relation and fundamental law of things, he struggled hard to solve the intricate problem of the universe. The incoherent record of his speculations is full of evidence that he was prompted by that ineradicable longing after unity, which is the only proper impulse to all strictly philosophic inquiry and research. His idea of unity in the universe was, however, such as to be in conflict with the old orthodox doctrine of a trinity, as applied to the Maker thereof. Yet, when questioned by the Court of the Inquisition, he claimed to be a trinitarian in theology, even as he was a unitarian in philosophy. Thus the inferences drawn from his published philosophic tenets placed him in an attitude of antagonism to the Romish Church, and ultimately bound him to the stake of unjustifiable torture and execution.

Many of Bruno's views were no more acceptable to Protestants than they were to Roman Catholics. The former, however, tolerated him in the bold flights of his erratic speculations, upon the generally conceded correctness of the principle that error is harmless when truth is left free to meet it in open combat. Deficient in some of the essential ingredients of a positive Protestant, he posed himself before the world as a free-thinker, rather than a legitimate son of Christian liberty. Instead of declaring against the chronic heresies of the Church, he measurably sundered himself from the authority of supernatural revelation as given in that sure word of prophecy in whose light the genuine reformers of his century passed to immortality and glory. He was right in criticizing and ridiculing arbitrary authority in the church, but wrong in his attempts at substituting his own lawless vagaries as something better.

In the domain of philosophy the Neapolitan monk was a skeptical revolutionist. He became disgusted with Aristotle because any new theory advanced by himself or others was approved or condemned, according as it was supposed to be in agreement or disagreement with the teachings of the peripatetic philosopher. In his view, God was not so much the ground-source of all being as the grand unit of all substance. He conceived of Deity as the universal intellect. What we call the creatures of God, Bruno looked upon as a series of God's mere manifestations. Such were the figments of his rambling mind on visionary stilts. The theologians either could not understand, or would not accept of his philosophy. His "all-uniting and all-embracing divinity" seemed to them like pantheism; and their fears were subsequently justified in the fact that Spinoza's pantheistic system of thought appeared as a further development of the egg that was laid and partially incubated in Bruno's brain.

The foregoing is not intended as even an attempt to give an outline-sketch of the philosophic views of the man whose statue was recently placed upon a pedestal in Rome. Some things logically connected with that great demonstration are, however, known to an absolute certainty. The occasion created quite a sensation in the Roman Church, and evoked a loud protest from its highest dignitaries. Cardinal Gibbons spoke out in the *Freeman's Journal*. His pastoral letter of last September contains some excellent things. The whole Christian world is in sympathy with the cardinal in his regrets that a demonstration partaking so much of a secular character should have taken place on the anniversary of Pentecost. More. The Protestant part of the Christian world will never cease to tender its profound commisseration to the Baltimore cardinal and *his* "Holy Father" in view of the disagreeable reminder which the record of that occasion must ever call forth. It will continue to remind the church of the inquisition that its history is crimsoned with the blood of martyrs, and many of the chapters thereof darkened with some of the most damnable deeds of intolerance. With all his erratic rambling, Bruno did not merit the torturous treatment he received as his earnest spirit was compelled to pass through the analysis of fire to the God who gave it.

It may be questioned whether the world has ever had a clear and comprehensive conception as to just what Bruno taught as a philosopher.

Hampered by his ecclesiastical environments, imprisoned in the very prime of his life and persecuted to a premature death, he was obliged to leave his work in a less complete and satisfactory condition than it would otherwise have come from his hands. Under these circumstances, other men reaped a harvest from the labor which he performed. If Descartes, Leibnitz, Spinoza and Schelling did not continue the hatching of some fertile thoughts which had been partially incubated in Bruno's apt and vigorous mind, they must, at least, have warmed their eggs in a similar nest.

In the concluding paragraphs of this paper it may be neither improper nor without benefit, to inquire both as to the points of resemblance and those of manifest dissimilarity between Giordano Bruno's work at the close of the 16th century, and the work of A. Wilford Hall in the last decades of the 19th century of the Christian era. Assuming the equality of their intellectual abilities as well as honesty of their purposes as philosophers, let us institute an inquiry and comparison as to the following points:

1. *Originality.* Whatever Bruno taught, or whatever he may have received credit for as a teacher, was largely due to the facts that just before his birth Magellan, by circumnavigation, had proven the rotundity of the earth; that Copernicus, by the unanswerable logic of applied mathematics, had demonstrated that this globe was not entitled to the place of sovereignty in the solar system; and that the dawn of the reformation had opened anew the old revelation of God to man. There was no such preparation for the Substantial Philosophy. True, there had been progress—unprecedented progress—in almost every department of the world's activity, but nothing that served as a precursor for Substantialism. On the contrary, when Wilford Hall first opened his intellectual eyes to take in the situation, the midnight of materialism was casting its broad, deep shadow upon the human race. And right here, in view of the above-mentioned facts, we stop the press, and in calm defiance challenge the world to produce from its voluminous records a single syllable of testimony that the Substantial Philosophy, as to its basic principles, essential ingredients or distinguishing features, was ever taught or even dreamed of during the long and sombrous night that preceded the "Problem of Human Life."

2. *Consistency.* Bruno's teachings consisted of odds and ends with no organic relation between them. Like Swedenborg, he was either above the world or outside the plane of its orbit. Not so with the teachings of Dr. Hall. It is either tyrannical prejudice or inexcusable ignorance that charges Substantialism with incongruity. It is the most consistent system of thought outside of pure divinity. All its essential parts are in harmony with each other, and every part is in logical relation to the grand and comprehensive whole.

3. *Applicability.* Of what use to the world were the sky-rocketings of Bruno? Like those of many others, his teachings were of no practical benefit to the human race. The world wants bread rather than the philosopher's stone. It calls for a truly catholic philosophy, as well as for a holy catholic religion. Substantialism is catholic. It is adapted to every legitimate department of human inquiry and research under the proper purview of science in the most general sense of the term. It opens the otherwise mysterious realms of chemistry, physics and biology, rises to the assistance of Christian faith, and enables the child of God to "endure as seeing the invisible," while it broadens the field of his vision and confirms his hope of immortal blessedness.

4. *Durability.* Because Bruno's teachings were incoherent and inapplicable to the solutions of mundane problems, as well as unsatisfactory to the religious yearnings of mankind, they have already measurably perished from the earth. It can never be so with the teachings of Wilford Hall. Substantialism will endure as long as truth is eternal. It doth not yet appear what it shall be. Up to the present time the seed has merely been in the slow process of germination. It is just now beginning to take root in some of the most intellectual and scholarly minds upon the planet. The campaign is now about to open with the booming of new artillery all along the line. If any one doubts the truth of the above assertions, let him read the names of the new recruits now flocking around the standard that attracts them by the "streakings of the morning light." Scientists, theologians and high dignitaries of the Christian Church are turning their faces toward the rising sun with emotions of joy and admiration for its transcendant splendor. Let doubters open their ears and catch the echoes awakened across the Atlantic. The recent accession to our ranks of Mr. George Ashdown Audsley brings to the cause of Substantialism the influence of one whose bugle-blast is worth ten thousand men. We tender to him and others a hearty welcome, and to Dr. Hall our congratulations upon the growing evidence that, unlike Bruno, he will need no bronze statuary to preserve his name from the obscurity of the grave. He is now unveiling his own monument by unfolding the basic principles of the Substantial Philosophy. That monument will live while the earth, "rock-ribbed and ancient as the sun," shall endure as the habitation of man.

Freemont, Ohio.

Acoustics: A Review of the Old and New Theories of Sound.—II.

BY GEORGE ASHDOWN AUDSLEY, F.R.I.B.A.

The Wave-Theory of Sound.

1. As hundreds, or more probably thousands, of the readers of this widely-spread journal have never given matters relating to sound any serious consideration, it is desirable that at the outset of our review we should give a very clear idea of what sound is understood to be according to the old and now commonly accepted theory, and as taught by the greatest European acousticians and scientists. The writings to which we shall most frequently refer, and from which most quotations will be made, are those by Prof. John Tyndall, LL.D., the greatest English acoustician, as published in his well-known work, entitled "Sound"—a Course of Lectures originally delivered at the Royal Institution of Great Britian,* and those by Prof. Hermann L. F. Helmholtz, M. D., as published in his celebrated work "On the Sensations of Tone." Our readers will kindly bear these works in mind, as the sources whence all quotations are taken which are given in this review as emanating from the respective pens of their authors.

* The second and fourth (last) editions will be compared and used.

2. Prof. Tyndall says: "The sound of an explosion is propagated as a *wave* or *pulse* through the air. This *wave* impinging upon the tympanic membrane causes it to shiver, its tremors are transmitted through the drum to the auditory nerve, and along the auditory nerve to the brain, where it announces itself as sound.

3. "A *sonorous wave* consists of *two parts*, in one of which the air is *condensed*, and in the other *rarefied*. The motion of the *sonorous wave* must not be confounded with the motion of the particles which at any moment form the *wave*. During the passage of the *wave* every particle concerned in its transmission makes only a small excursion to and fro. The length of this excursion is called the *amplitude of the vibration*."

4. In reviewing the above apparently lucid statement of the nature of sound let us be critical. From paragraph 2, it might, with some show of reason, be argued that sound *per se* has no existence. We are apparently taught that what we know as *sound* is simply a *sensation* in the brain. We are assured that what we realize as *sound* is caused by *waves* sent through the air by the mechanical exertions, so to speak, of a vibrating or exploding body, and by those waves striking or impinging upon our tympanic membrane and setting it into corresponding motion. Up to this point, however, sound, as we know it, may be supposed, on this reading, to have no absolute exisistence; but when the vibrations so set up in the tympanic membrane are communicated to the auditory nerves and by them conveyed to our brain, we instantly experience the *sensation of sound*. We have been led to draw attention to this reasoning from having observed a passage in an article from the pen of Prof. Stahr, of Franklin and Marshall College (Lancaster, Pa., U.S.A.), published in the American *Reformed Quarterly Review*, July, 1883, which seems to indicate that he has not read his Tyndall aright. He says, in his adverse criticism of Dr. Hall's *new theory*—"The *fundamental error which vitiates Wilford's* [A. Wilford Hall's] *whole argument of sound*, is a wrong conception of sound-waves. *Sound* is really a *sensation*, that is, the *impression made through the ear and brain upon the mind*." Truly Professor Stahr's pen was treacherous, and led him into difficulties he wot not of.

5. We can assure the student that Prof. Tyndall never contemplated such a reading of his certainly somewhat ambiguous definition, for in sanctioning it he would be laying an axe at the root of his favorite *wave-theory of sound*. As we do not intend again to allude to such a reading or, rather, misreading, we may quote Dr. Hall's reply to Prof. Stahr's attack. He says:—*

6. "The theory, as universally taught, is that *sound* is constituted of air-waves, each wave consisting of a 'condensation and rarefaction of the air,' not of a mental 'impression' or 'sensation' caused by such wave. We could quote a hundred passages from the highest authorities on acoustics to prove that *sound* is that very *wave-motion* which travels through the air from the place of origin, or from the sounding instrument, to the ear and to the brain, where it terminates in producing the 'sensation' of hearing as its effect. This mental 'impression' is not *sound* at all, but is the final effect of sound upon the brain and mind. If it is ever called *sound* it is by a well-known trope called *metonymy* of speech by which the effect is put for the cause. No man competent to teach a country school could soberly and literally thus pervert science in his blind opposition to Substantialism, and then, because we had not perpetrated the same worse than school-boy blunder, charge it upon us as our 'fundamental error.' If sound is fundamentally but '*the impression made through the ear and brain upon the mind*,' then that which produces such 'impression' by beating against the tympanic membrane and bending it 'in and out,' and which travels several miles from the sounding body through the air in the shape of 'condensations and rarefactions,' as the wave-theory teaches, is not sound at all. Hence the wave-theory, which teaches that sound consists of such air-waves, is false, and Prof. Stahr has thus abandoned it as a fallacy. There is no escape here for our assailant. He surely dare not claim that it is the mental 'impression' that travels miles through the air before the tympanic membrane is hit by it so as to make the impression! He thus squarely surrenders, and gives up the wave-theory of sound at his first blundering assault. Now to clench this fatal nail, let us give a couple of proofs from authorities which our critic will hardly dare dispute. Tyndall says:—

"'Thus also we send *sound through the air and shake the drum* of the distant ear.'

"That is, according to the distinguished scientist of Franklin and Marshall College, and the champion par excellence set for the defence of the wave-theory in the *Reformed Quarterly Review; thus do we send the mental impression through the air and shake the drum of the distant ear, when the ear has first to be shaken, according to the wave-theory, before the mental impression can exist!* Prof. Helmholtz takes the same view as Tyndall. He says:—

"'Corresponding to this ring of wave [produced on water], *sound also proceeds in the air*,' &c.

"What nonsense to say, as does our reviewer, that the mental 'impression' 'proceeds in the air' when this something which proceeds in the air, which Helmholtz calls 'sound,' has first to reach the ear and bend its membrane 'in and out' before the mental impression can be made!

7. "But," continues Dr. Hall, "Nature also contradicts our unfortunate critic. If *sound* is the sensation of *hearing*, then *odor* must be the sensation of *smelling*, as a matter of course. Thus according to Prof. Stahr, the 'particles of the odorous body' which Prof. Tyndall admits to constitute 'odor' have no existence outside of the brain because the 'sensation' of *smell* or the mental 'impression' is all there is of odor!

"The sensation of *seeing* also must necessarily be all there is of *light*, according to the same embodiment of scientific wisdom. Yes, if he should happen to be alone in the world, and should shut his eyes, he would thereby put out the light of the sun, because forsooth no one would experience the sensation or mental impression of sight that is normally caused as the effect of the sun's rays. Hence the rays of light themselves would cease to exist by the act of closing his eyes! We are free to say," remarks the learned Doctor, "that

* See MICROCOSM, Vol. III.

our book [The Problem of Human Life] does not 'represent' any such slovenly 'science' as this." We agree with the learned Doctor that it most certainly does not.

8. Perhaps enough has been said in the last four paragraphs to prevent the reader from falling into the serious misconception with reference to sound and the teaching of the wave-theory, which has placed the ambitious scientist, Prof. Stahr, on a conspicuous pedestal as an original thinker. We may, accordingly, return to the consideration of the old theory of sound as expounded by Prof. Tyndall. In the course of his first Lecture, he illustrated the proposition given above, in paragraph 2, in the manner explained by himself thus:—

9. "We have this day to examine," says the learned scientist, "how sonorous motion is produced and propagated. When a flame is applied to this small collodion balloon, which contains a mixture of oxygen and hydrogen, the gases explode, and every ear in this room is conscious of a shock, to which the name of sound is given. How was this shock transmitted from the balloon to your organs of hearing? Have the exploding gases shot the air-particles against the auditory nerve as a gun shoots a ball against a target? No doubt, in the neighborhood of the balloon, there is to some extent a propulsion of particles; but air shooting through air comes speedily to rest, and no particle of air from the vicinity of the balloon reached the ear of any person here present. The process was this:—

10. "When the flame touched the mixed gases they combined chemically, and their union was accompanied by the development of intense heat. The air at this hot focus expanded suddenly, forcing the surrounding air violently away on all sides. This motion of the air close to the balloon was rapidly imparted to that a little further off, the air first set in motion coming at the same time to rest. The air, at a little distance, passed its motion on to the air at a greater distance, and came also in its turn to rest. Thus each shell of air, if I may use the term, surrounding the balloon took up the motion of the shell next preceeding, and transmitted it to the next succeeding shell, the motion being thus propagated as a *pulse* or *wave* through the air. In air at the freezing temperature this *pulse* is propagated with a speed of 1,090 feet a second."

11. Nothing can be clearer than this epitome of the *wave-theory* of sound; but still the lecturer goes on to further aid the mind in realizing the theory by performing two experiments—one with a row of glass balls placed in contact in a groove, and the other with a row of boys placed with "each boy's hands resting against the back of the boy in front of him." Speaking of the first experiment, the lecturer says:—"Taking one of them (the balls) in my hand, I urge it against the end of the row. The motion thus imparted to the first ball is delivered up to the second, the motion of the second is delivered up to the third, the motion of the third is imparted to the fourth; each ball, after having given up its motion, returning itself to rest. The last ball only of the row flies away. Thus," says Prof. Tyndall, "is sound conveyed from particle to particle through the air. The particles which fill the cavity of the ear are finally driven against the *tympanic membrane*, which is stretched across the passage leading to the brain. This membrane, which closes outwardly the 'drum' of the ear, is thrown into vibration, its motion is transmitted to the ends of the auditory nerve, and afterwards along the nerve to the brain, where the vibrations are translated into sound. How it is that the motion of the nervous matter can thus excite the consciousness of sound is a mystery which the human mind can not fathom."

12. With reference to the second experiment, which is performed by giving the boy at the rear of the row a smart push, with the only obvious result of throwing the foremost boy forward and away from his next neighbor, the Professor remarks:—We could thus transmit a push through a row of a hundred boys, each particular boy, however, only swaying to and fro. Thus, also, we send *sound* through the air, and shake the drum of a distant ear, while each particular particle of the air concerned in the transmission of the *pulse* makes only a small oscillation."

13. We shall pass no special remarks upon these experiments; and the reader may accept them as illustrative of the *sound-waves* according to the commonly acknowledged theory. But as we have no desire to rob them of one atom of their value as illustrations of the *wave-theory*, and as we are compelled to quote from the highest authorities to convey the most accurate information respecting that theory, we give the reader, in Prof. Tyndall's glowing words, the closing remarks specially alluding to the balloon experiment. The Professor says in the second edition of his book:—

14. "Scientific education ought to teach us to see the invisible as well as the visible in nature; to picture with the eye of the mind those operations which entirely elude the eye of the body; to look at the very atoms of matter in motion and at rest, and to follow them forth, without ever once losing sight of them, into the world of the senses, and see them there integrating themselves into natural phenomena. With regard to the point now under consideration, you will, I trust, endeavor to form a definite image of a *wave of sound*. You ought to see mentally the air particles when urged outwards by the explosion of our balloon crowding closely together; but immediately behind this condensation you ought to see the particles separated more widely apart. You ought, in short, to be able to seize the conception that a *sonorous wave* consists of two portions, in the one of which the air is more dense, and in the other of which it is less dense than usual. *A condensation and a rarefaction, then, are the two constituents of a wave of sound.*"

(To be continued.)

OUR NEW YEAR'S OFFER TO CLERGYMEN.

We are so anxious that every minister in the United States and Canada shall have the benefits of our Health-Pamphlet, that we now offer to send it free of charge except postage (8 cents) to any regular clergyman who will send us the required promise not to reveal the treatment outside of his own family, and who will enclose the 8 cents in postage stamps. We are thus willing to become a missionary in using a large portion of our income from the sales of the pamphlet for the personal benefit of the noble band of workers in the cause of religion. Surely no class of our readers will demur to this liberal proposi-

tion, which applies alike to the clergy of all denominations. Should a little delay occur in receiving the pamphlet after writing for it, on account of the rush at this end of the line, be patient.

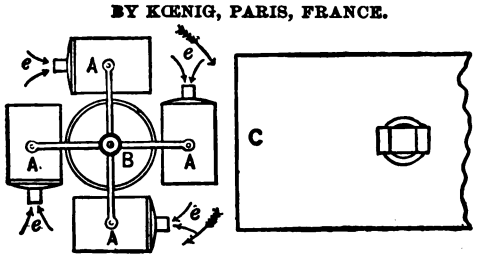
OUR OFFER TO THE POOR.

Although our offer to the poor, as printed some months ago, has cost us thousands of our Health-Pamphlets, yet we are more than gratified to feel that we have done much good service in alleviating the afflictions of the unfortunate. (See the letter of the Rev. Dr. Littlepage, in this number, page 28.) Will the medical doctors who solemnly calumniate us and protest against our selling for $4 the best prescription ever offered to the world, and which saves all doctor's bills for life, please go and do likewise, and offer their drugs and services free to the deserving poor? We now repeat our offer to every poor man not able to purchase $4 worth of medicine if prescribed by a physician, and who will get his postmaster so to certify, that we will send him the Health-Pamphlet free on receiving a written promise that he will not reveal it outside of his own family.

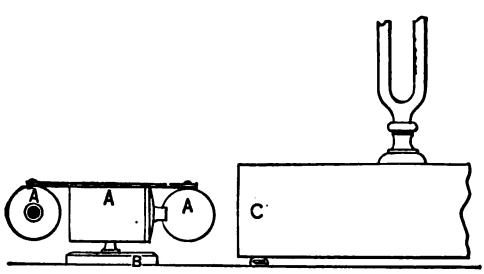
Communication from Geo. Ashdown Audsley, F. R. I. B. A., of England, Dec. 2, 1889.

"Roue de réaction acoustique,"

BY KŒNIG, PARIS, FRANCE.



TOP VIEW



SIDE VIEW

The Editor of the MICROCOSM:

DEAR DOCTOR—A few weeks ago I had the great pleasure of spending some hours with Dr. Rudolph Kœnig, in Paris, and amidst the wealth of his unique and matchless collection of acoustical apparatus—every piece of which has been made in his workshops under his loving care and skilled direction, and many pieces of which are of his own invention. To give you even an outline of what we did and what I saw and heard would fill many columns of your valuable journal—too valuable to be filled with any words of mine, even on such an absorbing subject as Dr. Kœnig and his life-work.

I write to you to submit to your consideration one experiment which adorned the interview; for to you, if you happen to be unacquainted with it, it will have a special interest. Should you know the experiment and the apparatus used in it, you will kindly pardon my troubling you, and commit this and the accompanying drawing to your capacious waste-paper basket.

In the first place let me describe the apparatus. A, A, A, A are four small and very thin canister-shaped vessels of aluminum, closed save at the small projecting necks. These are resonators, tuned to C^4. The resonators are attached to the ends of four arms, also of aluminum, provided at the crossing with a small cup or boss, which rests upon a sharp steel point, attached to the top of a pillar-stand, B. By this arrangement the suspended resonators are perfectly balanced, and revolve with the greatest ease. The rest of the apparatus consists of a tuning-fork—C^4—mounted on a resonant case, C. Now, with reference to the experiment. When the stand carrying the four resonators is placed directly opposite the open end of the resonant case, and the fork is bowed in the usual way, the resonators begin to revolve, and continue revolving so long as the fork is sounding distinctly. On testing the apparatus, I found that the resonators would only revolve in the one direction indicated by arrows in my top view, and that they would only respond to a fork of their own pitch. I do not know in what manner the wave-theorists account for the motion of this little machine, and I omitted to question Dr. Kœnig on the subject: but it is quite evident their explanation would resemble all their other explanations of the phenomena of sound. I presume they would attribute the revolution of the resonators to the same *sound-waves* as, according to their sapient teaching, are *sent through the air to "shake the drum of a distant ear."* It is quite evident that your substantiai theory can alone account for the remarkable behavior of this little apparatus, and I shall be glad if you will give the readers of the MICROCOSM the benefit of your logical reasoning in the matter, assuring you that amongst those readers you can not name a more ardent admirer than

Yours devotedly,
G. A. AUDSLEY.

REMARKS BY THE EDITOR.

We are under many obligations to Dr. Audsley for sending us the drawing and explanation of this unique and invaluable piece of acoustical apparatus.

He is unquestionably right in his surmise that its behavior can only be accounted for on the view that sound is a substantial force, and that air-waves, supposed to be sent off from the tuning-fork, have nothing whatever to do with this movement.

We go further and assert that the action of this wheel is the most complete overturn of the wave-theory of sound that could be imagined, while it is an equal and unlooked-for demonstration in favor of the substantial theory, as set forth in this journal. Let us now proceed to prove the truth of this assertion.

1. The fact that the wheel turns at all is positive proof that its motion is not due to the dashing of air-waves against it from the tuning-fork, because these waves, if any such are sent off, being mere mechanical impacts, as the

wave-theory teaches, must no more tend to move the resonators in the one direction than in the other, thereby equalizing and counteracting the tendency to move. That the claimed air-waves sent off from a vibrating body are purely mechanical impulses, striking any other object with the same force as they will strike a stretched cord, is proved by the fact that Tyndall, Helmholtz and all acoustical writers refer to these same air-waves as sent off from a *swinging pendulum*, and claim, though falsely, that they will start another pendulum of the same length into motion by their synchronous and mechanical dashing. Hence these supposed air-waves, as mere mechanical pushes, must tend to turn the wheel of resonators as much in the one direction as the other.

Indeed, if any difference can be imagined to exist, such mechanical impacts should tend to rotate the wheel in the opposite direction from that indicated by the arrows, since the flat ends of the resonators form better abutments against which such waves may impinge and give up their energy than the partially pointed ends with the necks. Is not this clear? But the truth is, even water-waves, with their powerful contacts, dashed against such a wheel placed in the position indicated, would not cause it to rotate in the slightest degree, as any thoughtful mechanic must be aware.

2. If this wheel were really caused to rotate by the force of the air-waves driven against it, then manifestly any powerful tuning-fork, whatever its vibrational number, would produce on the wheel the same effect as would the C^4 fork, *since there is no vibration involved in this circular movement of the wheel calling for corresponding vibrational impacts or synchronous re-enforcements to get up the movement as claimed in the production of sympathetic vibrations.* Remember that Dr. Audsley states that no other fork except the C^4 will move the wheel, and this is of course true even were the most powerful organ-tone ever produced employed with its supposed air-waves a thousand times stronger than those of the C^4 fork, unless of a unison tone. Hence the demonstration is conclusive that mechanical air-waves, such as the wave-theory claims, are in no wise concerned in this movement.

But now for the real, simple and beautiful cause of this observed motion of the wheel as set forth in the substantial theory of sound-force.

1. Let it be distinctly remembered that these substantial but immaterial pulses of sound-force do not act at all on material bodies, however light and easily moved, *unless their vibrational tension puts them in synchronous sympathy with that of the sounding instrument.* [Let the reader here stop and turn back to page 19, of this number, and read the first two or three paragraphs of the first column before proceeding with this argument.]

Hence, unless there were something connected with the four arms of this wheel having a tension in sympathetic synchronism with the substantial sound-pulses emitted by the C^4 fork, it is manifest that such pulses would produce no effect on the wheel one way or the other?

But here is the fact that unlocks the whole mystery. The air-column or chamber in each of these resonators is in exact sympathy with the C^4 fork and has the same vibrational number; but as these air-columns can only be reached in full power by the sympathetic force at the ends having the open necks, hence the substantial sound-pulses from the fork and its resonant case, acting exclusively against that end of these air-chambers *must necessarily drive the resonators in the direction which the arrows indicate.* Can anything be clearer and plainer than this? *

The view here set forth, of the sympathetic action of substantial sound-pulses *only on bodies of the same or nearly the same vibrational number*, has been urged by us ever since the "Problem of Human Life" was written. [See pages 80 and 81 of that book.]

But, notwithstanding, we have all this while been fully convinced of the correctness of the theory on philosophical grounds, and consequently that air-waves had nothing whatever to do in causing sympathetic vibration, yet we have had no absolute demonstration of the fact to present, about which physicists could not quibble, till Dr. Kœnig kindly came to the aid of Substantialism in the above-described apparatus, and by one mighty stroke of his inventive genius annihilated the wave-theory of sound. We thank both Dr. Kœnig and Dr. Audsley for this invaluable service to the cause of Substantialism, which from this on ought to set the matter at rest in every college where physical science is taught.

* See the small arrow, e, e, e, e, at the four necks, showing the direction of the sound-force.

PRIZE ESSAY NO. 4.

Spurious Substantialism.

BY REV. JOHN CRAWFORD, D. D.

No more efficient service has been rendered, either to science or revealed religion, during the present century, than that by Dr. A. Wilford Hall, in founding the Substantial Philosophy.

By this powerful weapon, he has given the death-blow to materialism, and every "mode of motion" theory, which has disfigured and disgraced science; and which leads to atheism.

By this philosophy the complete inertia of all material substances has been demonstrated; and motion has been proved to be no more than change of position in space—a mere effect which accomplishes nothing whatever.

It has proved also that all the forces of nature, such as gravity, magnetism, electricity, heat, sound, light, etc., are substances, as real as matter itself, although immaterial.

It has also demonstrated that the soul of man, although, like the force-elements of nature, immaterial, is a real entitative being, destined to exist, and live, when its material covering has been dissolved in death.

By this philosophy we are taught also to regard the human soul as an immaterial living *organism*, building up, keeping in repair, and using, as its instrument, the material organism which it inhabits; and which is its exact covering and counterpart, fashioned from the womb after its own pattern.

This philosophy moreover maintains that the great Creator of the universe is a spiritual, immaterial omnipresent substance, possessing a true personal existence, distinct from, and in no sense, dependent upon, the material substance of the universe, which, at every moment, is dependent on him both for its existence and for the laws by which he governs it; and which can not move a single molecule of its entire substance without either the immediate exercise of his omnipotence, or his power acting mediately through the force-elements of nature, and which have themselves no power

to operate but by him whose creatures and instruments they are.

These, in brief, are the principal characteristics of the new philosophy, as promulgated by its illustrious founder; and which weapon, in his energetic and dexterous hand, is destined to cut to pieces much of the false science of the day; and to vindicate the cause of eternal truth.

It is not every man, however, who is capable of wielding the sword of Achilles. Substantialism, in the hand of its founder, is a safe and efficient instrument for the overthrow of error; but, as wielded by some others, it may damage rather than establish truth. I have been much grieved to find some of the advocates of Substanstialism endeavoring to carry it altogether beyond its legitimate province, and the province assigned to it by its founder; and apparently for the express purpose of establishing what, to me at least, appears to be very questionable theology.

As the MICROCOSM, however, is not a theological, but a scientific, journal, I shall omit, as far as possible, what is strictly theological, while I endeavor to expose one or two errors, which are creeping into Substantialism; or are held and taught, at least by some of its advocates.

Let me say then that I seriously object to *faith* being regarded as a "substantial entity." Faith, or belief, I regard as neither more nor less than an *act* of the mind. It has been urged indeed that faith is a gift of God, and must, therefore, be a something, an entity. If so, repentance, for a like reason, should be reckoned an entity; for God is said to "give repentance to the acknowledging of the truth." When it is said that God gives faith and repentance, no more is meant than that, by his word and spirit, he disposes the mind to believe and repent.

I might name many other gifts of God to man, which are not subtantial entities, such as knowledge and wisdom. When he answered Solomon's petition, and gave him wisdom, he certainly added no substantial element to his soul!

Again, it has been argued that Scripture affirms that faith "*works.*" It must, therefore, be regarded as a substantial *force*, like one of the forces of nature. Let us see. A man, in the jungle, sees a lion crouching for a spring. The sight leads him to *believe* that the furious beast intends to devour him; and will not this belief, or faith, work in him mightily? It may make him tremble, or turn pale. Now, is this faith or belief a substantial entity? Nothing of the kind. It is no more than an act of the mind, caused by the knowledge of a fact. It has been said that knowledge is power; but this, by no means, implies that knowledge is a substantial entity.

It is admitted that no *material* substance can become a force; and, if it undergoes a change, must be worked upon by the direct power of God or man, or mediately by one or more of the forces of nature. But the case is different with the living rational soul. In common parlance, we may say that faith works, or that knowledge works, in the soul; but nothing more is intended than that faith or knowledge becomes the occasion of the soul's working. The moving force, in reality, is the living acting soul itself; and knowledge, or faith, which is the result of knowlege, is but the occasion, or, if you will, the cause, but not the *substantial* cause of the soul's working; and the nature of this soul-exercise depends upon the nature of the object of faith. Faith, or belief, that the lion is about to spring, works fear, while a belief in the fact that a friend had shot the lion, just before he had time to make the fatal spring, would work joy; but both the fear and the joy would be, in reality, the working of the soul; and of the faith only as an insubstantial cause or occasion; but certainly not a substantial force!

In like manner, faith in the threatenings of God's law works, or produces, fear, while faith in the salvation by Christ works joy and peace; but neither does this prove that faith, either in the threatenings or promises of God is a substantial entity; but only an act of the human soul.

But is not evangelical faith something more than simple belief? I reply, in its *essential* nature, it is not. Its *object* differs most essentially from that of every other belief; for its object is the divine character, as seen in Christ's finished work. But this object is not seen by the carnal mind, which is enmity against God, until the vail of prejudice is taken away by the Spirit of God; yet, in this removal of the vail, there is *nothing added* to the substantial elements of the soul. The Spirit of God indeed dwells in the renewed soul and influences it for good; but we must not confound this in-dwelling spirit with the soul in which he dwells, nor the work of the spirit with the acts of that soul.

Only a new *disposition* is given, by the Spirit of God, which causes the soul to receive the truth; and the entrance of this truth, from its very nature, brings life; for "it is life eternal to know the true God, and Jesus Christ whom he has sent."

[*Concluded next month.*]

DR. BRIGGS OF TEXAS ONCE MORE.

Last month we incidentally referred to one Briggs, M. D., who had become howling mad because the sensible people of his state persisted in sending four dollars for our priceless Health-Pamphlet and could not be cajoled by him into subscribing at half the price for his own crotchety, half-starved and dyspeptic burlesque on medical journalism.

This poor disgruntled and moribund vender of poisons is now so raving at our gentle suggestion of last month, that "somebody ought to give him a Brown-Séquard injection under the fifth rib," that he makes faces and fills one mortal column with his stereotyped wail of "humbug," "humbug," "humbug,"—closing with the following bilious shriek: "A more notorious humbug than A. Wilford Hall, editor of the MICROCOSM, has never lived on the American continent." What higher praise could a man ask, coming from such a source?

Of course, this Briggs is also down on the clergy of all denominations because, forsooth, they commend our Health-Pamphlet, and the treatment which it unfolds, as preferable to the use of drugs. Speaking of a certain minister who had kindly written him, he calls him a "*sanctimonious old cuss,*" and similar choice names selected from his gall-besmeared vocabulary.

But we have no need to say more of this particular case, as we have defenders all through the South who know all about our

Health-Pamphlet and are not backward in its defense.

The Rev. Dr. S. C. Littlepage, of Bastrop, Texas, one of the most prominent clergymen of that State, replying to Briggs in a county paper, says:

"No one who has studied Hall's theory of disease and method of treatment, questions their merit, but on the contrary indorses both enthusiastically, especially those who have used the treatment.

"I have been using it for over three months and have not taken a dose of medicine or been sick a minute in that time, and never expect to take another dose of physic. I do not know that in my life before I have been free from sickness so long at one time, besides, I have gained ten pounds in flesh. A distinguished professor of mathematics, whom I have known for more than twenty years, has just remarked to me 'I am done with medicine.' He has known Hall's treatment but two weeks. He further said that Rev. Mr. Dibrel, of Seguin, who was thought to be dying with consumption, is rapidly recovering under the treatment and would not take four thousand dollars for his interest in it. Dr. Byers, of Houston, whom I have known for fifteen years, one of the brainiest old men in the State, is equally enthusiastic; claims to have been relieved of a malady from which he has suffered for twenty years by this treatment. One of the most distinguished men who visits our city, on reading Hall's pamphlet remarked that he believed it was the 'only rational theory of disease ever discovered.' His wife since writes that she has been 'wonderfully benefited by Hall's treatment.' The wife of Bishop Pierce, of Ark., gives similar testimony and is doing all she can to circulate the remedy among the afflicted. Hundreds of others are pursuing a similar course, conscientiously.

"But, finally, Hall makes this proposition to minsters who purchase his pamphlet and use his treatment faithfully one month, if they are not satisfied with it he will refund their money at his own expense. And to the poor who are not able to buy $4 worth of drugs and will procure the certificate of the nearest post master to that effect, he will send his treatment free. Now, why not 'let the galled jade wince' or is it the galled jade that is wincing? if so, let him wince again; Hall can stand it if he can.

"Hall does not wish to antagonize the medical fraternity, but this cry of humbug is a game that he can play at as well as they. Doctors can't hide all their blunders under the ground as the following amusing incident taken by Hall from the New York *World*, of Oct. 27th, abundantly illustrates."

[See the Nellie Bly episode as printed in the November MICROCOSM, which will be sent free to those who have not seen it.]

A SPECIAL REQUEST.

Any person who may chance to receive a copy of this number of the MICROCOSM, and who may not be a subscriber, need have no fears of being held for subscription by keeping and reading the paper. We do not carry on business in that way. We will, on the contrary, be greatly obliged to any person, subscriber or not, who will send us any number of names of friends at a distance to whom we may send sample copies of this number free.

The Real or Substantial in the Forces of Nature and in the Spiritual World, No. 4.

BY J. W. LOWBER, PH. D., LL. D.

The following article is a condensation of a chapter in the author's new book, "The Struggles and Triumphs of the Truth."

The Bible clearly teaches us that there is something real or substantial in the unseen world. When God created man, He breathed into him a portion of His own spiritual essence; and man became a living being, possessing animal, intellectual and spiritual life. Man is a duplex being, one man living in another man. The outward man we can see, but we can not see the inward man. The inward man, however, is more substantial than the outward; for though the outward man perishes, the inward man is renewed day by day. Man can kill the outward man, but he can not kill the inward man. Jesus teaches us not to fear him who can kill the body, but can not kill the soul; but, rather, to fear Him who has power to destroy both soul and body in hell.

The apostle Paul recognizes the substantial in the things not seen. He teaches that the seen things are temporal; while the unseen things are eternal. We are, therefore, to look, not to the things that are seen, but to the things that are not seen. This language looks paradoxical, but it is not, for the same God who has given us outward eyes to behold outward things, has, also, given us inward eyes, by which we can perceive things spiritual and eternal. We can look, with these inward eyes, to that which is most substantial and durable. The substantial is something more enduring than flesh, than sky or air, earth or sea.

In this world the most substantial and enduring things are those which we can not see. Oxygen, hydrogen, nitrogen and all simple forms will ever remain pure and incorruptible; for we can not think of the annihilation of the ultimate forms of matter. If the skeptic wishes the eternal, he must cling to the unseen, even in nature. The apostle is perfectly scientific when he declares the unseen things to be eternal.

The stronger our convictions become with regard to things not seen, the less real the present becomes; and the unseen becomes more of a Positivism. Men have been so much in the habit of calling the future state unreal because spiritual, and unsubstantial because invisible, that the people now look upon future existence as a kind of dream-land. The reason why the character of Christ has so written itself upon the face of civilization, is the fact that its chief element was his faith in God and the future state. Christianity places man upon a border-land, with two natures capable of inhabiting two worlds. The margin between them is indeed very narrow; it is like the colors of the rainbow—we can not tell where one ceases and another begins. The body is conditioned and confined to this world; but the mind may live in the other. It may long for a better house than this world can give, and desire to depart and be with Christ.

Our Saviour promised his disciples that he would go and prepare a substantial home for them. Its location was to be a magnificent city, ornamented with the most costly and beautiful jewels. The house would contain many mansions, suited to the wants and capacities of all. Paul knew that God had pre-

pared such a building for His people; and he was ready for the present tabernacle to be taken down at any time. Man's future home will be substantial; the body in which he will live will be spiritual and incorruptible, and his environment will be suited to the highest development of all his faculties.

A CRITICISM ON GRAVITY.

St. Albans, W. Va., Dec. 13, 1889.

EDITOR MICROCOSM :—SIR: The author of your Prize Essay, No. 1, in December number of MICROCOSM, says a body will weigh more at Liverpool than at New Orleans, because it is nearer the centre of the earth. He is only repeating the statement of every Natural Philosophy I have examined, and hence the error is not specially his, but that of the ages. All the Philosophies produce upon our minds the idea that there is some mysterious influence about the centre of the earth which gives weight to bodies. The philosophers all know that every particle of the earth attracts a body, and that it only tends to the centre of the earth because a line through it would be the resultant of the attracting forces of all the particles of the earth. But this knowledge goes for nothing, and they will still tell us that a body weighs more at the poles because nearer the centre of the earth. This subject needs a little independent investigation. In looking into it I have placed a pea upon the blossom mark of an orange, and then upon its equatorial line, and made as close an estimate as I could of the disposition of the particles of the orange with regard to that pea, and the result of my estimate has been that if the motion of the earth had ceased, a body would weigh less at the poles than at the equator, and, hence, that it is only the centrifugal force of the earth that makes bodies weigh less at the equator than at the poles. If the earth were without motion I can not see, to say the least, how it would weigh more at the poles than at the equator. In making our estimate we have to suppose various lines running from different parts of the orange to the pea. We have to remember that a resultant force is greater or less in proportion to the acuteness of the angle made by the lines of the original forces. Nor must we lose sight of the fact that the intensity of attraction varies as the square of the distance. After full consideration of everything, my mental estimate has been that the force of gravity is less at the poles than at the equator, but I would like to see what others think of it. Respectfully,

GEORGE T. LYLE.

REV. MR. WILLISTON AS A LECTURER.

Mr. Williston, our old contributor, has a few important lectures prepared, which he stands ready, he says, *if desired*, to deliver wherever his *themes* would prove interesting. Some of those themes are these: 1. "Col. Ingersoll's Views of God and of Bible Religion, as Seen in his Recent Eulogy of the late Mr. Seaver of Boston, Impartially and Searchingly Sifted." Come and see whether God *is* the cruel monster that the eulogy represents Him to be. 2. "Time's First Great Week, or the Six Creating Days and the Resting Day that Followed." 3. "The Marvelous Changes that Time has Wrought Within the Memory of the Octogenarian Lecturer."

Mr. Williston is an able writer, as our older readers know, and though well on toward ninety, is as vigorous mentally as a young man. He will give our readers a brief article next month condensing some of the salient points of one of his lectures.

A COMMON ACOUSTICAL PHENOMENON.

BY PROF. D. JAMES.

DR. HALL,—Yesterday morning was clear, calm and cool, and the whistle of an engine three miles distant appeared to be only a fourth of a mile away. This is the case every calm, clear morning and evening. The intensity of the sound decreases gradually toward noon, and again increases toward sunset. I do not believe that the "ratio of density to elasticity," or "acoustic clouds," are sufficient to account for the phenomenon here mentioned, and, therefore, I ask you to explain its cause. Respectfully,

D. JAMES.

Vossburg, Miss.

REMARKS BY THE EDITOR.

No explanation of the above often-observed phenomenon seems rational other than the constant changes going on among the air-particles in their varied arrangement in relation to each other by the action of cohesive-force, as the humidity and temperature change, thus making the air a better or a worse conductor of substantial sound-force. This was fully set forth in the "Problem of Human Life," near the close of the sixth chapter.

Any attempt, on the contrary, to explain it on the principles of the wave-theory, must end in signal failure. Air-waves are mere mechanical undulation, and can no more be affected, if any such things as air-waves really occur, by the varying atmospheric conditions, than can a system of water-waves sent off by dropping a pebble into a still pond be modified by similar changes in the water.

Helmholtz says that water-waves and air-waves, as we have often quoted, are "precisely similar and essentially identical." This may all be true, in a certain sense; but it by no means follows that either air-waves or water-waves have any resemblance whatever to substantial, immaterial sound-pulses, any more than air-waves and water-waves resemble currents of substantial electricity or rays of immaterial magnetism.

THE PRIZE-ESSAY CONTEST DECIDED.

Last month we were only able to award the first prize, $30, which was given by the judges to Mrs. M. S. Organ, M. D. for her Essay on the "Origin of the Sun's Heat."

Since then the judges (Dr. Mott, Dr. Buck and Prof. Schell) have awarded the second prize, $20, to H. F. Hawkins, Esq., of New Madrid, Mo., on the "Necessity of a Supreme Being," June No.; and the third prize, $10, to Walter F. Gottwalles, of Jeffersonville, Ind., on the "Nature of Force," in the October No.

Several essays of real merit were necessarily ruled out of the competition owing to their length—the limit in the original offer being one solid page of the MICROCOSM in Brevier type, or 1200 words. This will be a warning to future contestants to keep within the limit unless

they should write without reference to the prizes. The same offer of three cash prizes, $30, $20 and $10, will be repeated for the present volume.

The cash prizes for the contest now closed have been sent to their respective owners.

DR. SWANDER ON BRUNO.

We call the attention of the reader to the second article in this number, from the pen of Dr. Swander, as containing some of the smoothest and most finished rhetoric in the English language. The Doctor is a master in belles-letters, and is the author of many beautiful things especially in his History of the Reformed Church in America. He is also the author of that unique and critical work the "Substantial Philosophy," which is having a large sale. The Doctor is anxious that every minister in the whole country shall have a copy of that work, and he has just written us that any minister who will send him 65 cents shall have a copy post-paid by return mail. This is simply giving away the book, and no one after such a proposition should wait a single day before sending for it. Address the author, Rev. J. I. Swander, D. D., Fremont, Ohio.

GEORGE ASHDOWN AUDSLEY, F. R. I. B. A.

We not only reproduce in this number from the great London Journal—the *English Mechanic*—Dr. Audsley's second article on the substantial nature of sound and in opposition to the wave-theory, but we present an original communication from his pen describing one of the most remarkable examples of acoustical apparatus ever invented. We ask the careful attention of every reader to that communication. Mr. Audsley has an inalienable right to discuss the sound-question, as he stands as the very first organ builder in the world in point of artistic design and acoustical properties, as we learn from the Rosevelt Organ Factory at 149 W. 18th Street, in this city,—the foremost establishment of the kind in the United States.

A PERSONAL LETTER.

The following letter was not written to us but to F. H. Miller, Esq., Cashier of the Merchants' National Bank, Appleton City, Mo. Mr. Miller kindly sends the letter to us with his own indorsement of its truth. Dr. Morrison, the writer, is making every effort to let his friends and neighbors know about the wonderful remedy which has fallen into his hands. Any one having doubts upon the subject can address the doctor at his home in Gunn City, Mo., inclosing stamp for answer. Here is his letter:

"F. H. Miller, Esq., Appleton City, Mo., Dear Sir,—I send by this mail Dr. Hall's Pamphlet. I have been using the treatment for two months and no language can express the benefits received. Two months ago I was one of the most miserable dyspeptics in the world. I paid Dr. VanMeter, Charleston, Ill., $100.00 in cash for medicine that did no good. I also paid Dr. R. V. Pierce, Buffalo, N. Y., $50.00 and received no real benefit. I have studied medicine for years with the view of obtaining relief. I have made three overland trips to Texas, hoping to stay these inroads of disease. My condition gradually grew worse—until my feet were cold all the time and a distressing cough that was fast wearing me out. To this was added the most distressing COLIC OF NEURALGIA of the stomach so that scores of times I had to take my bed. I had no appetite and could scarcely drag my wearied body around. I sent for the treatment, not even my wife knowing about it. It required about a week to get the full benefit of it. I began to improve at once—dyspepsia passed away. In a month's time my cough was gone. I can now eat anything I can get—meats, pickles, milk, cake, pie, &c., and can eat it for supper. Before beginning I had to get up from five to ten times per night; now I get up once at midnight. My sleep is just as sweet as that of a child. I never felt better in my life. The change is simply marvelous beyond description. * * *

"With esteem, E. J. Morrison."

Gunn City, Mo.

OUR "EXTRA" MICROCOSM.

That number of our paper is devoted almost entirely to the philosophical reasoning and scientific facts which lead up to our new hygienic treatment for disease without medicine, as unfolded in our *Health-Pamphlet*.

Many thousands of these pamphlets have already been ordered, and we have received more than two thousand of the most unqualified indorsements of the treatment, from those who have been cured by it, ever read from the afflicted. A specimen of these testimonials appears on the last page of this number. Those wishing to know all about it should send for the "*Extra*," which will be mailed free to any address.

The price of the *Health-Pamphlet* is invariably $4, and is admitted by unprejudiced physicians to be the cheapest remedial prescription ever sold. Those needing it, and having sufficient confidence in our statements to send for it, need not wait for a blank "Pledge of Honor," but can simply promise, on sending the money, not to reveal it outside of their own families—doctors, of course, being permitted to use the treatment in their practice.

A WORTHY BOOK.

THE AGNOSTIC, by Henry Niles Pierce, D.D., LL.D., Bishop of Arkansas, Thos. Whittaker, New York, Publisher.—This book of poems certainly does no discredit to the reputation which Bishop Pierce already has for originality of thought and logical acumen. The manner in which the professed agnostic is handled will command the admiration of every intelligent reader, and will convince him in an attractive and novel way of the absurdity of that philosophy, whose whole superstructure is made up of and founded on ignorance. We have no space for a further review of this admirable book, but cordially commend it to our readers as manifesting an uncommon amount of artistic and poetical skill, together with a profound intellectual ability.

OUR SCIENTIFIC LIBRARY

Now consists of 10 volumes, neatly and substantially bound in cloth, namely: Six volumes of the MICROCOSM, $8.50; two volumes of the *Scientific Arena*, $2; "Problem of Human Life." $2; and "Text-book on Sound," 50 cents—making $13 for the entire library. Until the electrotype plates shall pass into other hands, which may occur at any moment, we will send this entire library (10 volumes) by express for $6—the purchaser of course paying charges. If sent by mail it will require $1.50 in addition to prepay postage, or $7.50 in all. Thousands of our subscribers have already purchased and now own this library of books, which they hold almost sacredly as an heir-loom to be transmitted to their children.

THE HEALTH PAMPHLET ENLARGED.

We have just added 16 pages of the most important matter to our *Health-Pamphlet*, making 48 pages in all. Some of this information is so novel that it will startle even our best-read physicians. The invariable price of the pamphlet will remain unchanged ($4); but those wishing to return the old pamphlet and receive the new one in its place, will please inclose with it 25 cents to cover cost of clerk hire, postage, etc. Send full directions with the pamphlet.

Old pamphlets will be destroyed by us as fast as received, and none but enlarged pamphlets will hereafter be sent out. Terms to agents will remain the same as heretofore. We only add that no person having the old 32-page pamphlet should for one day neglect to secure the enlarged one in its place, as the additional information it contains is invaluable. Agents should let old purchasers know this at once.

DR. MOTT THE LEADING CHEMIST.

It affords us pleasure to learn that our co-worker in Substantialism, Prof. Henry A. Mott, has just been appointed the Chemist of the Medico-Legal Society of the City of New York. The election took place December 18th —last month. Prof. V. C. Vaughan, of the University of Michigan, Prof. Witthaus, of the University of New York, and Prof. C. A. Doremus, of the College of the City of New York, competing against Dr. Mott. We take this occasion to congratulate the doctor on his success, as the position of chemist to such a learned society is one of great honor.

OUR LITERARY PALÆONTOLOGY.

Again, we have been caught napping, and we have come to the deliberate conclusion that the MICROCOSM has the honor of including in its subscription list the most ingenious class of readers of any paper printed in this country.

Before sending out the last puzzle as printed in the December MICROCOSM we showed it to some of the brightest persons among our acquaintances, not one of which could work out the solution. On the strength of this preliminary test, we ventured to print it with the offer of a one-dollar bill to each subscriber who would correctly fill out the skeleton paragraph by the first day of January, present month. To our astonishment and almost consternation, correct answers by the hundred came pouring in, almost if not quite as rapidly as with the previous skeleton as printed in the November number; yet almost every person on sending the solution admitted that it was vastly more difficult than the former, taking them generally five times longer to solve it.

We confess that our subscribers are badly ahead of us so far, and we look forward with no little anticipation to the revenge we are to reek in our next puzzle, as soon as we can get time to prepare it. For the present, however, we are so driven almost day and night with the demand for our Health-Pamphlet that we can not take the necessary time suitably to construct the new skeleton.

Last month we promised to print the names and addresses of the successful contestants up to December 28th in this page of the MICROCOSM, as we expected only about one-hundred at farthest. But this is impossible, as it now turns out, as it would require several pages of the MICROCOSM. The best we can do is to send to each successful subscriber, as rapidly as possible, the crisp new one-dollar greenback as promised last month.

During the past month we have sent this magazine, Vol. VI, neatly bound in cloth to each subscriber who correctly filled out the November skeleton. The price is one-dollar by mail, and it is a beauty.

Here is the last skeleton just as it appeared in December number:—

T e m n w o n e n i n l l a d e i r t e x
d r u s n o h e e s v s n t o l h e e r o a-
t n o i s e l o e n, u t h e o n i g u n h-
m n o h e c i l l a . T d y o e r n l l
r p e t a e w o l a e o e r o y u , on-
f o m n o o n i t d i e n a t e n , ut
c p o t i e i s w h h e i g e s i t e e t f
s o e t n a i i l z e o m n i y.

And here is the mass of palæontological dry bones with the flesh put on in proper shape as it has been built up by many hundreds of our altogether too ingenious subscribers:

"The man who intentionally and deliberately defrauds another deserves not only the reprobation of his fellow men, but the condign punishment of the civil law. To do by others in all respects as we would have others do by us, conforms not only with divine enactment, but comports likewise with the highest interests of society in a civilized community."

We can not now promise definitely when the next skeleton will appear. But we intend to get it ready as soon as possible. In the mean time let our subscribers rest on their laurels already achieved over the too-confident editor till the next palæontological skeleton shall appear.

10,000 NEW SUBSCRIBERS WANTED.

Not that we need this number of subscribers to sustain the MICROCOSM, or any other number more or less; but we know that there are 10,000 intelligent persons,—professors, teachers, students, lawyers, doctors, clergymen, etc.,—who need the MICROCOSM and the unfoldment of true science which it aids and encourages. The MICROCOSM does not need another subscriber to guarantee its perpetuity, as its continuance through the year now begun is already provided for as certain as that its editor shall live. A careful examination of this number alone ought to convince any scientific thinker that the MICROCOSM is needed in the journalism of the world, and that the blows struck in this number against the motion-theories of science make it worth many times the subscription price charged. Materialism is now tottering to its fall, as it never tottered before. The bugle-blast of Substantialism is already echoing over Europe and reverberating through the colleges of this country in a tone that is unmistakable in its significance. It proclaims the doom of false science. The decree has already gone forth and the hand-writing is on the wall. All hail to the noble young Briton who has been commissioned by providence to lead on the substantial forces to victory.

☞ Correspondents will oblige our clerks and book-keepers by making their letters just as brief as possible to convey the ideas intended. A difference of a dozen lines amounts to hours of time when hundreds of letters a day have to be waded through.

THE MARVELS OF OUR HEALTH-PAMPHLET.

We give below another drop from the ever-filling bucket of unsolicited indorsements of our Health-Pamphlet. It is only because in our inmost conscience we believe in the priceless value of this treatment to the afflicted, as well as to those in health, that we continue to refer to it in the MICROCOSM. Read these plain statements and then judge.

Dr. W. Peters (M. D.), Ransom's Bridge, [illegible] C., an eminent medical practitioner, writes:

"Dr. Hall,—My friend, Geo. F. Allen, who has read your pamphlet and is desirous of testing the efficacy of your treatment, has consulted me as his physician in reference thereto. As my father with, at least, one hundred of the prominent citizens of Norfolk, Va., who have used your treatment state that they have been benefited by it, and, as I recognize the common-sense ideas on which it is founded, I have had no hesitation in recommending it to my friend Allen.

"Washington Peters, M. D."

Rev. J. L. Smith, Zanesville, Ohio, writes, Dec. 10th:

"Dear Dr, Hall,—After more than five months' travel in Europe I have returned home. I want to tell you how highly I appreciate the benefits derived from your treatment during all that journey. Its application, as I believe, kept me from many a bilious attack and fever, as I journeyed under the most scorching sun I ever knew. With its assistance I successfully ran the gauntlet of the "Break-Bone" fever in Smyrna, and the Syrian fever in Palestine. At Smyrna there were 60,000 cases of "Break-Bone" fever. I had a slight touch of it, but would have escaped entirely had I not neglected for a time to use your remedy. I am glad to know that you are meeting with success in selling your invaluable pamphlet. Ever your brother and well wisher,

"J. L. Smith."

F. M. Barker, Esq., Vice-President State Security Bank, Grand Island, Neb., writes, Dec. 9th:

"Dr. A. Wilford Hall,—I am using your treatment and can say that I have already derived many times four dollars of personal benefit that it has been to me. My stomach is no longer a source of constant trouble to me, thanks to your valuable remedy. I am now able, with this brief experience, to attend every day to my business. Yours truly, F. M. Barker."

A. H. Knapp, Lindley, N. Y., writes, Dec. 10th:

"Dr. Hall, Dear Sir,—I write to tell you that your treatment is doing a great work for my wife, who was low with consumption. She is now improving finely, and we are all encouraged. I assure you the Health-Pamphlet is rapidly advertising itself in this vicinity.

"Yours truly. A. H. Knapp."

C. W. Sewell, Mooresville, Tex., writes, Dec. 10th:

"Dear Dr. Hall,—I am successfully using your treatment; and it is rapidly curing me of chronic diarrhœa. I owe you a debt of gratitude. I enclose $1 for the MICROCOSM, as I do not know the price. [It is but 50 cents a year.—Editor.] Your sincere friend, C. W. Sewell."

Rev. John H. Gold, Washington, Ark., writes, Dec. 12th:

"Messrs Hall & Co.,—Rev. J. H. Riggin, of Mineral Springs, Arkansas, ordered your Health-Pamphlet for me some weeks ago, and I promptly commenced using your treatment. I am more than pleased with the result. I had been suffering for months with indigestion, constipation, nasal catarrh, and my kidneys and bladder have given me trouble since my boyhood. I have been bilious and have suffered much from malaria. I have for several years been taking pills and other medicines till I had to depend on them entirely. When almost hopeless of being cured your Health-Pamphlet came as a veritable godsend, and just in the nick of time, as my nervous system had become affected and I had insomnia added to my suffering. Since using your treatment I can sleep like a baby, and on rising in the morning I feel refreshed. There is in fact a general lubrication of the entire machinery of my organism. My appetite is now all right, food of every kind agrees with me, my catarrh is giving way and my brain is clear. The sensations in my entire body make a new person of me altogether. I shall ever feel largely indebted to Dr. Hall for what I regard as nature's own remedy for all the ills incident to the physical being of man. You can print this testimony in the MICROCOSM if you wish, as I desire my large circle of personal acquaintances to know how I regard your invaluable remedy. Four dollars are as the dust of the balance in comparison. Truly yours, John H. Gold,

"Pastor M. E. Church, South."

Geo. B. Crinklaw, Andrew, Iowa, writes, Dec. 7th:

"Dear Dr. Hall,—* * * My health is still steadily increasing, and I am now better than I have been for many years, all owing to your simple remedy.

"Truly yours, Geo. B. Crinklaw."

E. Gallup, M. D., Santa Ana, Cal., writes, Dec. 8d:

"A. Wilford Hall, Dear Sir,—I have been using your treatment in my practice for about four months, with the grandest results imaginable. A large number of families here are using it, having procured the pamphlet through Rev. Dr. A. L. Cole, who thinks there is nothing equal to it for the treatment of disease. I invested the four dollars when my attention was first called to it, and I have since recommended it to dozens of families, not one of which, so far as I know, would part with the treatment at any price. * * * May heaven speed the day when drug-medication will have become a thing of the past, and when your Health-Pamphlet shall have taken its place in every household. Sincerely yours, Dr. E. Gallup."

Rev. W. H. Lewars, Pastor St. Paul's Lutheran Church, Lititz, Pa., writes, Dec. 7th:

"Dear Dr. Hall,—* * * I have used your treatment with immense satisfaction to myself and family. Mr. Theodore Zellers, my neighbor, who recently procured a copy of your pamphlet has nothing but words of the highest commendation in favor of it.

"Sincerely yours, W. H. Lewars."

Asa Davis, Snohomish City, Wash., writes:

"My Dear Doctor,—I have been using your treatment for some time with the most satisfactory results. In fact I am getting well and about as strong as ever, so that I make a full hand in the field—something I have not been able to do in six years. I need not take up your time to narrate the history of my ailments which have so long disabled me. My son, J. A. Davis, was threatened with consumption, and he writes me that after using your treatment three months he has got entirely rid of his cough and is getting well. It seems too good to be true. * * * Yours with thanks,

"Asa Davis."

Rev. S. W. Cope, a Meth. Minister, 64 years old, Chillicothe, Mo., writes, Nov. 14th:

"Dear Bro. Hall,—When I was a boy the Methodist Church received members on six months' probation. For the same length of time I have had your health-treatment on trial. It has stood the test with satisfactory benefits from the very first application, and I am now ready to give it confirmation for life. I regard it as helpful alike in the prevention and in the cure of disease. By this testimony, unsolicited by you, I hope to be the means of bringing health and life to many who know me, and who, for the want of your discovery, would suffer and die. Your brother in Christ.

"S. W. Cope."

F. H. Horton, Gubserville, Cal., writes, Dec. 22:

"Dr. Hall,—I feel like joining with the multitude who are so heartily commending your treatment for the afflicted. It is doing much for me and my family, and I know of quite a number in this vicinity who are using it, not one of whom is dissatisfied. I candidly regard your hygienic discovery as a priceless boon to suffering humanity, costing as it does such a trifle compared to continuous drugging and medical attendance. I regard the $4 I paid for it as the veriest bagatelle in comparison. Yours gratefully, F. H. Horton."

In a recent number of the MICROCOSM we referred to the fact that Dr. R. F. Stevens, of Syracuse, N. Y., whose indorsement of the new treatment appears elsewhere in this "Extra," had been writing hundreds of letters gratuitously to persons all over the country who wished reliable medical advice in connection with their physical condition, and the best use of the new remedy. We suggested that it was only fair that persons thus drawing on the doctor's valuable services should inclose at least one dollar, and we are glad to know that many are heeding this suggestion, and getting many times the worth of their money in valuable information.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
Address all communications to A. WILFORD HALL, 23 Park Row, New York.

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TIMBRE, OR THE QUALITY OF TONE—ITS HARMONY WITH SUBSTANTIALISM.

BY THE EDITOR.

Four fundamental peculiarities of sound are involved in the science of acoustics, namely, *pitch, intensity, duration* and *timbre*. To these may be added the gradual changes in pitch and intensity which go to make up diverse musical effects. At present our remarks will relate entirely to *timbre*, or that peculiar quality of tone by which two or more sounds of a given pitch or intensity may easily be distinguished from each other.

It is upon this phase of sound-investigation that Prof. Helmholtz made his reputation as an acoustician. Though his explanation of the *timbre* of musical sounds was necessarily and essentially wrong, as must be every explanation based on the wave-theory, yet he was right in the general facts he discovered and illustrated, namely, that the different qualities of the tones of different instruments and voices result entirely from the combination of overtones, undertones, resultant tones, etc., with fundamental notes.

A string, for example, has not only a fundamental vibration by which its chief note is produced, but in addition it has supplemental, intermediate, or incidental vibrations, either slower than the fundamental or more rapid and smaller, somewhat as small waves of water may be seen crawling over the surface of ocean billows, and even in different directions.

Now the substantial theory of sound, the same as the wave-theory, teaches that the tone of any musical instrument is produced or liberated by means of its vibrations, and that if two, three or more diverse orders of vibration are produced in the same instrument at one time in addition to its fundamental swing but of a subordinate or less pronounced character, such over or under vibrations will necessarily generate over or under tones corresponding in intensity and pitch to their amplitude and vibrational number as compared with the fundamental tone.

As all such supplemental or incidental tones are quite faint in comparison, they are gener ally drowned entirely as distinctive sounds by the fundamental note, though they are sufficiently audible as they mix up with the fundamental tone to constitute the *timbre* or quality by which the tone of nearly every musical sound can be distinguished from that of all others and by which its source can accurately be determined.

The great achievement of Helmholtz was the construction of a system of *resonators* by which successfully to institute a search among the mass of these tones—fundamental and supplemental—and thus to analyze their true character and thereby prove their actual existence as the true cause of *timbre* or the quality of tone.

These resonators consisted of confined chambers of air, of different vibrational numbers, having an open mouth at one end for the reception of the tone sought, and an ear-tube at the other for determining its actual existence when found. As the resonator for a given note will not sensibly augment any tone save the one of its own vibrational number, and with which it is in sympathy, it is plain that should there be an overtone corresponding to that vibrational number it will be distinctly heard; while all other supplemental tones or even the fundamental itself, not being reinforced by the sympathetic air-chamber, will not be sufficiently audible to interfere with the proper analysis of the supplemental tone sought. In this way Helmholtz sought out and determined the existence of numerous supplemental tones,—more or less in number and distinctiveness according to the nature and character of the musical instrument tested, and its peculiarities of vibration.

This was truly praise-worthy and all very well, and had not the great German physicist been hampered and handicapped by the absurd and fallacious wave-theory of sound, his dis-

covery would have been almost infinitely enhanced in its importance. But look at his predicament. To account for these over-tones, under-tones, differential tones, resultant-tones, etc., in addition to the fundamental tone of the instrument, all produced by the different forms of vibration actually occurring in a single string, he was obliged to assume, in accordance with the wave-theory, that they all consisted of separate systems of purely mechanical air-waves driven off from the string, crossing and criss-crossing each other's paths in every conceivable direction, with the same air-particles oscillating in no less than a dozen systems of waves, primary and incidental, all of different amplitudes of swing, according to a dozen different degrees of intensity, and all of different rates of oscillation according to a dozen different pitches of tone. Yet all these conflicting and battling wave-systems had to enter the ear in their dozen conflicting bombardments, and all at the same instant were obliged to produce as many systems of similar wave-motions in the tympanic membrane,—a flabby mass of tendenous tissue not stretched at all, as falsely supposed, and not capable of a single vibration even with the sound of thunder!

Not only this, but every tone of an orchestra of a score of pieces, with all their complex fundamental tones, over-tones, resultant tones, etc., must in like manner fill the air of a room, moving every particle of it in hundreds of different directions at the same time, at hundreds of different velocities, according to intensity and consequent width of swing, and at hundreds of different rates of oscillation per second according to the innumerable pitches of these fundamental tones, over-tones, differential tones, etc. Yet any one of all these conflicting bombardments of air-particles from any particular instrument, with their vibrations wrecked in form, spoiled by collisions, and knocked out of time, if isolated by a musical ear can be distinctly heard and followed as if no other sound were in the room.

The foregoing is no exaggeration of the monstrous impossibility involved in the wave-theory of sound. Tyndall realized it and, like the brave man he used to be, he faced the music and put it on record to his own present mortification and sorrow. Hear him:

"The same air is competent to accept and transmit the vibrations of *a thousand instruments at the same time.* When we try to visualize the motions of the air—to present to the eye of the mind the battling of the pulses direct and reverberated—the imagination retires baffled at the attempt."—*Lectures on Sound*, page 257.

The reason why the imagination must retire baffled at such legitimate consequences of the wave-theory is because the supposition is an inherent and preposterous absurdity on its face. But let us see how beautifully the wave-theory hangs together in the hands of its chief exponents. Tyndall goes on to remark:—

"I have already had occasion to state to you that when several sounds traverse the same air, *each particular sound passes through the air as if it alone were present.*"—*Ibid*, page 281.

This latter statement is true and according to observation, and is therefore the most incontrovertible proof that sound does not consist of the motions of the air at all. Plainly, if sound consists of the motions of the air through which it passes, then two sounds of different amplitude of swing and of different rates of oscillation passing through the same air at the same time must necessarily conflict with each other's motions and neutralize each other's effects; and consequently the above truism is converted into a falsehood.

Even Tyndall himself flatly contradicts the foregoing truism in a dozen different places in his book, where he teaches that two sounds may so pass through the same air together that their two systems of air-waves will conflict, interfere, neutralize each other, and thus produce total silence. Here is only one statement out of many:—

"If the two sounds be of the same intensity their coincidence produces a sound of four times the intensity of either; *while their interference produces absolute silence.*" *Lectures on Sound*, pages 284, 285.

How then is it possible, when "several sounds" pass through the same air at the same time, for each particular sound to travel as if it alone were present? The truth is, the theory was so inherently unscientific and unmechanical that these manifest self-contradictions seemed to make no impression on the minds of those physicists. It mattered not how often their statments conflicted with each other the inconsistent theory had to be carried out at all hazards since nothing better than the wave-theory was then known to science.

But we need no better proof that the wave-theory of sound is false in its elementary principles, than the calm and deliberate admission of Helmholtz himself. He declares that the conflicting motions of the air-particles in a room filled with sounds of different intensity and different pitch, as necessarily involved in the wave-theory, is an absolute impossibility and the sound-waves still to remain intact, and hence he forces us to the conclusion that the wave-theory must be a scientific fallacy. Here are his words:

"Any particle of air can, of course, *execute only one motion at one time.*" "It is evident that at each point in the mass of air, at each instant of time, *there can be only one single degree of condensation*, and that the particles of air can be moving *with only one single determinate kind of motion, having only one single determinate amount of velocity*, and *passing only in one single determinate direction.*" "Sensations of Tone," pages 40, 222.

Of course this single statement annihilates the wave-theory; yet so wedded was its author to that impossible hypothesis that he could not see the fatal effects of his own invincible application of mechanical law.

Any one can demonstrate the existence of fundamental vibrations in a long stretched rope while at the same time smaller intermediate and supplemental systems of vibration may be caused to take place ir the same rope at the same time. In this way, as previously observed, can the tensioned musical string, by numerous supplemental and intermediate systems of vibration, be caused to liberate several classes of minor and supplemental tones in addition to its primary or fundamental note. But it by no means follows from this well-known principle in mechanics that the same air-particles constituting theoretic sound-waves, as some have superficially supposed, are capable of two different and directly opposite motions at the same time as theoretically required to produce two sounds of equal intensity (which require equal amplituds of swing), *and of double the number of vibrations and at double the velocity of travel.* Is any man so superficial in mechanics that he can not see this?

Tyndall repeatedly lays down the universal law of the wave-theory in the following words:

> "We have already learned that what is *loudness* in our sensations, *is, outside of us nothing more than width of swing or amplitude of the vibrating air particles.*"

This being so, it is perfectly plain that two sounds of equal loudness (*equal amplitude of swing*) and an octave apart (*one double the number of vibrations of the other*) could not use the same particles of air, *since it would require these particles to move equal distances simultaneously in opposite directions*, and at the same time the particles producing the octave would be obliged to move at double the velocity of the same particles producing the fundamental tone. Helmholtz, as just quoted, says that such simultaneous motions, directions and velocities of one and the same particles are impossible, and in so saying he passes sentence of death upon the wave-theory of sound.

But after all this unanswerable logic against the wave-theory, how simple and beautiful are the principles of the Substantial Philosophy in their solution of all these acoustical phenomena! Every conceivable shade of a vibration of a stretched chord, for example, whether fundamental, incidental, or supplemental, liberates a corresponding phase of substantial sound-force from the fountain of natural energy. These substantial but immaterial sound-pulses, without the slightest disturbance of the air even an inch from the vibrating string, radiate in all directions at the same instant, as over-tones, combination tones, resultant tones, fundamental tones, etc., and being immaterial substance do not conflict but pass through each other undisturbed or unmarred as if only a single tone were involved. Thus the ear has no difficulty in recognizing all of the scores of tones of an orchestra and at one and the same instant, distinguishing each peculiarity by a suitable act of attention, just as the experienced perfumer can analyze a dozen different substantial odors issuing from a single bottle at the same instant. (See the concluding pages of Chap. V. "Problem of Human Life," in which this entire subject is discussed.)

No one doubts but odor is a substantial element emanating from odorous bodies. Whether it is material or immaterial substance, or a combination of the two lying along the border land of materiality, we are not even yet fully determined. Upon one thing, however, all are agreed—Tyndall, Helmholtz, Carpenter, Sir William Thomson, everybody—that odor is a real substance. Yet it has over-smells, fundamental smells, combination-smells, resultant smells, etc., the recognition and analysis of which by that sense through the olfactory nerve is almost precisely similar to the hearing and analyzing of numerous sounds at one and the same time through the auditory nerve. Yet remember, that no super-position of odorous waves, or vibration of the nasal membrane, is needed for the recognition and analysis of various substantial odors all received at the same time. Neither the olfactory nerve nor the auditory nerve requires air-waves or membranic vibrations to receive and transmit these respective sensations to the brain. Substantial odorous force from the musk and the rose answers the purpose in the one case without air-waves. Why should not substantial pulses of sound-force answer a similar purpose in the case of hearing, and thus at a single beautiful solution, forever wipe out and do away with the monstrosities and self-contradictions of the wave-theory of sound?

PRIZE ESSAY, No. 5.
THE NATURE OF FORCE.

BY REV. F. HAMLIN, D. D., PH. D.

John Stewart Mill, after declaring that "our experience instead of furnishing an argument for a first cause, is repugnent to it; and that the very essence of causation, as it exists within the limits of knowledge, is incompatible with a first cause;" proceeds to contradict himself by saying that "cause, when analyzed, is found to be a certain quantum of force combined with certain collocations;" force is a "permanent element which may with some justice be termed a first or universal cause;" and then says that "as the primeval and universal element in all causes, the first cause can be none other than

force." It were a sufficient answer to this last statement that all around us are evidences of design, which in turn necessitates the pre-existence of an intelligent being; and as force in the common acceptation is not thus intelligent, it can not be the first cause of all things. And when in addition to this consideration we remember that "a cause must carry in it its entire effect," the presentation of force as the first cause of all things is utterly unreasonable; for man is a thinker, and from mere force as we see and know it in its relation to the natural world, the ability to think can not be derived. But the purpose of this paper is to show that the accepted definition of force is utterly meaningless; and deprives it of that substantial reality of essence which is absolutely necessary to the accomplishment of results. According to the "mode of motion" theory of the nature of force it can not be even a means of accomplishing God's purpose in the world; to say nothing of the position which Mr. Mill assigns it as the first cause of all things. And the very fact that it does produce results, is the best argument that the present accepted definition of it is a false one. This leads me to say that:

I. Force is not and in the very nature of things can not be "a mode of motion." That this is the popular belief we admit; but submit that public opinion is not always a standard of either right or truth. Indeed, as in many instances the few are capable of judging, the "general opinion" is often the opinion of the few chosen by all. The views of so-called educated men are communicated gradually from mind to mind, descending lower as they extend wider, until they leaven the whole lump, and as John Ruskin said, "rule by absolute authority, even where the grounds and reasons for them can not be understood." While it is not true that universal consent has in it no force of argument; it is equally true that no proposition becomes true because one, or many, or all men believe it to be true. The truth is that *motion* can not be a correct definition of force, because only the substantial or substantially existant can move inert matter; and as *motion* is not an entity, but relates merely to change of place or position, it can not be and is not a true definition of force.

Indeed, such a definition of force is unreasonable and unscientific; for surely the definition of a thing and the effect of a thing can not be the same, else cause and effect are one. And as motion is the effect of the activity of the various forces of nature, surely that very word can not be a definition of the agent producing it. Webster defines force to be "any action between two bodies which changes or tends to change their relative condition AS TO REST OR MOTION," "or which changes or tends to change any physical relation between them." And the same author defines power to be "applied force; force producing either motion or pressure." Meyer says that "power is that which is expended in producing or resisting motion;" how then can power which is but applied force be the same in its nature that it is in its results or effects? As well define an axe to be a gash in the side of a tree, or a horse attached to a moving truck to be a "mode of motion," as to call any force of nature "a mode of motion." II. *The only rational definition of force in any of its varied operations is that it is a substantial entity.* Indeed, we are quite surprised to find so profound a thinker as the author of "Studies in Theism," declaring (p. 356) that the "inherent laws" (that is, acting forces) of the world are "simply modes of his (God's) activity;" and that (p. 178) "what we call natural forces are but so many permanent and fixed methods of the operation of a great all-pervading will-power." Surely these words must have been thoughtlessly penned; for the most superficial thinker can but see at a glance that forces are neither "modes" nor "methods," but real substantial entities,—means which the Almighty utilizes for the accomplishment of his grand and beneficent designs and purposes. As well might the carpenter call his chisels and saws "modes and methods" instead of real substantial entities. Indeed, there can be no motion anywhere unless there is some entity to be moved, and some entity to move it. While, as in the case of a definition of deity, there is necessarily the exclusion of corporeity, there must be in all forces the essential of substantiality. The interacting forces which effect the relations and positions of atoms must be (if not so visible), at least as substantial and real as the atoms themselves; otherwise there is no meaning in the language of the Duke of Argyle when in his "Unity of Nature" he declares (p. 125) that "when two distant bodies seem to exert an influence on each other, the effect must be really due to SOME INTERVENING MEDIUM BY WHICH THEY ARE PUSHED OR PULLED," and until we are convinced that *motion* is a forceful medium, capable in itself of pushing and pulling, we can not accept it as a proper definition of force. In short, if *one* force is unsubstantial, then *all* forces are *probably* so; and if *that* be true, adieu to all rational faith in a *hereafter for man;* for if "mind, or rather soul, is the product of organism, not as being but simply as *phenomena*, immortality becomes an impossible conception." But, on the other hand, if force is an entity, then one of the foremost orthodox thinkers and editors of our day is wrong in saying that "the doctrine of immortality, reason finds difficulty in supporting, because it seems scientifically improbable." How beautifully the above view of the substantial nature of force, which is "but a rending of a truth of the eternal one through his works," harmonizes with the Christian idea of immortality" which is founded upon the reading of his truth in Revelation."

New York, January 1st, 1890.

The Six Reconstructing Days of Time's First Great Week.

A LECTURE BY REV. T. WILLISTON.

It is a serious evil that, in the minds of many, geology has created a seeming discrepancy between its conclusions and the proper interpretation of the Fourth Commandment. When told in that command that "in six days the Lord made heaven and earth, the sea and all that in them is, and rested the seventh day," most readers have supposed that the Lord's six laboring days were, in length, just such days as ours, and that we are commanded to labor for six successive days, and to rest on the seventh, in *imitation of the Lord's example.* The interpretation has been, that man's working days, no less than his resting day, were to be of the *same length as the Lord's;* and that is both the natural and the correct interpretation of that Command. With due regard to the undisputed facts of geology, and without

rejecting one of them, it will be my aim to show that the construction which some geologists give to the Six Creating Days is erroneous; that it makes the Fourth Commandment a blind, misleading precept, and that geology demands no such construction.

If construed as by some scientists it now is, the Fourth Command might be thus paraphrased: "Six days, O man, shalt thou labor and do all thy work, but every seventh day thou shalt rest. For in six successive periods of vast length (embracing, probably, many scores of centuries) the Lord made all things, and for the one natural day that succeeded these many centuries, He rested!" Strange, inexplicably strange, that in one part of a command issued by the all-wise God, and meant for observation everywhere, *six days* should mean only six-sevenths of a week, while in another part of the same command it means thousands or millions of years! In refutation of this unnatural interpretation, and at the risk, perhaps, of being deemed an ignoramus, I proceed to assign several reasons for believing that the "Six Days" were six rotations of the earth on itself. How to reconcile this with the admitted facts of geology will come afterwards.

I. That the *first day* of the six became a day, not by the lapse of a long series of years, but by a single rotation of the earth, is made well nigh certain by the description we have of it in Genesis, i, 2-5. At the time God's reconstructing work began the earth was in a formless and void state, enveloped in water and darkness, and it was the sole work of this first day to speak light into being, and to divide the light from the darkness. Now in what way did God *then* separate light from darkness, if not in the way He has separated them ever since, viz.: by the earth's diurnal revolution? Considering the nature and properties of light, it is difficult to conceive of any other way of dividing it from darkness but that of having an opaque object intervene and hide the one from the other. And then the fact that as soon as light and darkness were separated, God named the one *Day* and the other *Night*, and the additional fact that at this day's close (and, varying the *number*, at each day's close) it was said, "The evening and the morning were the first day," are facts that sound strangely if this first day was made up of whole centuries; but if, as is seemingly certain, it was made up of the same two parts that a day now is, the words used are natural, intelligible, and just what we might expect. If each of the six days was composed of centuries, to represent each of them as having one evening and one morning is quite unintelligible.

To what has been said respecting the first day it may perhaps be objected, that as the sun is not spoken of as existing till the fourth day, God's mode of separating light from darkness could not have been the same, on the first three days, that it became on the fourth, and that the earth could have had no diurnal rotation till the fourth day. To this the reply is, that in the opinion of eminent scholars (Fairholme, the geologist, Prof. Bush, and others) the sun, moon, and stars *were in existence on the first day*, but did not shine clearly out, or become distinctly visible, till the fourth day. Fairholme speaks of the earth as "already revolving on its axis in the first and second days," and of the sun as then existing, though not shining through "the, as yet, cloudy atmosphere." Professor Bush, speaking of the sun's not being mentioned till the fourth day though existing on the first, says, "Let it be supposed that on the fourth day the clouds, mists, and vapors were all cleared away; the sun, of course, would shine forth in all his splendor, and to the eye of our imagined spectator would *seem to have been just created;* and so, at night, of the moon and stars." If these bodies were not created till the fourth day, and if the six days were periods of immense length, then our forlorn planet had no sun, or moon, or stars to illumine it till it had itself existed many thousands of years. Is this credible? How much more rational is the supposition, that it was the sun's beclouded light which dimly lighted the earth during the three first days, and how probable, how certain it is that this first day, with its evening and its morning, was measured by one diurnal revolution of our globe. And if the first of the six days was evidently such a day as ours, were not all the rest?

II. The Mosaic record shows that before the Flood man was to subsist on herbs and fruits; that such herbs and fruits as were suitable for his sustenance were produced on the third creating day; and that the first human pair were created on the sixth day. Now if each of these days was a period of vast and indefinite length, thousands of years must have intervened between the production of things necessary for man's subsistence, and the creation of man himself. Does it seem probable that provision was made for man's support thousands of years before it was needed? I know, indeed, that

"Full many a flower is born to blush unseen,
And waste its sweetness on the desert air,"

but I hardly think that he who once said, "Gather up the fragments that remain, that nothing be lost," was so wasteful as to provide things for man's necessities whole centuries before any such necessities existed.

III. The fact that from time immemorial, and among widely separated nations, *such a division of time as the week* has been known, is strong additional proof that the six reconstructing days were days of 24 hours in length. The week is not, like the month and the year, a *natural* division of time. By no movement of the heavenly orbs is it marked out, and I see no way of accounting for its existence but by supposing that God meant it to be a lasting memorial of the fact that in six natural days He wrought his great creating work, and then rested a day. It is obvious that man's temporal and eternal interests demanded such a time-measurer as the week; but of this he would have remained ignorant, had not God originated the week in the way He did. And what a monument is this artificial time-measurer of the Creator's wisdom!

[*Concluded in the next Number.*]

PRIZE ESSAY NO. 6.
MOTION AND FORCE FROM A FREE THOUGHT STANDPOINT.
With Remarks by the Editor.

BY G. B. JOHNSON.

In the MICROCOSM for May, 1889, p. 86, a reverend contributor, speaking of Materialism, says: "If that theory affirms that matter is eternal, it hesitates to say that matter in motion is eternal, because then it must admit that motion is a quality inherent in matter." "Materialism can not explain how they (the atoms) came to start in motion. There must have been a first motion, or else all motion is eternal, which it does not admit."

Does "materialism" "hesitate to say that matter in motion is eternal?" My understanding is that materialism holds motion to be uncreated and eternal; that there was no first motion; that motion is transmitted from portion to portion of matter, and transmuted from one manner of motion to other manner of motion.

All materialists may not see alike, even on material points. A man may be a scientist, a materialist, a spiritualist or a substantialist, and see many things truly and see many things wrongly.

Outside of "Substantialism," I do not know who they are who hold that motion is not eternal, except those who religiously hold that matter is not eternal. And I am not aware that Substantialism holds matter to be eternal. I have sought in my reading to get at the meaning of the writer, and not to misunderstand nor misconstrue the words of a Christian, or a spiritualist, or a materialist, or a substantialist. Very often I do not get a definite or satisfying idea of what a writer means; and inconsistencies appear not uncommon, whatever the creed of the writer.

The idea that motion is eternal, is neither materialistic nor non-materialistic. I do not know that it is a tenet which Christian and non-Christian may not hold in common. If Christians can not hold this doctrine, I think there are many who suppose themselves Christians who are not. If the idea that motion is uncreated and eternal does away with miracles, then perhaps a Christian must reject it. I do not know that the eternity of motion is destructive to miracles.

I think many Christians interpret miracles in a way which takes the miraculousness out of them; and I think such persons may be sincere Christians. You may regard them as on the highway to "free thought," and may have little charity for them. When faith in that which is, and hope for what may be, and charity for another's ideas, are cast out from religion, what good is there left in the religion? It may persecute; but will it inspirit to a higher life? It may crush opposition; but will it lead a soul into juster light?

I think "materialism can not explain how atoms came to start into motion." I can see no occasion for its making any such explanation. I suppose a materialist does not believe there was a starting point, but believes there was no beginning and will be no end. Can not a Christian thus believe? Do not some Christians believe thus? What does Christianity consist in; and who has framed its creed?

I think materialists will be led naturally to hold that matter is uncreated and eternal; that motion is uncreated and eternal, and that force is uncreated and eternal. I think they will be led to see that motion is not force, and that force is not motion. I do not see why non-materialists may not possess these tenets.

I think materialists will be led to see that motion is change of place of portion of matter among portions of matter; and that force is influence of portion of matter on portion of matter. Is this wicked? If a person is not a materialist, he might come to see that motion is of portion of substance among portions of substance; and that force is influence of portion of substance on portion of substance. He may be ruled out from "Substantialism," yet believe in immaterial substance none the less.

If the substantialist holds that matter has no influence, but is utterly passive, and acted on by immaterial substance without reciprocation, I think the substantialist nevertheless will come to draw a distinction between immaterial substance that exerts influence, and the influence which is exerted by the immaterial substance.

The *influence*, whatever its nature, is what I understand by force. Force is the affecting power portion of substance has on portion of substance. This does not imply materialism; it does not interfere with the doctrine of immaterial substance. The truths of any system of philosophy, do not stand or fall upon the interpretation of a word.

I am not writing to take sides in any controversy. I would not turn my hand over to gain a point against another. I would rather yield the point except to put things truthfully and understandingly. I think there are tenets which "materialists" and "substantialists" may hold in common. I do not know that the time may not come when Christian and non-Christian may come to love each other as human beings, and to treat each other fairly, inspired by a common faith that a power beyond us, personal or impersonal, has its hold upon our thoughts and upon the lives we lead.

Corning, Kan.

REMARKS BY THE EDITOR.

Mr. Johnson has not yet studied Substantialism with that freedom from materialistic pre-conceptions to have a clear idea of a consistent and universal philosophy of the entities of nature. It requires very close and careful thought to comprehend the continuity of things material and immaterial which embrace and include universal existence, and we believe that no philosophy save that of Substantialism pure and simple ever took such a comprehensive grasp of the material and immaterial universe

For example, Mr. Johnson has confused ideas about *motion* as a thing that possibly exists as an entity. He speaks of motion as eternal, and of matter in motion as different from matter at rest, Matter is essentially the same whether at rest or in motion, and motion is nothing but the change in position of some entity, material or immaterial. Motion does not exist at all, and never did exist. Motion *occurs* as the effect of force exerted upon some objective thing. The eternity of motion is only conceivable on the assumption that an entity of some kind eternally existed with the inherant power of constantly changing position. Such a conception is only applicable to the self-existent first cause as the primordial author of all things material, and as the prim-

ordial and uncreated fountain of all force in its general sense, and out of which have come all specialized forms of force, physical, vital, mental and spiritual.

Mr. Johnson clearly thinks that matter, philosophically and logically, must have been eternal. This does not by any means follow. Of course it is essential to materialism, not only that matter always existed but that there is no other substantial entity in the universe but matter in some of its forms. Let materialists maintain this view if they can in opposition to Substantialism, but they will have a more serious battle than many of them have thought.

Christian Substantialists do not need any such imperfect conception as the eternity of matter. To us it is a simple and easy conception—the creation of matter out of the immaterial force-element of nature by an infinite personal power. True, some Substantialists have stumbled upon this very point and can not see how immaterial substance can be changed into matter even by omnipotence, any more than how matter can be converted by the same power back into immaterial substance. We believe, however, that both propositions are easily conceivable by the human intellect when properly trained, and that this is the only consistent view to round out Substantialism as a harmonious and universal system of philosophy.

In the first place we say frankly that to our mind the transformation of matter by analysis back into immaterial substance, from which, as we have always believed, it must have come at the start, would be but a simple process on the part of the Infinite, judging by analogy from what man himself is capable of doing and is constantly doing in the ordinary affairs of life.

Plainly and undeniably, if man can so change or transform matter as absolutely to destroy one property after another until most of its observed properties have been annihilated, it would not seem a difficult task for infinite power to proceed a little further and destroy the remaining properties peculiar to matter, thus completing the analysis and transformation back to absolute immateriality.

We now lay down a principle in philosophy amounting to what we regard as a new physical law, namely, *that a given substance is only material by virtue of possessing certain properties peculiar to matter; while a substance is only immaterial by virtue of possessing other and entirely different properties which will enable such substance to act in certain directions in defiance of material conditions.*

Magnetism, for example, is as really substantial as is our atmosphere, though it will pass through a sheet of glass or any other impervious material body as if nothing intervened, while our atmosphere will not thus pass, both these results being entirely in consequence of the peculiar properties the two substances possess.

Now there is no dispute but that puny man, by calling to his assistance the natural forces, can so transform matter as absolutely to change and even to annihilate many of its observed properties and to substitute others entirely different. If finite man has this power, thus to nullify the properties of matter one after another, such, for example, as hardness, brittleness, opacity, combustibility, fluidity, compressibility, elasticity, ductility, solidity, transparency, etc., and substitute for them exactly opposite properties which before were absent; is it not reasonable to assume that an infinite intelligence, by calling to his aid other natural laws and forces at present unknown to man (as is probably the case in all miracles) can destroy the properties of inertia, weight, inter-impenetrability, etc.,—properties which make matter essentially what it is,—and that he can substitute properties adapted only to immaterial conditions? This, as we conceive, is the only view practicable by which to harmonize the resurrection of the material body as taught in first Corinthians XV—namely, its change to immateriality, thus making it "a spiritual body," by abrogating its material, corruptible, and carnal properties.

And further, if God is capable thus of converting or transforming matter by infinite analysis into immaterial substance by a simple abrogation of a few of its properties more than man is capable of accomplishing, he surely ought to be able to take immaterial substance, and by infinite synthesis construct matter by a similar abrogation of its immaterial properties, and by giving to it the new properties of inertia, tangibility, ponderosity, etc. Thus man's own capability as seen in the destruction and production at will of properties of matter almost *ad libitum*, by aid of the natural laws and forces, furnishes a clear analogy in proof that infinite power could easily so annul the essential and inherent properties of the force-element as to change it into solid rock with its whole retinue of differentiated properties, notwithstanding our inability to conceive the process of such change.

It is urged that it is contrary to all human experience, this idea of the possibility of the change of material into immaterial substance, or *vice versa*, and that such changes are as unthinkable as the annihilation of an entity or the creation of something out of nothing.

Now we demur to this conclusion. It is perfectly thinkable as well as demonstrable, that even man, as just shown, can change and destroy many of the properties of matter, producing new ones in their place, which, as we have seen is all that is needed if carried far enough, to change force-substance into gross matter; while not even the slightest approach to the annihilation of a substance or the creation of something out of nothing has ever been experienced or observed by man. Hence all human experience, as well as all analogy, is against both the annihilation of any substantial entity as well as against the creation of matter out of nothing. Matter, however refined or sublimed, is nothing but matter, so long as one material property exists. When these properties which constitute it matter are all destroyed, and immaterial properties substituted, then it becomes immaterial substance, a work only conceivable as within the power of the All-wise Creator. We can conceive of immaterial substance, such as constitutes the force-element of nature, as eternally present with Deity as the agencies and instrumentalities of his power, and as constituting his environment or exterior being. But we can not conceive the necessity or propriety of gross matter in any form as a part of his environment without its being, as it certainly was not, a part of his own substantial existence.

OUR NEW YEAR'S OFFER TO CLERGYMEN.

(From the January Number.)

We are so anxious that every minister in the United States and Canada shall have the benefits of our Health-Pamphlet, that we now offer to send it free of charge except postage (8 cents) to any regular clergyman who will send us the required promise not to reveal the treatment outside of his own family, and who will enclose the 8 cents in postage stamps. We are thus willing to become a missionary in using a large portion of our income from the sales of the pamphlet for the personal benefit of this noble band of workers in the cause of religion. Surely no class of our readers will demur to this liberal proposition, which applies alike to the clergy of all denominations. Should a little delay occur in receiving the pamphlet after writing for it, on account of the rush at this end of the line, be patient.

OUR OFFER TO THE POOR.

(From the January Number.)

Although our offer to the poor, as printed some months ago, has cost us thousands of our Health-Pamphlets, yet we are more than gratified to feel that we have done much good service in alleviating the afflictions of the unfortunate. (See the letter of the Rev. Dr. Littlepage, in this number, page 28.) Will the medical doctors who solemnly calumniate us and protest against our selling for $4 the best prescription ever offered to the world, and which saves all doctor's bills for life, please go and do likewise, and offer their drugs and services free to the deserving poor? We now repeat our offer to every poor man not able to purchase $4 worth of medicine if prescribed by a physician, and who will get his postmaster so to certify, that we will send him the Health-Pamphlet free on receiving a written promise that he will not reveal it outside of his own family.

N. B.—Any editor who may desire to benefit the poor, is at liberty to print the foregoing item, giving our address.

Acoustics: Review of the Old and New Theories of Sound,—IV.

BY GEORGE ASHDOWN AUDSLEY, F.R.I.B.A.

[In his number III in the *English Mechanic* of December 6th Dr. Audsley devotes nearly the whole article to quotations from the *Sensations of Tone*, in which Prof. Helmholtz elaborates the principles of the wave-theory. As these statements differ but little from the views set forth by Prof. Tyndall and other acoustical writers, we will omit the quotations and give herewith Dr. Audsley's number IV, from the *Mechanic* of December 20.]

26. VELOCITY OF SOUND.—The velocity of sound in air has been found by careful experiment and observation to be as follows:—At the freezing temperature it travels about 1,090 feet in a second of time, whilst at the temperature of 26·6° Centigrade it travels at the increased velocity of 1,140 feet a second. These calculations show that sound receives an increase of velocity in air of about 2 feet a second for each degree Centigrade above freezing point. At all temperatures below freezing point—0° Centigrade—its velocity is less than that first given.

27. These remarks naturally bring us to the consideration of a matter which has always been descanted upon with gratification by the teachers of the *wave-theory of sound;* but before entering directly upon it, we may briefly allude to the methods adopted in determining the velocities above given. Many interesting details might be furnished in connection with this subject, and especially with reference to the many efforts made by scientific investigators in this country and on the Continent to establish the velocity of sound in air with precision. The most successful investigators have been certain French and Dutch scientists who spared no pains in their essays to solve the problem. They took into careful calculation the temperature and all other conditions of the air, which to the best of their knowledge and belief, would influence the velocity of sound therein. Two distant stations were selected, and the exact number of feet between them was accurately determined by trigonometrical observation: and the most exact means were devised for measuring the time occupied by the sounds in passing from station to station. Loud sounds were made at the same instant at both the stations, and accordingly travelled through the same mass of air and under similar conditions. The time occupied by the sounds in travelling, expressed in seconds, divided into the distance between the stations, expressed in feet, gave the velocity of sounds per second. Careful comparisons of all trials resulted in the velocity of 1,090 feet per second being fixed at a temperature of 0° Centigrade or 33° Fahrenheit. As accurate and properly conducted experimental demonstration may be accepted as *fact*, so far as results are concerned, without reference to any questions of theory, the velocity of sound as arrived at by the French and Dutch scientists may safely be accepted as practically correct; and, accordingly, will be recognized as such throughout this part of our review. Be it understood, however, that we are not prepared to admit that sound is conducted by the air, at any fixed temperature, with anything approaching a uniform velocity.

28. Now we come to the consideration of the matter alluded to in the opening of the preceeding paragraph. This embraces Sir Isaac Newton's calculated or theoretic velocity, its disagreement with the results arrived at by direct experiment and accurate observation, and Laplace's ingenious correction (?) or appendix thereto, reconciling Newton's theoretic calculation with observed facts. Newton, basing his investigations on the known density and elasticity of the air at a given temperature, calculated that sound should travel through air at the freezing temperature at the uniform velocity of 916 feet a second, be the distance what it may between the origin of the sound and the ear which receives it. Now, whilst it was not easy to dispute the apparent accuracy of Newton's calculations, it was evident from the results arrived at by practical experiments and observation, that his theoretic velocity was only about five-sixths of the true velocity. It was natural that so great a discrepancy should give rise to much discussion in the scientific world; and that many theories should be started to in some way account for the missing sixth. Newton, fully recognizing the importance of this matter, attempted to square it by throwing out a conjecture that sound only took time in passing from particle to particle of the air, and that it occupied absolutely no time in passing through the particles them-

selves. This supposition compelled him to assume that the path through which sound passed was occupied by air-particles only for a portion of its length. Prof. Tyndall alluding to this question says it is "one of the most delicate points in the whole theory of sound"; and we agree with him that it is, seeing, as we shall incontestably prove later on, that it leads, along with other things, to the complete overthrow of the *wave-theory*. But we must not anticipate.

29. Everything remained in an unsatisfactory state, notwithstanding Sir Isaac Newton's attempted explanation of the missing sixth, until the great scientist, Laplace, came forward with his heat hypothesis, and received the congratulations of his brother philosophers. As Prof. Tyndall says, the "great French mathematician Laplace was the *first to completely solve the enigma.*" We shall now attempt to explain how he solved the enigma.

30. All acousticians seem to have agreed in recognising this rule.—The velocity of sound in air depends upon the *elasticity* of the air in relation to its *density*. That is, the greater the *elasticity* of the air the greater is the rapidity with which sound is propagated therein; and, on the other hand, the greater the *density* of the air, the slower is the rate of propagation. The recognition of these essential facts, however, failed to account for the missing sixth in Newton's apparently correct and reasonable calculations. A greater elasticity than the air was known to possess under ordinary circumstances was evidently required to account for the known velocity of sound. Heat was necessary to create this increase of elasticity, but where or how could it be generated? Certainly this was a "delicate point" in the *wave-theory* of sound—a veritable "enigma." Its solution, unfortunately, was reserved for "the great French mathematician, Laplace." He, at a time when this missing sixth was greatly exercising profound thinkers, came into the full blaze of the scientific footlights and announced that every difficulty was swept away; that he had discovered the source of the increased elasticity of the air, and, accordingly, had reconciled Newton's theoretic velocity with the observed velocity. It will be remembered that in paragraph 8 it is clearly stated that a *sonorous wave* consists of two parts, in one of which the air is *condensed* and in the other *rarefied*. Laplace blindly accepted this statement, and without pausing to question the truth or reasonableness of the *wave-theory*, in its entirety, formulated the heat hypothesis which has linked his name forever with a theory now hoplessly shattered. Laplace pointed out that as each *sound-wave* consists of a *condensation* and *rarefaction* of the air, both heat and cold must of necessity be generated in every *wave;* and that such changes of temperature produced in the *sonorous wave* have no relation to or effect upon the normal temperature of the mass of air through which the sound passes. He calculated that the heat generated in the *condensed* portion of the *sonorous waves* imparted an increased *elasticity* sufficient to account for the missing sixth. We may remark here that although a corresponding degree of cold is produced in the *rarefied* portions of the *waves of sound*, which, logically, should diminish the *elasticity*, yet by a most ingenious chain of reasoning this *rarefaction* is made to lend its aid in reconciling the theoretic with the true velocity of sound. Prof. Tyndall points out that Newton only recognized in his calculations "the change of elasticity resulting from a change of density"; and he further points for our guidance in this "delicate point," that "over and above the elasticity involved in Newton's calculation, we have an additional elasticity due to changes of temperature produced [according to Laplace's heat hypothesis] in the *sound-wave* itself. When both are taken into account, the calculated and observed velocities agree perfectly." Newton did not take into account the changes of temperature within the *sound-waves*, and gave his calculated velocity as 916 feet per second at the freezing temperature; but Laplace assumed such changes to exist, and by multiplying Newton's figures by "the square root of the ratio of the specific heat of air at constant pressure to its specific heat at constant volume, the actual or observed velocity is obtained." The result of his calculation gave 174 feet a second as the increase of velocity created by the heat generated in the *condensed* portion of the *sound-waves*.

31. Neither Prof. Tyndall nor Prof. Helmholtz has given us any information respecting the amount of increased density caused by the condensation of the *sound-wave*, and this is, to say the least of it, an oversight; but on turning to the pages of Appleton's *American Encyclopœdia*, we find that Prof. Mayer—America's highest authority on the old theory of sound—in his article on "Sound," supplies this deficiency. He says: "This compression gives for the *compressed half of the wave* an increase of 1-679 to the ordinary density of the atmosphere." Let all the above be carefully realised and remembered by our readers; for we shall, later on, pass a few rather trenchant remarks and present some rather startling figures, based upon Laplace's and Prof. Mayer's calculations.

32. Several experiments have been devised by acousticians to show the existence of *sound-waves*, and the velocity with which they are propagated; but one, by the way of an illustration of the rest, need only be described here. Prof. Tyndall in the course of his first lecture at the Royal Institution, brought before his audience a tin tube, 15 feet long, entirely open at one end and reduced to a small opening, by a conical piece, at the other. Pointing out that such a tube was highly suitable for confining the *sound-waves* and preventing their lateral diffusing, he illustrated the fact by placing a watch at the open end, which was distinctly heard by an ear placed at the distant end. But now came the most noteworthy part of the experiment. Placing the tube on supports, and a lighted candle close to the small orifice of the conical end, the flame being directly opposite the orifice, he clapped his hands together at the open end, and immediately the flame ducked down as if blown by a sharp gust of wind. Then taking two books, one in each hand, he clapped them smartly together directly opposite the open end of the tube. A loud noise was, of course, the result, and the report was instantly followed by the extinction of the flame at the other end. The professor now assured his audience that the candle was extinguished by "a *pulse* and not a *puff* of air"; in proof thereof he continued the experiment by filling the *open end* with the smoke of brown paper, and again clapping the books together (*once*), he directed attention to the fact that no smoke

was ejected from the distant orifice. The lecturer concluded the experiment by informing his hearers that the *pulse* passed through both smoke and air without carrying either of them along with it. We suppose the lecturer believed what he was saying; but it is a pity, just for the sake of science or common sense, that he did not charge the distant end of the tube with smoke, or repeat the clapping of the books for a sufficient length of time to enable the smoke he inserted to be blown out at the smaller orifice. This is a fair specimen of the experiments which have been found necessary to recommend the *wave-theory of sound* to persons who can not or will not think for themselves.

33. Since writing the above we have once again tested the accuracy of the results obtained by an old experiment of our own, originally suggested by Dr. Hall's strictures on Prof. Tyndall's experiment. We have taken a tube 2 feet in length and 2 inches in diameter, furnished with a conical end, having an orifice of about ⅛ inch in diameter, just as in Prof. Tyndall's notable experiment. This tube has been laid in a horizontal position, with its smaller end within ½ inch of the upper half of the flame of a candle. On hands being clapped smartly together at the open end of the tube the flame was instantly blown away from the smaller orifice; and on striking violently together two books the flame was extinguished. So far we were merely corroborating the results obtained by Prof. Tyndall, with a much shorter tube, however (about one-seventh of the length), and, accordingly, under more favorable conditions. We then clapped together two soft cloth pads, without producing any audible sound, and of course the flame was disturbed in precisely the same manner as when the hands were clapped, with a loud report. A teacher of the *wave-theory of sound* would, doubtless, say that *sound-waves* were there in full force although the ear could not realise any sound from the soft pads. But what would such a teacher say with reference to the concluding part of our little experiment? Allowing the flame to become perfectly still, we took a large brass wind instrument of the Horn class, and placing its bell close to and directly opposite the open end of the tube, we sounded a short and very powerful note; the flame made no response and remained unaffected. We then blew a sustained and very loud sound directly into the tube, increasing the power until the limits of the instrument were reached, but the flame gave no indication of being affected. Why was it, ye teachers of the *wave-theory*, that although the sound was loud enough to be heard a mile away in the open air, and was louder than the simultaneous clapping of fifty pairs of books, the candle flame never flickered at the end of a tube only 2 feet long, and only distant from the source of sound about 2 feet 2 inches? The sound was there, but where were the potent *sound-waves?*

34. How such teaching as that given in the lecture above alluded to, and as illustrated by the remarkable experiment of the tube, books and candle, and which naturally ended in smoke, was ever swallowed by an intelligent English audience, must for ever remain a mystery; and we can not help thinking that the lecturer paid a very poor compliment to the common-sense of his audience, whilst he taxed their gullibility to its utmost limit. But the lecturer was not content with attributing the extinction of the candle to the direct action of a *sound-wave*, for that, doubtless, seemed but a poor example of its mighty power, so, in the same lecture, he directed attention to the memorable explosion of the Erith powder magazine in the year 1864. Prof. Tyndall, in describing the effects of this fearful explosion, stated that the windows of Erith Church, situated "some miles distant from the magazine," both front and back, were "bent *inwards*;" and he told his audience that "as the *sound-wave* reached the church it separated right and left, and, for a moment, the edifice was clasped by a girdle of intensely compressed air." He also conveyed the idea that almost every window of the houses in the vicinity of Erith was shattered by the "*diffraction*" of the "*sonorous wave.*" We may probably again touch on this matter in the second division of our review; but we may just ask the thoughtful reader—Is it possible, in the entire range of professed scientific teaching, to find a grosser absurdity than this?

(*To be continued.*)

SUBSTANTIALISM AND THEOLOGY.

BY REV. DR. JAMES A. BUCK.

What has theology to do with Substantialism? I answer, much every way. But chiefly this. To show that as God is one; so there is one word, and but one, in which God is presented as one in all his works of nature and grace. Not matter and motion, nor matter in motion, nor power, but *substance* is that one word which sums up all of spirit and matter and of the many immaterial forms of force which are neither spirit nor matter. That matter is substance, the agnostic believes and there stops, and with emphasis asks the question, "How can there be anything substantial which is not material?" To this the theologian replies, that God though spirit is substance, and as such the substantive source of all things, and so every thing lying in between mere matter and pure spirit, must also come within the scope of the one word substance.

But is God substance? Is the word admissible in speaking of pure spirit? The theologian answers yes. The ancient creeds so define. The Nicene Creed says, "I believe in one Lord Jesus Christ. . . . Begotten, not made, of one *substance* with the Father, by whom all things were made." And in the creed of St. Athanasius we have the same view over and over again repeated. Hence, if substance can be predicated of spirit, how much more of those entities which are so much less attenuated and sublimated, and though not material are so closely allied to and connected with matter, such as magnetism, electricity, cohesion, heat, light and sound, as well as the life, mind and soul in men.

Substantialism is the only philosophy that ever discovered an appropriate definition for these physical forces, and at the same time the vital and mental forces, which exist between gross matter and the pure spirit of Deity. In fact all previous philosophies either ignored their existence in the economy of the universe as entities, or relegated them all as modes of motion to non-entitative existence. Even Swedenborg, with all his profundity and fine discriminations, gives no place in his religious philosophy for the physical forces here named

as real objective existences, but seems to accept them as modes of motion.

It remained for Substantialism to classify the entities of the universe, and while making them all substantial, yet so to grade and define them as to keep each division in its proper place with matter at the base and pure spirit, at the apex of the mighty pyramid of universal existence.

Again, as God *is* and can not cease to be, so man is and must be immortal. No, no! death does not end all. Nor is man's immortality conditioned, but ex-necessitate. When God by creation made him out of the dust of the earth, "He breathed into him the breath of life and he became a living soul." So Moses taught,—such is the teaching of Christian theology,—and so teaches the Substantial Philosophy. Hence, not by evolution in any sense, implying a transmutation of species, did man have his being, but as the second Adam, the Lord from heaven came into our world by supernatural generation, so the first Adam, being made in the divine image and the divine likeness, the masterpiece of divine wisdom and skill, was a special creation. Though like other animals in many things, yet he stands alone. "He is fearfully and wonderfully made." Man as he came from the hands of his Creator was perfect. Perfect knows no limits. Hence man was great and glorious, and as noble and perfect as he could be to be man. But alas! as he is now degenerate, so must he become regenerate. Hence the necessity of the Christian revelation and all the varied appliances of the Gospel and the Church. With all this Substantialism does not interfere, but when it is understood it comes in as an aid and help, and demonstrates that as there is conservation in the substantial forces of the physical universe, so there should be a conscious persistence in the spiritual world.

God reveals himself as light, and true science lives and revels in the light of God.—As the sun rules the day, and the moon gives light by night, so God the great substantive source of all things speaks to us by the light of the Bible, His Holy Word,—and by the light of nature, His Wonderful Works;—and as the sun in nature shines from God of itself, so the Bible shines in revelation; and as the moon shines by the sun, so science, nature and revelation all concur in guiding us substantially in the safe and sure ways of truth and righteousness In the great substantive realm of the universe of the Infinite, there is much that is profound but nothing in conflict with itself. But there is universal order and harmony because universal law prevails; all things are perfect because substantial and from a perfect substantial source.

Hence, as theology is the science of God's nature and works, in his dealings with man, and as God is substance, under all, over all, and in all, and since "by him all things consist," so it is manifest that theology has much to do with Substantialism, and Substantialism much to do with theology.

But with the motion-theories of science admitted as true, and with the forces of nature, as now taught, regarded as but the vibrations of material molecules, theology has and can have no sympathy. If one force of nature can be but the motion of matter, then any force and all forces can be scientifically explained only as motion. This would destroy the basis of all theology, and would confirm Prof. Hæckel's view that soul-force, life-force, mind-force and spirit-force were but the motions of our brain-particles; and consequently that they must necessarily cease to exist as soon as the brain-particles came to rest in death. Thus Hæckle proves by the science of our colleges that force, *per se*, vital force as well as any other, is only *motion of matter*, and hence, that *death ends all.*

It was Substantialism that saved theology from this overwhelming conclusion of Hæckel, by demonstrating that force in the physical realm, in every possible case, is a substantial though immaterial entity, and thus by an unanswerable natural analogy, broke the force of Haeckel's materialistic logic which he had successfully urged in favor of the soul as a mode of motion.

Natural analogy, under the motion-theories of heat, light and sound, as well as of other natural forces, was all in favor of Hæckel's materialistic argument, and every Christian professor who attempted to prove by analogical reasoning, that the soul of man was a substantial entity capable of immortality, was abruptly silenced by the German professor, with the most conclusive proof that the vital and mental forces were but modes of motion like those of sound, heat and light, or else natural analogy was without weight or reason. All honor to Substantialism for helping theologians out of their trouble.

St. Paul's Rectory, Washington, D. C.

A SCIENTIFIC CLOUD-BURST FORMING.

Friends of Substantialism in America may well take courage with the assurance that the long night of suspense and uncertainty in which their cause has been involved, is about to break, and give place to a flood of glorious and substantial sunshine.

The accession of Dr. Audsley, of England, to the ranks of the Substantial Philosophy, has struck the Chinese gong that is destined to arouse the sleeping physicists of Europe as they never were aroused before.

Already some of the most prominent acousticians of Great Britain are rallying at the Audsley war-cry against false science, and are writing to him their astonishment that a new theory of sound, which has manifestly crushed the life out of the wave-theory, has been published for years in the United States, and has been well known to Profs. Tyndall and Helmholtz, and yet that not one word have they uttered, by which the professors of European colleges have been allowed to know, or even to suspect, that such a theory existed! But the crisis has at last arrived, and it will be no longer possible for those high authorities to hide the glorious sunlight of substantial truth under their puny bushels of wave-motion.

Dr. Audsley, before he started in, had sent privately through his New York agents, for all of our publications from the "Problem of Human Life" up to the last volume of the MICROCOSM, and unknown to us or to any

American Substantialist, had for years been studying these works and preparing that funnel-shaped cloud, in the stillness of his Music Hall at Chiswick, that is always the precursor of the most destructive of tornadoes. And now the fullness of time has arrived when a scientific cloud-burst may be looked for, such as has never before been witnessed.

The two distinguished physicists named, can not, and dare not longer remain silent and affect indifference.

The crusade against their untenable incongruity, taught in all the colleges of the world as the wave-theory of sound, has been organized on a resistless footing right at their very doors, and the scientific recruits required to carry the war into the very citadel of their intrenchments, are already rallying around the Audsley standard.

The universities of Great Britain and of the continent are even now beginning to feel the tremor of the pent-up cyclone, which in its full sweep will shake the colleges of Europe as by a veritable earthquake.

We have the forecast already in this office that will sound the tocsin for American Substantialists, but we will wait for the formal and authoritative announcement that is soon destined to open the eyes of the ten thousand professors in our colleges and universities wider than they were ever opened before. In the meantime, let every reader of the MICROCOSM possess his soul in patience.

SUPERPOSITION OF AIR-WAVES AND COMPOSITION OF MOTION.

BY THE EDITOR.

In our leading editorial in this number of the MICROCOSM we refer to the impossibility of different sounds passing through the same air at the same time on the principles of the wave theory. Indeed, it is our opinion that a properly-balanced mechanical mind has only to contemplate for a single moment the impossibilities involved in the current view to be driven to astonishment that such a theory could ever have come into vogue and been accepted as science by trained physicists. Let us here consider these impossibilities a little further:

According to the wave-theory of sound, as set forth in all the standard works on the subject, the motions of the air-particles, as started by the vibrating instrument, and which occur in the sound-waves sent off, are of a simple harmonic character; that is to say, every particle of air receiving the mechanical impulse from a vibrating instrument must, like the sounding body itself, have the regular to-and-fro swing of the pendulum of a clock. This is distinctly taught by Prof. Tyndall in various parts of his book. He says:

"The motion of a sonorous wave must not be confounded with the motions of the *particles*, which at any moment form the wave. During the passage of a wave *every particle* concerned in its transmission *makes only a small excursion to and fro*. The length of this excursion is called *the amplitude of the vibration*." [See this with numerous similar passages quoted in the "Problem of Human Life," page 78.]

Now, it is taught in the great work of Prof. Helmholtz on the "Sensations of Tone," that instead of this essential to-and-fro motion of each air-particle as the sound-wave passes, no such motion can take place in the case where two or more sounds pass through the same air at one time, for the best of all mechanical reasons, namely, that the vibrational impulse of one sound, which tends to drive a particle in one direction, is met by a similar vibrational impulse of another sound, of equal force and of equal vibrational amplitude, requiring equal to-and-fro oscillation of the same particle in another direction, and which, hitting it laterally or diagonally, necessarily interferes with its simple harmonic swing.

Of course, as stated on page 35, present number, next to last paragraph, first column, a particle of air must be hit by these supposed impulses, at least half the time, in exactly opposite directions and with exactly the same force, in case of two sounds of equal intensity and an octave apart or with double the number of oscillations. In such case a single direct counteracting impulse of equal force striking against an oscillating air-particle would bring it to a dead standstill, and all its sound-producing work, according to the theory, would come to an end.

It is simply astounding that physicists, meeting as they must have met with this mechanical impediment to the transmission of sound by atmospheric vibration, should have attempted to proceed any further with a theory so impossible and self-nugatory on its face. But, strange as it must appear, they have kept right on as if no difficulty were in the way, simply because they could conceive of no feasible theory outside of wave-motion, having never dreamt of the substantial though immaterial nature of all force.

Not only is it absolutely essential, if the theory be true, that an air-particle, having received its simple harmonic impulse from the sounding instrument, must keep up this to-and-fro vibration with another equal impulse hitting it in the opposite direction, but, as Prof. Tyndall says, it must keep right on with its to-and-fro work, producing its own individual tone without the least diminution of its "amplitude of vibration," though hit with "a thousand" different impulses in all

conceivable directions, many of which are of hundreds of times greater force and velocity than the one which gave it a start! (See our leading editorial, this number.)

But how is all this apparent incongruity accounted for and explained by the champions of the wave theory? Our readers must not for a moment think that the great acousticians, who have written ponderous volumes on the subject, have not seen this difficulty, though we do not believe that they have ever realized it in the fullness of its shocking and annihilating force against their theory. They have faintly, and as it seems to us, complacently, stumbled upon it, but as there was no other conceivable way for the transmission of sound save that of the to-and-fro vibrations of the air-particles, these great investigators apparently closed their eyes and set aside the whole difficulty by the "superposition of air-waves and the composition of motion." Yet a more impossible and irrational attempt at the solution of the difficulty could not have been immagined. Look for a moment at the manifestly unsatisfied mental condition of Helmholtz as he states this only conceivable explanation that the wave-theory has ever offered:

"The displacements of the *particles of air* are compounded in a similar manner [to water-waves]. If the displacements of two different systems of waves are not in the same direction, *they are compounded diagonally;* for example, if one system [or impulse] *would drive a particle of air upwards and another to the right, its real path will be obliquely upwards towards the right.* For our present purpose *there is no occasion to enter more particularly into such compositions of motion in different directions.*" "Sensations of Tone," page 42.

No criticism of ours can add emphasis to the manifest predicament in which that foremost physicist of the world found himself and his favorite theory, as in his self-evident desperation he resolved to write out the above paragraph; and we do not believe that there is an intelligent scientific thinker, with the least milk of human kindness in his nature, but must feel a throb of sympathy for that distinguished authority as he reads this involuntary confession of weakness. "No occasion to enter more particularly into such compositions of motion in different directions"! Yes, there was "occasion," and an abundance of it, to let the readers of his book know how a particle of air when hit by two equal impulses in exactly opposite directions could move at all, and how the same particle could possibly keep up its simple harmonic and pendulous swing, so essential to musical tone according to the wave-theory, when hit laterally, driven diagonally, and when compelled to find a new path "obliquely upwards towards the right." And would not that have been a notable "occasion" to put on record even a hint as to how the faint tone of a flute, constituted of the weak, simple, harmonic motions or to-and-fro swings of the air-particles of a room, could be followed in all its unmarred purity by the attentive ear, while the very same air-particles were driven hither and thither in hundreds of different directions and velocities by as many different instruments in the same room, each sounding with tones louder and with bombarding impulses stronger than those from the flute?

The truth is, Helmholtz must have known, if he reasoned as a physicist of his ability should have reasoned, that there was no possible explanation of the problem according to the wave-theory of sound. Hence, the easiest way out of it was: "there is no occasion," etc., etc.

THE ANNULAR THEORY.

BY PROF. L. N. VAIL.

No. 1.

The Annular Theory predicates that this earth once had a ring-system just as the planet Saturn has at this time. In the year 1874 I published the *Deluge and Its Cause*, showing that the "flood" necessarily came from the falling of the last and outermost earth-ring of acqueous vapors. Being a geologist, I spent fully ten years in a rigid and thorough examination of the geologic column, in search of indubitable evidence for and against this theory, and found such an overwhelming fund of testimony in favor, and so little against it, that in 1886 I gave the result in the "Story of the Rocks." Since that time I have been intensely occupied in a new and most fascinating field—the boundless waste of mythology—and find such an amazing wealth of testimony in support of the annular theory, that I am now preparing for the press "The Gods Unvailed" proving that in mythological times man lived under a belted canopy of vapors, just as he would if he were now on either of the planets, Jupiter or Saturn. Thus with a three-fold panoply of evidence, the annular theory asks the recognition of man, and in order that my readers may join me in this rich field of thought, I will rapidly run over some of the more evident testimony that has awakened in me a resolution to champion the theory.

THE CAUSE OF RING FORMATION.

The earth was once in an incandescent condition, just as every sun and star is to-day. This is so evident that almost all people admit its truth. Upon this rock stands our theory. In that age of implacable heat there was not a drop of water on the earth's surface, and we must look into the great fire-formed and glaring primeval atmosphere for it. Every particle of the mighty waters that now dash against the shores of the world, were held at a vast distance from the infant earth, rocked in its cradle of fire. It is very plain that this great terrestrial envelope of vaporized water, of vaporized minerals and metals, was a vast one, and moved with the earth in all its motions. It turned round within its diurnal rotation just as our atmosphere does to-day.

Consequently, the vapors on the outermost bounds of that great atmosphere, had a rotating velocity so immensely great that when they began to condense they could not fall inwards, no more than the moon could fall to the earth while it maintains its present velocity. I might here state that this conclusion is susceptible of the clearest mathematical proof, that all vapors, suspended 22,000 miles above the earth, with its present rotary velocity, could not fall to the earth as the latter cooled down. But all astronomers, physicists and geologists agree that those vapors were driven at least 200,000 miles from the earth.

But if this mass rotated once in twenty-four hours, those vapors moved at the rate of 50,000 miles an hour, and a ton of vapors had a momentum of 50,000 tons. Now, every philosopher knows that no body revolving about the earth can fall to it while it revolves more than 17,000 miles per hour. Hence, we are forced to the conclusion that as the earth cooled down, a vast fund of condensed aqueous, mineral and metallic vapors continued to revolve, and rolled on and on for unknown time. Here is the stepping-stone to that grandest of conclusions, *that all worlds in passing from the molten or incandescent condition to a habitable state, must pass through annular formation.* This is eviuently only another rendering of that uniformitarian principle of law, *that all worlds are made by similar processes.*

The Omnipotent Architect and Framer of worlds would not make Jupiter according to one law, Mars by another, and Earth or Venus or Saturn by others. The stars are molten and scintillating suns, and therefore we conclude that the earth was once a sun. The earth has an atmosphere, clouds and oceans, therefore all planets must, *some time*, have all these. Saturn has an annular system, and Jupiter has a belted canopy, therefore the earth, during some period of its varid career, must have had the same. Annular formation, then, is a necessary consequence of the evolution of worlds from the sun state. On this rock we will rear an edifice that will stand forever. As we bore into the granite sills of the earth we will find every page of its stony volume written in annular characters, imperishable as rock. The familiar stamp is seen everywhere. The geologist of the future will stand on this foundation, or he will stand nowhere.

We will now begin an examination of the earth's crust, and see how inexpressibly simple the annular formation of worlds is. In the first place, we *know* that the earth had a primeval atmosphere, and if it had rings around it, they were formed out of the materials in that atmosphere—out of the vaporized and sublimated materials of the igneous earth. Let us then ascertain what that atmosphere contained, and we will then know what the earth-rings were composed of. We might approach this subject by a spectroscopic examination of the stars, for the glowing atmosphere of every star contains the vaporized elements exhaled from its fiery bosom?

I was once lecturing in the great lead-mining region near Joplin, Mo. I told my audience that a vast amount of lead escaped from their smelting furnaces and went up to the clouds in those vast columns of smoke, in vapor and invisible sublimations, and that if all the lead they thus lost could be collected, it would yield a vast income. Before I left the neighborhood, a gentleman brought me a fine sample of lead, saying, "We got this out of the smoke of our lead-furnace; we have a patent on the process which cost us $10,000." In the refining furnaces for gold and silver many thousands of dollars are extracted from the sooty and smoky vapors that would otherwise be lost. A vast amount of iron is lost in the smoke of every smelting furnace. Well, when this earth was in a molten state it was a vast smelting furnace; and all the lead, the iron, copper, silver and gold of the globe was in that furnace. Need I tell my readers that these metals were vaporized in that inveterate heat?

We know, then, what some of the materials were that composed the primeval atmosphere, viz.: whatever could be vaporized and distilled in that mighty center of fire, and the earth-rings were made up of these materials. Please remember this, for next I will show the reader that these metals could not be found as they are to-day if they had not formed a part of an annular system about the earth, and therefore the order and manner in which they now exist in the earth prove that the earth had such a system.

Elsinore, Cal.

THE FIRST HEALTH-PAMPHLET EVER SENT OUT.

The readers of the MICROCOSM will remember that some nine months ago, when the Health-Pamphlet was first announced, we printed a strong indorsement of the new treatment from Dr. E. R. Pettit, of Philadelphia, Pa., who had the honor of ordering the very first pamphlet we sold. Singular as it may seem, last month, on announcing the enlargement of our pamphlet by the addition of sixteen pages, and offering to exchange it with old purchasers for 25 cents—the old pamphlets to be destroyed by us as fast as received—the first one to return his pamphlet for the new one was this same Dr. Pettit, with the following hearty renewal of his indorsement after using the medicineless remedy for about nine months, thus showing that it is not a thing of temporary and uncertain effect. He writes:

"DR. A. WILFORD HALL, Dear Sir,—With this I mail you my pamphlet to be exchanged for the enlarged one as per your proposition in the MICROCOSM, and inclosed herewith you will find the 25 cents required. As the pamphlet returned was the first one sent out by you, I would like to have retained it as a memento of your revolutionary work. [Our manager, Mr. Rogers, has fastened upon that pamphlet, and no amount of money can get it from him. —EDITOR.] I have made a thorough study of the rationale of your treatment, and I doubt if any one could have described its effects and advantages so clearly and yet so concisely as you have done. * * * * * I would like to state the benefits I have derived from this treatment, but must postpone everything except to say, that I have not had a sick headache since I began the treatment, nearly nine months ago, although before I received it I was subject to these attacks nearly always once or twice a week. It has also been of wonderful benefit to me in other ways, and I would not be deprived of the knowledge of it for a fortune. I am glad that you are meeting with such well-deserved success, so as to enable you to help the poor, and thus benefit

mankind by your discovery. I could mention a number of cases if I had time in which your treatment has been wonderfully efficacious. * * * * * With best wishes, I am, very truly yours, E. R. PETTIT."

[Many hundreds of the old purchasers are now sending us their pamphlets in exchange for the enlarged one, and all unite in acknowledging the additional information the new one contains as absolutely invaluable.—EDITOR.]

[The following letter was not written to us, but to Mr. Rose of *Allentown, Pa.*, by Mr. Halbert, a prominent lawyer of Vanceburg, Ky., one of the early purchasers of our Health-Pamphlet. It speaks for itself. EDITOR.]

Vanceburg, Ky., Decr. 14th, 1889.

WM. B. ROSE, ESQ.,—Dear Sir: Yours of the 11th Inst. received, and for reply to same, say that I gave the testimonial printed in Dr. Hall's circular. I could now give him a much stronger one. The first of June last when I commenced using Dr. Hall's remedy I was not only afflicted with the piles, but had also dyspepsia and kidney disease, and had been thus afflicted for many years. I feel now cured of them all. The same remedy has perfected other cures of persons living here afflicted with various diseases. One women here who has been bedridden, and thought to be incurable of a complication of female diseases for more than eight years, is now up and going about from same treatment. It cures all chronic diseases—no failure here so far as tried, and dozens of persons are now using Dr. Hall's hygienic remedy. Every family should be in possession of the Doctor's Pamphlet.

Yours truly, GEORGE T. HALBERT,
Attorney at Law.

THE ANNULAR THEORY OF GEOLOGY.

We call attention to the beginning of Prof. Vail's series of articles, in which during the present volume he will unfold his theory of the annular system of the earth. Prof. Vail is an able scientific thinker and writer, and his series of novel papers, will, no doubt, justify a careful perusal. With this series in connection with the Audsley discussion of the old and new theories of sound, no thinking man will be very much the loser by sending fifty cents and subscribing for this volume of the MICROCOSM. All subscriptions begin with the first of the volume, or the December number.

THE CLERGY RESPONDING.

Already, before we go to press, thousands of clergymen of all denominations, Protestant and Catholic, have accepted our New Year's offer of last month, and have sent for our Health-Pamphlet, free, except postage—eight cents;—and now, as we write nearly a thousand applications a day are coming in by mail, requiring the best efforts of our entire force of nineteen clerks to keep up with the business. We expect during the months of January, February and March to receive the names of not less than 50,000 ministers, who will gladly and gratefully accept our New Year's offer, judging from the kindly expressions of those who have already made application. We copy the offer in this number, page 40. Of course no minister who has previously seen the pamphlet is included in this offer.

Although our gift to this noble army of Christian workers is as free as heaven's sunshine, yet we take the liberty of suggesting to those who thus receive the Health-Pamphlet and who may be pleased with its reasoning, that they supplement it with a year's subscription to the MICROCOSM, not as a reward for any generosity on our part, but as a means of doing themselves still more good. A hint to the wise.

THE EDITOR'S PORTRAIT.

Many of our agents and purchasers of the Health-Pamphlet have been urging us for some time to have Dr. Hall's photograph taken, imperial size, as he now appears, that they may know at a distance exactly how a man looks who has followed this new treatment uninterruptedly for forty-one years, and who was saved thereby from a consumptive's grave. We have just had prepared such a portrait by one of the first photographers in this city, which represents the doctor as natural as life itself, a copy of which will be sent at cost (25 cents) post-paid to any address.

ASSOCIATE EDITOR.

"HELL."

This is the somewhat startling caption of an article just received from the erudite pen of our good contributor Dr. Swander. It was too late for this number of the MICROCOSM, but will be presented to our readers next month. Look out for it.

THE LAST WORD.

We have waited, before finishing this last page of reading matter, fully to grasp the situation, and here it is. We can not begin to keep up with the orders from clergymen who are accepting our New Year's offer of the Health-Pamphlet free, except postage,—eight cents. Already there are nearly 10,000 orders on file more than we have been able to attend to with all our force to aid us. And what is very encouraging is the fact, that hundreds of these ministers send fifty-eight cents instead of eight, the fifty being for the MICROCOSM, Vol. VII. In this way many clergymen who need the MICROCOSM in their religious work and who have never before become acquainted with it, will from this on receive its benefits.

We say again to each friend who has ordered the pamphlet,—wait patiently, as the orders will be filled in their proper turn as they are received, and will be but a few days behind. We are also glad to report many letters, filled with grateful sentiments, from the ministers who were among the first to order the pamphlet, expressing their high appreciation of the treatment unfolded therein.

NO LET-UP TO OUR HEALTH-PAMPHLET.

The demand increases as it becomes known, and the sales never were so large as now, notwithstanding the tens of thousands of copies we are giving free to the clergy and to the poor. See the preceding page. We add here another installment of testimonials out of the hundreds we are receiving weekly:

John F. Rowe, editor of the *Christian Leader*, 178 Elm Street, Cincinnati, Ohio, writes us, January 23d, after using the new treatment for some three months:

"Dear Doctor Hall,—When I met you in Akron, Ohio, some twenty years ago, I remember that you told me you had discovered a treatment for greatly prolonging life, but I did not understand you. Now I comprehend the significance of your words. Had I known your discovery twenty years ago as I do now I would have been saved from much misery from the effects of constipation and the sluggish circulation of my blood. Thank the Lord your remedy without medicine has entirely cured me of constipation, and as I believe has removed the cause of the disease. Your treatment also serves as a refreshing tonic and acts as an invigorator of my whole physical system. My kidneys, which have given me much trouble, have been entirely restored to their normal condition. Truly yours, John F. Rowe."

The Rev. E. H. Sweet, pastor of the Baptist church, Brockton, Mass., sends us, January 26, the following indorsement of our treatment handed to him by Mr. Temple of that place, with the request to forward to us:

"Dr. A. Wilford Hall, Dear Sir,—I had been sick since last April. My trouble began with fainting fits. I grew worse each month, until my family physician said he could do nothing for me. I visited the Massachusetts General Hospital, but got no encouragement there. A specialist for nervous troubles was recommended to me and consulted, who informed me that I would require six months of treatment before I could expect to be any better. I came home where I had about three quarts of medicines of different kinds, but having adopted your treatment, I threw away these drugs, and have not taken any medicine since. That was about five weeks ago. I have applied your remedy three times a week in the mean time, and the result has been apparent from the very first. I am getting better rapidly. I have a good appetite for three meals a day My food does not distress me as in the past. I expect ultimate recovery. I am grateful for your common-sense treatment of diseases. Yours respectfully, Frank F. S. Temple."

Rev. J. W. Nuby, pastor First Baptist church, Chillicothe, Ohio, writes, January 6th:

"Dear Dr. Hall,—I have tried your new treatment on myself and my wife, and we are now prepared to say that it is all that you claim for it, and is the very thing we have long needed. I have been using it vigorously, and am now freer from pain than for many years. I have suffered with heart trouble for fifteen years, but now—thank God and your therapeutical discovery—the attacks are growing less frequent and less formidable. For years also I have had severe attacks of kidney trouble, but now when they occur I go right to work and cure them in a single night. The habitual palor of my face has left me, my sleep is now sound and recuperating, and my general health greatly improved. My wife also for many years has been afflicted with neuralgia of the stomach, but since adopting your remedy she has not had a single attack of that or of any thing else serious. Surely more real benefit must ultimately accrue to humanity from this simple discovery than from all discoveries in the past history of physiology put together, while it is only surpassed by your wonderful and revolutionary discoveries in science involved in the Substantial Philosophy. Send me fifty copies of the "Extra" MICROCOSM and a lot of your circulars for distribution among the people, for which find inclosed $1 postage. May you live long to wear the laurels of honor you have so justly won. Gratefully yours,
"J. W. Nuby, pastor First Baptist church."

W. J. Hammond, merchant, 129 Young St., Toronto, Canada, writes, January 8th:

"My Dear Dr. Hall,—* * * I have been practising your treatment for about six weeks, and find it doing me a great deal of good. I am getting back my old color and adding flesh. My appetite is splendid, frequently requiring me to eat four meals a day to satisfy my hunger. * * * But much as it has done for me, it has done more for my wife. She has been for years a great sufferer with bilious or sick headache, and her recovery is something marvelous. Her headaches would come on under the least excitement, and she was obliged almost to starve herself, being so careful as to what she would eat. She was thus laid up on an average two days in every week. Under your treatment she is becoming a different woman, her appetite is now good and her flesh is increasing. Words can not express to you our gratitude for these changes. * * *
"Yours very truly, W. J. Hammond."

G. W. Powell, Findlay, O., writes, Jan. 7th:

"Dr. Hall,—Inclosed find money order for your Health-Pamphlet for Dr. J. W. Arthur of this city, who has one of the finest sanitariums in this or any other state. He will, no doubt, make good use of your remedy in his institution. * * * I have been the means of getting many persons to order your pamphlet, and so far as I have learned all are pleased with it. Many of them are highly elated and claim that through this process they are becoming *rejuvenated*. For myself I can assert that there is nothing like your remedy for invigorating a man and making him feel like a new creature, both mentally and physically. We want your new revelation that you hint at in a recent number of the MICROCOSM, and are prepared to receive any thing from you, however startling, as worthy of a fair trial.
"Your sincere and grateful friend, G. W. Powell."

Mr. G. H. Stewart, Stockville, Neb., writes, December 30th:

"Dr. Hall,—I have been a miserable dyspeptic for years, and after much reflection I resolved to purchase your Health-Pamphlet and try your remedy without medicine, as I had tested all sorts of drug-remedies for so long. I have only used the treatment between one and two weeks and the result is simply astonishing. I have received more benefit from it in this short time than from all the drugs I have taken from physicians during the last ten years. Your services to the afflicted in making known this treatment must stamp you as the world's benefactor, and humanity can not be too grateful to you. Sincerely yours, George H. Stewart."

J. F. W. Kuhlman, Cumberland, Md., writes, January 8th:

"Dear Dr. Hall,—* * * Your pamphlet on health and longevity has created a genuine sensation here and is arousing great interest as it becomes known. My wife is as good as well after using your treatment two months, and no ordinary sum would deprive us of its use, though costing us but the trifle of $4. I am also vastly improved in my general health. I can work three times as long as before beginning your treatment, and yet experience no fatigue. Many of my friends are expressing a desire to have the pamphlet printed in the German language. Would it not pay you to have this done? Others are anxious to know what is the limitation of one's '*own family*' in your 'Pledge of Honor.' Please let me know. Your grateful friend, J. F. W. Kuhlman."

[We have thought of printing it in German; but this would require our "Extra" MICROCOSM, circulars, pledges and the entire outfit of accompanying literature also to be produced in the same language, which would be an expensive undertaking. Indeed, we already have more than we can do to supply the demand in the one language. See the previous page. As to the meaning of "family,"—it signifies, in its liberal sense, all those who are related by family ties (not boarders) and who live in the same house or eat at the same table.—ED.].

Eld. J. N. Hall, Fulton, Ky., writes, Jan. 6th:

"Dr. Hall, Dear Sir,—I have recommended your treatment to numerous friends, not one of whom but is well satisfied with the result of its operation. I have just had occasion of using it upon myself in a very severe attack of bilious fever, and I assure you it worked like a charm. All success to you in your good work of relieving the suffering of humanity without the after effects of deleterious drugs.
"Most truly yours, J. N. Hall."

P. R. Showalter, Rockingham, Va., writes, December 26th:

"Dear Dr. Hall,—I have been using your treatment for some time, and it has already made me feel fifteen years younger than when I commenced. My wife's health is so much improved since she adopted your medicineless remedy that she would not dispense with it for any money. The $4 we paid for it are not worth a moment's thought. Your treatment is all right and is a genuine boon to the world. Ever yours, P. R. Showalter."

E. R. Harrell, Gloster, Miss., writes, Jan. 8th:

"Dr. Hall, Dear Sir,—* * * I am pleased to report that I have been using your prescription for the cure of disease without medicine with excellent results. I simply state the truth when I say I would not take $100 and be deprived of the use of your remedy. You deserve success. Truly yours, E. R. Harrell."

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
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DR. AUDSLEY ATTACKED.

As was to have been expected, Dr. Audsley is not to be allowed to proceed with his series of articles in the *English Mechanic* against the wave-theory of sound without assaults from various sources. The first of these attacks, based upon the very foundation of the wave-theory, we give below, from the pen of Prof. Grey, with our reply, as requested by Dr. Audsley for the *English Mechanic*. Our answer to Prof. Grey will speak for itself. If he or any other acoustician in Great Britain can blunt its points or weaken its force we should be glad to see them undertake it. Here is Prof. Grey's criticism:

It is not my intention to enter into any controversy with Mr. G. A. Audsley, F. R. I. B. A., respecting the theory of sound. If he likes to attack modern views, and if you, sir, choose to give him space in the *E. M.* to do so, well and good. But in order to guard against your readers being misled by inaccurate statements regarding facts, I wish to call attention to a sentence in his article on p. 395. He there asserts: "The wave theory certainly breaks down in a most ignominious manner in attempting to account for such high velocities, &c." This statement is absolutely incorrect. The velocity of wave movement in a medium whose density is D, and elasticity E, is equal to

$$\sqrt{\frac{E}{D}}$$

and the velocity of sound in any medium as determined by experiment agrees entirely with the velocity calculated from the above formula. If Mr. Audsley knows this, then he has stated what he knows to be inaccurate; and if he does not know it, then he should master a subject before trying to write critical articles on it. In the case of iron, for example, we have $E = 1{\cdot}963 \times 10^{12}$, and $D = 7{\cdot}78$, whence—

$$v = \sqrt{\frac{1{\cdot}963 \times 10^{12}}{7{\cdot}78}} = 502{,}810 \text{ centimètres per sec.,}$$

which is equal to 16,480 feet per second. I might give any number of similar examples, but the above will probably be sufficient. It would be just as accurate to assert that the movements of the moon are not in accordance with the law of gravitation, as to state that the wave theory of sound can not account for the high velocities of the movement observed in most solid substances.

On many subjects there may be room for difference of opinion, but Mr. Audsley should really endeavor to be accurate concerning matters of fact.

WM. JOHN GREY, F. C. S.,
Analytical Chemist, Newcastle-on-Tyne.

THE WAVE-THEORY OF SOUND. PROFESSOR GREY *versus* MR. AUDSLEY.

To the Editor of the *English Mechanic*:

My attention has been called to a criticism upon Mr. Audsley's paper of January 10, 1890, by Prof. Wm. John Grey, as printed in your excellent magazine for January 17, page 420. Prof. Gray calls Mr. Audsley to account for stating that "the wave-theory certainly breaks down in a most ignominious manner in attempting to account for such high velocities" of sound as are observed in metals and certain woods on the theory of the relation of density to elasticity, etc. Prof. Grey adds: "This statement is *absolutely incorrect.*"

Now we undertake to say that the whole question of the repudiation of the wave-theory is so novel and startling to Prof. Grey, that on the spur of the moment he is not qualified to make a safe or intelligible defense of that theory in reply to the arguments which Mr. Audsley is commencing to mass against it. Had Prof. Grey been as familiar with this discussion of density and elasticity and their supposed relation to sound-velocity as is Mr. Audsley, he would not have made the mistake he has of rushing into print in defense of the wave-theory of sound, depending as it does for its entire existence upon this same doctrine of density and elasticity.

For example, Prof. Grey states that "the *velocity of sound* in any medium, as determined by experiment, *agrees entirely with the velocity calculated from the above formula,*" of the relation of density to elasticity. Yet a more glaringly inaccurate statement, as demonstrated by scientific experiment, was never penned. The statement, in fact, is so self-evidently false on its face that it is wholly inexcusable in a professor of physics in any of its branches to have made it.

Is it possible that Prof. Grey was unaware of the fact that Sir Isaac Newton, the originator of this formula of density and elasticity in their relation to the velocity of sound, had himself been compelled to abandon it as a rule for determining the velocity of sound in air? Newton, after inventing, working out and estab-

lishing this very formula which teaches that sound must travel through a medium in exact accordance with the relation of its density to its elasticity, proceeded himself to apply the formula to the known velocity of sound in air. And what was the result? Why, Newton was obliged to confess that his formula, as Mr. Audsley mildly puts it, had ignominiously broken down, since the observed velocity of sound in air was actually 174 feet a second too fast for the formula!

Of course Newton was greatly nonplussed at this failure of his formula, and sought out many inventions by which to account for the failure, such, for example, as the supposed solid particles of the air through which, as he believed and insisted, sound passes instantaneously, etc. But Newton certainly knew that these same solid particles with their "crassitude" and their instantaneous conductibility had to be considered in formulating the density and elasticity of the air; why, then, should this very structural formation of the air which determines its density and elasticity prove the unfortunate stumbling-block for upsetting his formula and conveying sound one-sixth faster than it ought to travel?

At all events the formula, when applied by its founder to the normal and universal medium for sound-propagation, did not work, but ingloriously broke down, thus mechanically and mathematically demonstrating the wave-theory itself to be false in the very formula upon which its life depends.

Let Prof. Grey not take our word for this fact of history, but turn to Prof. Tyndall's book on "Sound," and there read the frank confession of that leading English acoustician, that the formula of density and elasticity in the hands of its originator did actually fail to sustain the theory by a deficit of 174 feet a second, as compared with the observed velocity of sound in air.

No physicist has ever called in question or for a moment doubted the correctness of the estimated density and elasticity of the air as worked out and laid down by Sir Isaac Newton. Hence, all physicists who have lived since Newton's time, standing as they do committed to his formula, are self-confessed repudiators of the wave-theory, since all know, not excepting Prof. Grey, that sound travels 174 feet per second too fast for the theory. What stronger argument against any theory can be asked than a fact like this?

But Prof. Grey will tell us that Laplace, the great French mathematician, has since explained Newton's discrepancy, and accounted for this too great velocity of 174 feet per second, by the heat and cold generated in the sound-waves on account of the "condensations and rarefactions" of which they are composed. Let us here, however, once for all, answer this reference to Laplace's solution of the difficulty —the last and the only resort of wave-theorists by which to keep the semblance of life in this underlying formula of density and elasticity.

Did Prof. Grey ever reflect that if there are heat and cold really generated in the sound-waves of air, as Laplace claimed, by which one-sixth is added to their otherwise normal velocity, that there must be the same proportionate allowance made for the heat and cold generated in the sound-waves of iron or of any other medium? Prof. Grey, on the contrary, gives us in this very criticism of Mr. Audsley's article the density and elasticity of iron by which he formulates the velocity which sound must have, substantially as proved by experiment and observation. (See list of velocities as quoted by Mr. Audsley.)

But here we spring the trap which the professor was unconsciously setting for himself, and ask: where is the allowance for one-sixth additional velocity over the professor's very careful formula, as a result of the heat and cold generated in these iron sound-waves? If the same law holds good in iron—and it certainly should, if there is a shred of scientific truth or consistency in the explanation of Laplace—then the mathematical formula of Prof. Grey for the elasticity and density of iron should have been put down one-sixth less than he fixed it, so as to be proportionately as much below the observed velocity of sound in iron as Newton's formula was below the observed velocity of sound in air. Don't you see, professor? Instead of taking this wise precaution, Prof. Grey entirely ignores the vaunted solution of Laplace—as all other candid scientists will do after a little—and so arranged his figures as to hit the bull's-eye of the observed velocity of sound in iron, without the least respect for the thousands of feet of additional velocity which the heat and cold of the iron sound-waves should have yielded.

The simple and suggestive truth is, no allowance whatever for the heat and cold of sound-waves has ever been made or thought of by physicists in estimating the elasticity and density of iron or other solid substances, in fixing their formulas to suit observation. Not one of them, so far as the record shows, has ever thought of so gauging their formulated estimate of the density and elasticity of the solid medium, as to obtain the same proportionate discrepancy between theory and observation that Newton obtained in the case of air! Why is this thus?

Surely sound-waves of veritable "condensations and rarefactions" ought to generate at least as much heat and cold in iron as in air, and thus make sound travel about 3,000 feet a second faster than shown by Prof. Grey's formula.

But the naked scientific fact is,—and here is where the beautiful and variagated bubble of density and elasticity is pricked,—there is no means by which any definite amount of elasticity of a solid body can be determined, and hence it is all guess-work to attempt to fix in advance any definite relation between the density and elasticity of solids.

How does Prof. Grey know, for example, what the real elasticity of iron is, as a basis for determining the relation between its elasticity and its density? Surely, steel of the same known density, is more elastic than soft iron, yet sound is known to travel faster through soft iron than through steel. Is there a man living that can determine the slightest difference between the longitudinal elasticity of *aspen* and that of pine? Yet sound as observation shows, travels 16,000 feet a second along the fiber of aspen, and only 10,000 feet a second along the fiber of pine.

Glass is one of the most elastic solids known, and of very small density as compared to iron and according to Newton's formula of the relation of elasticity to density, sound ought to travel two or three times faster through glass than through soft iron. Yet observation proves that the conductibility of glass is far below that of iron.

But one point more before we close, upon this much mooted formula of Newton, which may be news to Prof Grey, and that is, *that Newton never seriously intended his formula of the relation of density to elasticity to apply to the velocity of sound in solids.* Does the reader ask for the proof? here it is: Newton supposed that sound passed *instantaneously* through solids as proved by his attempt to explain the discrepancy of 174 feet a second stumbled upon in applying his formula to air. As already hinted, he assumed the air to be composed partly of solid particles, and that no time whatever was consumed in their conductibility of sound. Hence, Newton must have intended his formula to apply only to air; and as this chief-corner-stone of the wave-theory had confessedly given way at the first fair trial, it is marvelous that Newton as a consistent philosopher did not then and there abandon the theory built upon it. Plainly, as Newton believed sound to pass through solids instantaneously, how could the relation of elasticity to density, in iron for instance, have anything to do in determining its sonorous conductibility?

The plain scientific conclusion is therefore reached, that substantial sound-force, the same as substantial electric force, travels through various material bodies according to their conductibility under the regnant and controling force of cohesion. According to the Substantial Philosophy every form of force is a substantial though immaterial entity, and as really substance, in a higher sense of that term, as is the material body it moves or impresses. And it is scientifically just as reasonable to attempt formulating the velocity of electricity by the density and elasticity of the different metals as to undertake a similar task for sound. And we firmly believe that the time is not far distant when the wave-theory of sound, with the formula upon which it is based, will be abandoned by scientific investigators and consigned together to the appropriate limbo of exploded hyptheses.

A. WILFORD HALL, Ph. D., LL.D.,
Editor of the MICROCOSM.

New York, February 5, 1890

HELL.

BY J. I. SWANDER D. D.

The reader will please observe, first of all, that the heading of this paper is punctuated with a period. We think that that point is well and wisely put. An exclamation point at the termination of such a term might direct the reader's mind toward false conclusions, and call into question the chastity of the writer's thoughts. Even when properly punctuated there is danger that the word will be misunderstood as to its meaning, and the writer misconstrued as to his intent in the employment thereof. The discussion of no other subject is so apt to provoke dissension and adverse criticism. There has, however, been a manifest change in the disposition of the Christian world toward the topic under consideration. Scholars are now willing to view the same old orthodox hell with great calmness and coolness, considering the formerly supposed high temperature of the subject under its Plutonian aspect. In former years the mere mention of the word would waken imaginary echoes from the dismal region of the damned, and send a sulphurous odor toward the skies.

There has also been a manifest modification of some doctrinal inferences drawn from the subject now under consideration, Of late years sound theology has placed more proper emphasis upon the fact that whatever torment there may be in the future world is largely the result of perverse forces at work in this. These forces are now viewed as concretely operative in abnormal humanity. Sin and consequent sorrow are no longer regarded by the more scientific and scriptural hamartologists as mere abstractions. They can have no real existence in that form. Human sin as an actuality can exist only in human nature; and where human beings are not delivered from the power of such sin, they must of internal necessity suffer in consequence thereof. Sin is now viewed more as the germ of suffering, unfolding itself in unregenerated human nature than as a mere offence against God. It is, therefore, now emphasized as a violation of the law of man's well being, no less than as the transgresion of God's law. Such self-violation and abnormal development involves organic damnation; and the latter can not cease where the former continues. (See the rational solution of this question in the writer's "Substantial Philosophy," pages 272 and 276.)

We notice and note still another change in the attitude of a certain class of people toward the one feature of the subject under discussion. Scoffers and infidels, more than formerly, affect to believe, and in many cases openly declare, that the Christian press and pulpit have measurably abandoned the old doctrine of eternal punishment, since it is now advocated in a somewhat modified form, and with more becoming moderation of argument. Ministers of the gospel are charged with being trimmers. The charge may be true in some cases, but it is certainly not so in general. Ingersoll and his disciples do not go to church enough to know what the preachers have to say upon the subject which gives them so much uneasiness. Robert is mistaken when he announces from his platform of profanity that the old orthodox hell has exploded. Although somewhat differently apprehended than formerly, the doctrine of perdition has not passed into obsoiescence; neither has the truly scriptural idea of damnation vanished away. Ingersoll will speak differently after he has once become fully warmed up in his subject.

The present pretended belief that there has been a general falling away from the old orthodox doctrine of eternal punishment is based upon a false and foolish assumption. The delusion received its illogical inspiration, and flattered itself with an unwarranted justification from the fact of the recent translation of the Holy Scriptures, in which the word "hell" is now repeatedly rendered "hades." This change was immediately proclaimed by sophists, and looked upon by superficial thinkers as the result of a successful attempt on the part of the Christian world to dodge the disagreeable doctrine of damnation. At the same time wicked men, with the incipient torments of perdition already experienced in their consciousness of depravity and guilt, began to lift up their bleary eyes with a forced expression of perfect delight at the temporary effects of such a placebo hypodermically administered. What a fearful delusion! In this mat-

ter men would do well to think and believe with more consideration. There has been no toning down of the truly Scriptural idea of hell. On the other hand, there is a manifest toning up of infidelity. The eloquent blasphemy of Robert Ingersoll is beginning to blush itself out of existence to make room for the glittering poison of Robert Elsmere.

There was a necessity for the new translation. Theological science, according to both revelation and reason, could not hope to attain to systematic perfection without "hades." The organic chain of Christian soteriology required its recognition. In the absence of such a missing link the creed of Christendom was not satisfactory to a strictly scientific faith. On the other hand, truly Christian science demanded Scriptural authority for any change made in either the phraseology or interpretation of the creed. Of course this consciousness of defect was confined to Protestantism. The Romish Church acknowledges no doctrinal defects. Its only desideratum is dominion over all things. Any other acknowledgment would be fatal to its infallibilistic pretentions. For centuries its theology was satisfied with its *limbus patrum*, after the most antique style of ecclesiastical architecture. Long before the reformation, *limbo* was fitted and furnished to serve the more modern purposes of a purgatory. The reformers rejected the purgatorial dogma of the Romish Church. In doing so, they felt, to some extent, the necessity of the genuine missing link. The last clause of the fourth article of the Apostle's Creed had been enveloped in more than a thousand years of mist. This mist was not immediately dispelled by the rising sun of the reformation. It continued to hang around the horizon of Protestantism. On the one hand, the "hell" of the creed was made to mean merely the grave; on the other, it was construed exclusively into a place and state of penal torment.

Such was the attitude of Protestant theology toward the mystified subject during the sixteenth century. In the beginning of the seventeenth century, King James I. ascended the throne of England and ordered a new translation of the Bible into the English tongue. In this way Protestant Christendom was supplied with the "Authorized Version." In performing the work assigned them the translators kept themselves as far from purgatory as possible. Indeed, they moved so far in the opposite direction as to measurably ignore one side of a great truth revealed in the Word of God, and recorded in the original languages of the Holy Scriptures. As a result of their one-sided exegesis in rendering those passages and terms which primarily pertain to the general realm of the departed, they gave the English readers of the Bible either the "grave" with all its sepulchral solitude, or "hell" in its most narrow sense and with its most dolorous accompaniments.

Not only was the English language in need of another word, but rational faith was also in equal need of something complemental to any previous popular interpretation of the Creed. According to any consistent view, an arc seemed missing from the grand circle of human life, as it was supposed to extend beyond the "valley of the shadow of death." Immortality and continued consciousness were claimed for man, notwithstanding the throes and threats of physical dissolution, but there was no satisfactory conception of any link of organic connection between the two sections of a human being seemingly sundered by that section of duration between death and the ressurrection.

The proper recognition of the hadean realm was therefore a necessity. Fixed and finished orthodoxy disdainfully rejected the idea with an elevation of its Roman nose, but the living and more progressive portion of conservative Christendom was led to regard such an intermediate state as belonging essentially to the fullness of human life, as well as indispensible to the solution of its problem. Such recognition was, in fact, as necessary to sound theology as was the discovery of Neptune to the perfection of another heavenly science. Worlds are not such insignificant things that men may ignore them without disadvantage in their efforts to acquaint themselves with God's purposes and methods. This truth was realized by Le Verrier. And who will now say that hades is not as essential to a correct apprehension of God's complete system of human redemption, as was Neptune to the more correct knowledge of the solar system when Galle, in response to the request of the French mathematician, turned his telescope toward the nocturnal skies, and rolled the great planet into the field of astronomic vision.

We repeat, therefore, and with increased emphasis, that the world of departed human spirits in their present condition, whether they be on the one hand in "Abraham's bosom," or, upon the other hand, in "torment," is a fact forced upon our recognition by both revelation and reason. Indeed, such a spirit-world is an essential section "in the path of life," or rather the path to still higher life where there is "*fullness* of joy," and more than paradisic "pleasures forever more."

The late Dr. J. J. Oosterzee, one of the most learned Evangelical theologians, of this country, in his excellent dogmatics, says substantially: "It must be admitted that there exists a world of spirits in a condition as well of happiness as of misery. * * * The spirit of Christ, after his death, lived and wrought there, where all the dead are assembled." As a rule, however, Protestant theologians are not primarily interested in the question as to what "must be admitted." Their first inquiries are: "What saith the Scriptures?" and "How readest thou?" Theological exegetes search for the truth in the original tongue, and, if possible, in the original or most ancient of extant MSS. It was this heaven-born desire to learn the truth as near as possible at the fountain head that lead to the grand movement which resulted in giving to the world the new version of God's old word. With recently-discovered MSS. before them, and in view of the advancement that had been made in all kindred departments of learning, the recent English translators performed their work under advantages superior to any that King James' pious linguists ever enjoyed.

It may be reasonably conceded, therefore, that the new version is superior in wealth and accuracy of expression to the old. If so, it has more authority in fact than that which was "authorized" in form. Reasons for the changes in terms and phraseology are claimed to have been found in the unchangeable constitution of revealed truth, and made in accordance with the essential law of progress in theological science. The change of "hell" into "hades" in some passages was made be-

cause the former word did not express the full truth found in the original text Revealed truth justifies a rational belief in a spirit-world whose lines of longitude extend from the time of the putting off this tabernacle until a future time when the spirit will be fully clothed upon with its house which is from heaven. Why not? Who will deny that there is such an intermediate state? Materialists may deny it with untruthful consistency; but Christians can not do so without self-stultification. And if there be such a realm—hades—todenreich, the English language should contain a word sufficiently broad and full of derivative wealth to give the idea thereof a fair and adequate expression.

Of course the foregoing implies that disembodied human spirits now in hades are real entities and not shadows. In our efforts to form a rational concept of "the souls under the altar" (Rev. vi, 9) we must exclude our present notion of material and the idea of mere motion as constituent elements of a soul in paradise. We must also cling to the fact that these "souls" are substantial and personal beings, who carried their identity, consciousness and characters with them from this stage of action to their present camping ground, upon the hadean plains, fast by the pearly portals that must swing entirely open at the sound of the resurrection trumpet, and admit them into their full consummation of redemption and bliss.

In conclusion, we may also add that such a consideration of our subject and the facts which it constitutionally involves will, of rational necessity, lead the reader to acknowledge the basic principle of the Substantial Philosophy. Where is that basic principle? That whether in heaven, earth or hades there are things substantial, *i. e.*, possessed and formed of substance without being material, and immaterial without being any the less real. There is no possibility of fleeing from the presence of such immaterial substance. If we investigate the elements which underlie the mere phenomena of nature to the uttermost parts of the earth, it is there. If we descend into hades it is there. And when we wing our final flight to the highest heaven of the saints we shall fully realize that some immaterial things are substantial and eternal.

FREMONT, OHIO.

The Six Reconstructing Days of Time's First Great Week.

A LECTURE BY REV. T. WILLISTON.

[Concluded from last month.]

IV. The wording of the Fourth Commandment is itself a strong reason for believing the Lord's "six days" to have been common or natural days. If His six working days were not such days as ours, then He has given the world a very blinding and unnatural Command. That Command says, "Six days shalt thou labor . . . *for* in six days the Lord made heaven and earth." That *for* has the sense of *because;* but if the Lord's six days comprised scores of centuries, the *for* conveys a false idea, or leads to a false inference. Is there no unnaturalness in man's being commanded to spend six-sevenths of every week in labor, and one-seventh in rest, *because* the Lord occupied 60,000 years, or more, in building the world, and then rested for 24 hours?

V. The foregoing reasons for believing the six days to have been six complete rotations of our globe are strengthened by such passages of Scripture as these: "And God said, Let there be light, and there was light;" "Let the waters . . . be gathered together unto one place, and let the dry land appear; and it was so;" "By the word of the Lord were the heavens made, and all the host of them by the breath of His mouth;" "He spake, and it was done." Why did Longinus pronounce the first of these passages a fine specimen of the sublime? Simply because it represents God as ushering light *instantaneously* into being, by merely saying, "Let there be light." "He spake, and it was done." If at God's behest light sprang instantly into being, is it probable that the creating flats of the six days took many thousands of years for their accomplishment? The passages I have cited seem to indicate that *much rapidity* marked the grand reconstructing work of God, and the instantaneous production of light is but one specimen of that rapidity.

But how reconcile the long periods and the vast transformations which geology rightly demands, with the belief I have been arguing in favor of? *Answer.* By locating the long geological ages *between the first verse of Genesis and the closing sentence of the second verse:* in other words, by having those ages *precede* the reconstructing work which began when "The Spirit of God moved upon the face of the waters." There is nothing to forbid our viewing the first verse of Genesis as a general and independent announcement, having no immediate connection with what follows, nor to forbid our placing a long interval between the event mentioned in verse first, and the earth's void and formless state referred to in verse second. There is room in that interval for every thing that geology's facts can possibly require; and thus the seeming quarrel between that science and the Fourth Commandment is healed, and we are left at full liberty to believe that the Lord's six working days were no longer than ours.

To show that I am not alone in this belief, and in this mode of solving the geological difficulty, let me here present some extracts from what two or three eminent scholars have said. Says the distinguished Dr. Chalmers, "Does Moses ever say that when God created the heavens and the earth, He did more, at the time, than transform them out of previously existing materials? Does he ever say that there was not *an interval of many ages* between the first creating act (described in the Bible's first verse) and those more detailed operations . . . described as having been performed in so many days?" Similar to Chalmers' views are those of the Rev. B. Lloyd, once Provost of Trinity College, Dublin. He says, "When Moses comes to the work of the six days, . . . it appears that the original work of creation, spoken of in verse first, is *excluded* from the series of performances belonging to the six days, and if excluded, then, perhaps, removed to an indefinite distance." And here, as still more to the point, is what the Rev. Dr. Charles White says, late President of Wabash College. "The Christian world was startled, a few years ago, by the announcement, by geologists, that the Scripture account of the Creation is an egregious mistake. The crust of the earth, they confidently asserted, has forty successive strata, holding vegetable

and animal remains, . . . and each of these forty strata, they affirm, could have occupied no less than a million of years. This makes the creation's age to be at least 40,000,000 of years, and the Bible's 6,000 years no more than 'a single hour' of the world's vast age. . . . But what, then, is to become of the simple faith of the Christian world? If the great mass of believers, lettered and unlettered, have been deluded by the apparently perspicuous narrative in Genesis; if that be either an inexplicable allegory, or a plain but false statement, what assurance have they that any part of the Scriptures is sober, intelligible truth, or a communication from Heaven? But there is no need of alarm. The matter is thus explained. . . . At one epoch in the infinite past . . . came the visible creation from Jehovah's hand: at another epoch, comparatively recent, where the Scriptural narrative begins, the earth was in a disorganized condition. The third great fact in this history is, that in six natural days God renewed and readjusted the earth and the heavens for the residence of man, a more intelligent inhabitant than had before occupied it. . . . Between these two points (the work mentioned in verse first and the reconstructing work of the six days) there might have revolved many millions of years. Be it so, then, that the present mineralogical constitution of the earth must have resulted from the working of unnumbered centuries; . . . here was room and facility for all the changes which are alleged to have been wrought. . . . Doubtless that unmeasured tract was largely occupied with production and deposition, submersion and elevation, the extinction of some races of plants and animals, and the creation of others. . . . No less probably did there accumulate, in subterranean recesses, coal, metals, and other materials for the denser population of the later and millennial centuries of the world."

By the above extracts it will be seen that in the interpretation I have been defending, I am found in highly honorable company. It is one of Solomon's witty sayings, that "even a fool, when he holdeth his peace, is counted wise;" and as it is somewhat probable that I shall be counted a dunce, by some, for the belief I have expressed, instead of wishing I had remained silent (so as to escape being deemed a fool), it is something of a consolation to be a fool as an associate of four such notables as Moses, Chalmers, Bartholomew Lloyd, and President White.

Ashland, N. Y.

THE ANNULAR THEORY, NO. 11.

BY PROF. I. N. VAIL.

I presume that my readers can readily see that the hypothetic annular system was largely composed of vaporized and comminuted particles of metals and minerals, for the reason that they largely composed the archaic atmosphere from which those rings were derived. Now it is plain that as gold is heavier than lead and more difficult to vaporize, it would gravitate lower in the atmosphere, and that all vaporized matter would arrange itself according to its specific gravity and vaporizing point. Thus mercury, while it is heavier than lead, would be vaporized long before the melting point of the latter would be reached, and consequently would rise higher in the atmosphere. In short, we see the tendency and utter necessity of the great primeval atmosphere forming into concentric zones or rings, and we see this verified by the telescopic evidence of Saturn's rings, so that the true philosopher will readily understand the process of ring-formation. He will see each annular system made up of rings of different specific gravity, the heaviest always nearest the surface of the planet, and the lightest the most remote. Now this innermost ring would fall first and form the first ocean upon the earth, and from that ocean would be deposited the solid materials largely composing that ring. And as a pure result, the geologists of every land would find the first aqueous beds to be of the very greatest specific gravity. It could not be otherwise. That innermost ring made up of watery vapors and heavy metals distilled in the implacable earth-furnace would, in the lapse of ages, be spread over the old planet nucleus as a vast casement of metaliferous rock, washed by a universal but shallow sea.

Now, it is not worth while for me to tell geologists that the oldest sedimentary deposits are thus arranged. They know it full well. The Laurantian or archaic piles of the earth are the densest, the heaviest and the richest of all strata. They are the native beds of gold, silver, lead, etc. How did these metals find a lodgment there? If the earth in its igneus throes had not sent them from its inmost depths, they would still be disseminated through the entire mass of the globe, and practically inaccessible and unattainable. We may thus note the wisdom of the Creator in making the molten or incandescent state one of the necessary conditions of all evolving worlds; for by it all the metals and many other materials most useful are expelled into each world's primitive atmosphere, and these by gravital assortment prepared for their return to the outer crust, where alone could they be found and obtained by sentient beings.

Thus if the earth had never been rocked in its cradle of flame, not one pound of the metals now so essential in the arts and industries of man could be obtained by any human power, and without this highly philosophic and amazingly simple means of metal aggregation, we are brought to face a problem that defies solution. When the solar problem cools down, the metals now vaporized and revealed by the spectroscope, must gravitate each to its proper level in the *coming* annular system of the sun, and finally find a lodgment in the outer crust of that giant world.

Thrust an ice-cold iron rod for an instant into the hottest furnace, and it becomes covered with watery particles condensed from the flames, so that the cooling of a molten world simply mean the evolution of an aqueous ocean that must fall upon its surface. This intimate association of water with fire insures its association with all the rings of every system, so that when the innermost earth-ring fell to its surface, the accompanying waters fell with it and augmented the infant ocean already condensed from the lower portions of the primitive atmosphere.

It is therefore very plain to my mind that every ring-fall upon the earth would bring in a vast amount of sublimate mineral matter accompanied by immeasurable deluges of water, and when we view the stately motions of Saturn's rings as well as the excessively slow decline of his belts, and those of Jupiter, polarwise, we can form some idea of the vast lapse of

time that it requires for a ring to descend from its celestial anchorage. Thus, when the innermost earth-rings descended into the atmosphere, it was not so much of a catastrophic collapse as we might at first suppose. Buoyed up by the resisting atmosphere, it simply floated downward toward the poles,—the region of least resistance—as comminuted, meteoric and vaporous matter. Vast meteoric showers, covering immense periods of time, falling in higher latitudes, inch by inch built up the mineral and metallic bottom of the old ocean; just as it would to-day if a vast dust-shower should descend upon the earth and gravitate to the ocean's bed.

With these conceptions in our minds, if we look back at the geologic ages we find these conditions so harmoniously complied with, that I would now as soon doubt the existence of a molten earth as to doubt the former existence of its annular system.

As before stated, then we find the oldest sedimentary beds heavily filled with just such metals as would, in the natural adjustment, be found in the earth's innermost ring. We find this mighty casement of the heaviest rock to extend all around the known earth, and we are thus forced to admit that it was deposited from a universal ocean, and derived from a source on high. It is vain that the old school claims that this remarkable formation was derived from the igneous crust below by the long action of an eroding and transforming ocean. It is devoid of every feature pointing to such a source. Its gravity absolutely forbids such a conclusion, for grading the beds from this point downwards, according to the known specific gravity of the series in question, the mass of the earth should be more than five times as heavy as it is. Its immense thickness of more than 40,000 feet, as in Canada, is an objection that none can overlook. But laying these and other objections aside, another question is forced upon us. Where are the sublimations that we *know* went up from the great world-furnace in archaic times, if they be not in the massive strata under consideration? They are not found above them, in later formations, and they can not be below them; consequently they are either located in the Laurentian series, or they have not yet returned to the earth. The question, then, is no longer one of argument. We are simply forced to admit that the heavy exhalations of the molten earth are located in the oldest sedimentary beds. This again impels us to admit that they returned to the earth after it cooled down, and an ocean had rolled its waves all around it.

Now it is very plain that if these exhalations came upon the earth after an ocean rolled over its surface, they came from beyond the atmosphere—from rings that revolved about the earth, for they could not have remained in the atmosphere, nor beyond it, unless they revolved around the earth, no more than a star or a moon could remain there to-day without motion.

Thus the first grand series of rocks in all their features lead us irresistably to the annular idea, even if uniformity of world-evolution did not demand its recognition.

But we are only *starting* on a tour of startling revelation, and if at the very starting point we have such witnesses to testify, what may we expect to find as we climb up the geologic column where the scenes are less clouded and the evidence more emphatic?

Elsinore, Cal.

"MEMORY."

BY JOHN C. DUVAL.

As when benighted on some desert plain
With one small spark the wander'rer lights a flame,
Which spreading far reveals to him again
The distant hills from whence at morn he came.

So doth a look, a word, a tone oft cast
Oe'r memory's waste a momentary blaze,
And light amid the vistas of the past
The long forgotten scenes of other days.

The faculty of memory alone it seems to me should be sufficient to convince any one that mind is a distinct thing from matter, and that it can not be developed by any arrangement of *material* atoms: Let us suppose that the brain of a living human being has been brought to the condition in which it exists by all the requirements necessary, to enable it to develop this latent property of matter—mind or intelligence of which memory is one of the attributes. Then let us observe what work is done by this one atttribute of mind, and see, if in any way, we can account for it satisfactorily according to the materialist's creed.

By this faculty of memory all the scenes and incidents of a lifetime—tens of thousands of words, names, people, places, villages, towns, cities, lakes, rivers, mountains—in fact, every thing we have seen or heard during a lifetime, is depicted or recorded with more or less truthfulness and distinctness upon a small lobe of the brain, and the impressions thus made may be called up whenever we wish, and all without any mingling or confusion or the overlapping of one impression upon another.

Probably the representation of things can be made materially, as minutely and as permanently by the Daguerrean process as in any other way, but if every thing a man had seen or heard during a lifetime was depicted and recorded in this manner, what a vast amount of matter, or of its surface, would be requisite in order that one impression should not conflict with or overlap another; and yet that little lobe of the brain, supposed to be the organ of memory, is not larger than an English walnut. How is it possible to conceive that the countless impressions, made during the half of a century, say, could be represented in any *material* way with distinctness, upon so small a substance, or surface? If every atom of a man's brain was large enough to receive a distinct image of a city or town, for instance, this would be totally inadequate for the reception in any *material* way, of a fraction of what is recorded by the memory.

But even admitting that such representations could be made materially upon the brain, or rather upon the minute portion of it supposed to be the organ of memory, another difficulty presents itself. If materially made upon a material substance, how can we account for the fact that we are not always cognizant of them? When once formed by material action upon a material substance, it seems reasonable to suppose that every image thus depicted would always be present to the mind. But we know that such is not the case—on the contrary as a general rule, they are not seen, although they may be, when we wish it—occasionally they are reproduced without any conscious effort of the will.

For example, I will make a requisition upon

the organ of memory for a representation of something I have seen in days long gone by, my native village for instance—which I am sure I have not thought of for months, and have not seen for more than a quarter of a century. "Presto," here it is before me, not all at once, but by consecutive efforts of the will, I see the little stone Court-house in the middle of the square, with its gilded vane in the shape of a fish, surmounting the apology for a dome,—the Cathedral, with its tapering spire, which to my boyish imagination seemed to touch the clouds,—the college grounds where I have so often—not studied the classics,—but played foot-ball and shindy,—every street and building,—the beechen groves, cliffs and springs and all the other features of its surroundings are as plainly visible to me as they were the last time I saw them. Now I see no reason whatever for supposing that this representation of my native village, as well as thousands of others subsequently made, was impressed in some *material* way upon the matter composing the organ of memory; and yet, this must be so if mind, and memory as one of its faculties, be but a product of the brain,—in other words, if the brain be mind, and not the mere vehicle for its manifestations. If then, we admit that memory is the product of a particular lobe of the brain, how is it possible for us to suppose that the countless scenes, incidents, localities, names, words, etc., all we have heard or witnessed during a lifetime, could be impressed with more or less distinctness upon a thimble full of brain-matter? Take, for instance, a man who can speak fluently half a dozen languages, which is not at all unusual, and of words alone there would be nearly a hundred thousand depicted in some way upon one little lobe of the brain, and from this we may form some idea of the vast number of impressions made upon it. Now it seems to me if these impressions were made materially upon a material substance as small as the organ of memory, their number is so great, and the representations would have to be so varied and different that they would necessarily conflict with and overlap each other, and memory would be but a tangled and confused chaos.

The work performed by memory can not be satisfactorily explained materially or by any of the known properties or qualities of matter. And if the materialist should attempt to dodge the question by asserting that the phenomenon of memory is due to some unknown property or quality of matter, I would reply that I can more readily believe that mind is not a product of matter than any assertion in regard to properties of matter totally antagonistic to all its *known* properties.

To account for any phenomenon of the kind, the materialist must necessarily reason from a material basis. He can not consistently go outside of the known qualities of matter. Everything else must be purely conjectural. But where among them all do we find anything to sustain, or indeed anything that is not antagonistic to the assumption, that the memories of a long life have been depicted upon a little "dab" of matter, which it seems to me would hardly be sufficient to take the impressions in any *material manner* of what might be conveyed by the physical senses to the organ of memory during the course of a few minutes? The fact that mind, and memory as one of its attributes, as a general rule, becomes enfeebled by age, has been urged as an argument in favor of its being but a product of the brain; but such an argument has no weight with those who believe as I do, that the matter constituting the brain is no more the mind or intellect than is the matter composing any other portion of the human body,—that it is merely matter so arranged as to serve as the vehicle for the operations of mind, and when this medium is enfeebled by age or injured by other causes, the manifestations of intelligence will be of course correspondingly imperfect, just as vitality is weakened by disease or destroyed by injuries to the vital viscera,—and yet no one will contend that the heart, lungs, etc., of an animal are its *vitality*.

In conclusion, I will reiterate that reasoning *materially* upon the subject, we can not regard the "tablets of memory" as a mere poetical myth, for they must be *material* and have certain dimensions, and it seems to me, if every atom of the brain was a separate tablet, it would be an impossibility to record or depict upon them in any material manner the memories of a lifetime.

A TELLING INDORSEMENNT OF OUR HEALTH-PAMPHLET.

The following letter of inquiry from W. B. Manly, Esq., cashier of the Bank of Belfast, N. Y., was addressed to Dr. R. F. Stevens at Syracuse, N. Y., which we print with the doctor's reply. No one ever doubted the purity of the doctor's motives or the intelligent ability which he brings to bear on all his investigations. Here are the letters:

R. F. STEVENS, M.D., Dear Sir: I am informed that you recommend the use of Dr. A. Wilford Hall's hygienic treatment as set forth in his Health-Pamphlet. Will you be kind enough to inform me as to the truth or falsity of said information and greatly oblige,

Yours truly,
W. B. MANLY, Belfast, N. Y.

Crouse Building,
Syracuse, N. Y., Feb. 17, 1890.

W. B. MANLEY, ESQ., Dear Sir: Yours received, inquiring as to the truth or falsity of your information that I recommend Dr. Wilford Hall's treatment, etc. In reply, I have to say that such information is correct. The doctor mentioned it to me twenty-three years since, and I then adopted it, and have continued its use since—with occasional intervals—as a prophylactic. I weighed at the start 145—now at 71 I weigh 206. Have had no cold in these twenty-three years, nor ailment of any kind, and do not believe a healthier man can be found. Many cases in my practice have been benefited by it.

Recommendations published by Dr. Hall are reliable, and generally come from an intelligent class of people. It is on trial by great numbers at the present time, and producing good result to many of the afflicted.

Yours very truly,
R. F. STEVENS, M. D.

[We add that Dr. Stevens has not a penny's financial interest in the sale of the Health-Pamphlet, and only volunteers such letters as the above from a desire to benefit the afflicted. —EDITOR.]

OUR HEALTH-PAMPHLET NOW FREE TO PRACTISING PHYSICIANS.

We have been outrageously calumniated by a few medical doctors, including one notoriously unprincipled Briggs of Texas, because we have ventured to sell as a prescription, for $4, our 48-page Health-Pamphlet to the afflicted who have become tired of taking drugs.

It has been charged that we were cruelly making money out of the people by asking $4 for so small a physiological and therapeutical treatise. But such objectors do not realize that doctors everywhere would be regarded as not at all exorbitant while charging the same price for a prescription of a thousandth part as many words or of a millionth part as much real information to the afflicted.

The truth is, so far from speculating off the sufferings of our fellows, we have used and are now using the bulk of the cash receipts from the sale of this *recipe* in giving the pamphlet free to the deserving poor and to others in need of the remedy.

Within the last three months we have mailed free nearly 50,000 copies of this "priceless work" —as it is generously termed by those who have received it—to the poor and to the clergy of the United States and Canada; thus, instead of oppressing the people as charged, we are actually using a large portion of our income from the sales of the pamphlet to mitigate the sufferings of the world free of charge. (See our standing offer to the poor and to the clergy in this number.)

To stop the mouths of all such calumniators we now extend our offer to practising physicians of all schools and professions, and will cheerfully send a single sample copy of the Health-Pamphlet free (except postage—eight cents) to any doctor who will send us his name and address, and who will agree, while being permitted to use the treatment in his practice, not to show the pamphlet or make known the details of its instructions to any one outside of his own family.

We make this offer in order that the class of men, who are responsible more than any other for the physical condition and well-being of humanity, may have the free use of our discovery in their practice, thus enabling thousands of suffering patients to derive benefit from our experience. What more could we be asked to do while keeping the wolf from our own door?

In carrying out this offer we appeal to the magnanimity of this noble profession, as a rule, and ask every doctor who shall receive our treatise on health and longevity to weigh fairly and without prejudice the considerations presented therein. And while we do this, we most respectfully and earnestly challenge them to point to any authority in which the comprehensive treatment prescribed by us in the Health-Pamphlet was even hinted at previous to our discovery in 1849, or even previous to our revelation of the treatment to Richard F. Stevens, M.D., of Syracuse, N. Y., some twenty-three years ago, at which time he made it known to the doctors of the country by a public lecture on the subject. (See the Health-Pamphlet, page 46.)

And now we will add, in passing, that while doctors are sending eight cents postage for a free copy of the Health-Pamphlet, if they shall see anything in this number of the MICROCOSM that is indicative of its future interest to them, they can, if so disposed, add fifty cents as a year's subscription to the same. Back numbers of the present volume will be sent to each new subscriber. (See accompanying sheet, containing indorsements.)

Remember that while tens of thousands of doctors shall be accepting of this gift, our experience in the same offer to clergymen warns us to say that it will be impossible for us to keep pace with the demand thus created, but we will keep as near it as possible, filling all orders in their regular turn. The above offer, of course, only applies to such doctors as have not previously seen the Health-Pamphlet.

N.B.—As we *know* what offer we have made, please do not mar this number by cutting out this offer, but keep the MICROCOSM for reference, and when you have received the Health-Pamphlet and have carefully read it, compare its teachings with the spirit of this offer, and report to us your candid opinion of the value of the revelation it contains.

Cordially, A. WILFORD HALL.

TO OUR CORRESPONDENTS.

We have no doubt, judging from numerous letters we receive, that many of our dear friends at a distance feel slighted by our neglect to answer their letters. We say to all such friends that it is totally impossible for us personally to read even one-tenth of the letters we receive if we did nothing else from morning till night. We can not even open our daily installment of letters and note their contents with two clerks to assist us at this single task. The reader has only to imagine from 1000 to 2000 letters, besides other quantities of mail matter, placed on our desk every morning the week round, to form a guess as to the nervous strain we are constantly under. Instead of censuring us for neglecting to answer letters personally, our correspondents should rather sympathize with us and write as briefly as possible unless the emergency requires a more lengthy letter, which of course must sometimes occur. We say to our readers that we are bringing our rapidly accumulating correspondence into system as fast as possible by the addition of new and competent clerks, and will soon we hope be able to keep pace with the requirements of this office. We already have twenty-two assistants with busy hands and pens endeavoring to keep up with the work. We are trying personally, above all other things, not to break down physically before having accomplished the good we see opening up before us. We believe we have only fairly begun the work which is mapped out by Providence in the near future for us to accomplish. There is, however, a maximum strain even for steel when the snap will surely occur. Our nervous and physical structure is something less enduring than steel, as we are beginning to find out, even with all the untold advantages of our wonder-working hygienic treatment to aid us.

OUR "EXTRA" MICROCOSM.

Those who have become at all interested in the claims of our Health-Pamphlet can not fail to be more than interested in the physiological and therapeutical discussions contained in the "Extra," as they all have a direct philosophical bearing upon the new treatment itself. It will be sent free to any who have not seen it.

PRIZE ESSAY No. 7.
Spurious Substantialism.
BY REV. JOHN CRAWFORD, D.D.

[Concluded from January MICROCOSM.]

Again, it is argued, from 1 John v, 4, that faith is said to be begotten of God, and "God can not beget a nonentity." Therefore faith must be an entitative substance. Let us read the text: "Whatsoever is begotten of God overcometh the world; and this is the victory that overcometh the world, even our faith."

Now, in the first place, the passage does not say that God *begets faith*. It affirms that God begets anew all those who are possessed of saving faith. It lays down an obvious principle that whatsoever, or everything παν το begotten of him, or in every instance where the soul is regenerated of God, that soul has victory over the world.

We have a similar passage in 1 Peter i, 3, "Who hath begotten us again unto a lively hope, by the resurrection of Jesus Christ from the dead." It is neither faith nor hope which, in these passages, is said to be begotten of God, much less that they are substantial entities. They are no more than simple exercises of the soul.

Again, when it is said, in the first of these passages, "This is the victory that overcometh the world, even our faith," we have a simple metonymy. Victory, the effect, is put for faith, the cause. Nor is faith here presented as the *substantial* cause, for it is the believer himself who, through faith, obtains the victory in the struggle with the world, the believer who has been begotten anew of God in his regeneration. This, from the clause following, is obviously the apostle's meaning: "Who is he that overcometh the world, but he who believeth that Jesus is the son of God." It is not the belief that is begotten of God, but he who believeth.

But even grant that these passages assert that faith and hope are begotten of God, which they certainly do not, this would signify no more than that God *originated* faith and hope in the soul, by disposing it to perceive, without prejudice or aversion, the object of faith, and the ground of hope.

But it is said that evangelical faith is the working of spiritual life, given in regeneration; and, as life is one of the substantial elements of the soul, and which, moreover, they say "becomes faith," such faith, therefore, must be a substantial entity.

I will admit that life was one of the substantial elements of the soul of man at his creation, when he "became a living soul;" but I utterly deny that man lost that substantial element, or any portion of it, in his fall. There is a sense in which, according to the divine threat, he died the very day he ate the forbidden fruit; but not in such a sense as deprived him of any portion of his soul-substance. He died in law, and henceforth lay under the sentence of death. Sin also cut him off from all fellowship with God, the source and fountain of life and spiritual enjoyment. This is evident from his vain attempt to hide from his Maker among the trees in the garden, after his sin. But all this by no means implies that man lost a particle of his entitative substance. His entire life-substance the unregenerated man still possesses equally with the regenerated. Paul speaks of certain women "who were dead while they lived." So it was with our first parents after their fall; and so it is with all their descendants before their regeneration. In one sense they live, while, in another, they are dead; but this death by no means implies the loss of any portion of the life-substance, which they received in their creation.

I go a step further, and maintain that, as we lost no portion of our life-substance in the fall, neither do we receive a particle of life-substance in our regeneration. The life which we forfeited in the fall, being not entitative life, neither is the life which we receive in regeneration entitative. We must bear in mind that the terms life and death have a variety of meaning in the Holy Scriptures.

It is by his spirit that God quickens the soul of man in regeneration; but, in this quickening, we have not the slightest reason to believe that anything has been added to its original substance. The soul-substance had become depraved, but not lost nor diminished; and in its regeneration it is by the Holy Spirit's energy set right, and thus made to answer the true end of its creation, the glory and enjoyment of God. Like the prodigal, it was dead, but now is alive again, when it returns to its proper position in the family of God. The word life does not always mean a substantial element. It is put, for example, for the *enjoyment* of life, as in Luke xii, 15, "For a man's *life* consisteth not in the abundance of the things which he possesseth."

But granting, for argument's sake, that an additional portion of the substantial life-element is added to the human soul in regeneration, how will this prove that this added life is one substance with faith? I see no philosophy in this! If the substantial life-element be thus increased, of which there is not the shadow of evidence, faith would still be no more than a mere act of this enlarged soul; but by no means any portion of it. It seems to me to be the very height of absurdity to regard faith as any portion of the soul that believes!

Again, faith has been called a "substantial faculty or an organ."

Faith most assuredly is neither a *faculty* nor an *organ*. I presume it is affirmed to be an organ because falsely regarded as a substantial entity, or an element of the soul. I think, however, I have disproved its substantial existence; and, if not a substance, either material or immaterial, it can not be an organ. On the other hand, to call faith a "substantial *faculty*," even were it proved to be a substance, would be as absurd as to call a duck's foot a faculty for swimming.

Again, the quality or attribute of a substance, whether material or immaterial, must not be confounded with the substance in which it inheres. A diamond is hard, but the hardness is no part of the substance of the diamond, but its attribute. Nor is the hardness any part of the cohesion, the entitative force which causes the hardness. In like manner could it be proved that the soul, in regeneration, receives an increase of life-substance, causing faith, it would by no means prove that this life and faith are one and the same substantial entity, any more than hardness can be regarded as a substance because it is the result of cohesion, or that hardness and cohesion are one and the same entity.

Again, I have similar objections to regarding sin as an entitative substance. I could op-

pose it by the same mode of reasoning as that by which I have opposed the entitative nature of faith. Sin, like faith, is simply an act, either in thought, word or deed. It is the transgression of God's law, or disobedience to his expressed will. As man lost no portion of his life-substance in his fall, neither did he receive any substantial addition called depravity. This depravity is no more than a quality, or propensity of the unregenerated soul which, in a figure only, is called a "body of death." To regard the depravity of the soul a substance is as erroneous as to call the putridity of a decaying corpse a substance.

St. Thomas, N. Dak.

Acoustics: A Review of the Old and New Theories of Sound.—V.

BY GEORGE ASHDOWN AUDSLEY, F.R.I.B.A.

35. At this point of our review we must ask the interested reader to carefully study what Professor Tyndall has written on the labors of Newton, Laplace, Mayer, and Joule, as presented on pages 31 to 35 of "Sound."* If he is a believer in the *wave-theory of sound*, he will doubtless be lost in admiration at the transcendent genius of these great scientists; but, on the contrary, should he already have been induced to think for himself, and have gained an inkling of the huge absurdity of such a theory, he will be lost in astonishment at the amount of misdirected and misspent ingenuity expended by learned men in formulating and supporting it—a theory absolutely devoid of one atom of foundation outside the brains of its advocates and teachers. We do not make this assertion without the ability to prove it on incontrovertible scientific data; but the proofs must stand over until we enter on the consideration of the theory of sound as shown under the bright and clear light of the Substantial Philosophy. Our readers need not fear that we shall "beg any question" or shuffle out of any difficulty; and all we ask in return is that the believers in the ancient *wave-theory* shall beg none of our questions, or shuffle out of the difficulties they will find themselves or their pet theory surrounded with as we clasp them with a girdle of intensely compressed common-sense and scientific conclusions.

36. We have, perhaps, said enough on the velocity of sound in air under the normal conditions; and may now direct attention to the velocities which have been observed in certain gases, liquids and solids. A few examples will here serve our purpose. We are told by the professors of the *wave-theory* that the velocity of the propagation of a *sonorous wave* depends upon two conditions of the body through which the *wave passes*, namely, its elasticity and its density, and the rule they lay down in this matter is as follows: When elasticity is augmented without change of density the velocity of the *sound-waves* is augmented, and when the elasticity remains unchanged, and the density is diminished, the velocity of the *sound-waves* is also augmented. We shall let this rule stand recorded; and without attempting to apply it, we shall content ourselves by giving some of the results of carefully conducted experiments and tests. Such results are simply observed *facts*, and have nothing to do with theory.

* "Sound," fourth edition, pp. 31–35; second edition, pp. 32–37.

37. In the recorded results of Dulong's experiments on gases are to be found the following calculations, all the gases being tested at freezing point (0° Centrigrade):

Hydrogen.....	Velocity	1,164	feet a second.
Carbonic oxide....	"	1,107	" "
Oxygen.....	"	1,040	" "
Carbonic acid.....	"	858	" "

38. For the determination of the velocity of sound in water we are indebted to the labors of Colladon and Sturm, and, as the method adopted by them is both interesting and instructive, it may briefly be described here. The Lake of Geneva was selected for their experiment; its great depth (stated at 459 feet) and the purity of its water recommending it for their purpose. The greatest stretch of deep water was found to lie between Thonon and Rolle, places situated about eight miles apart. Off Rolle a vessel was anchored, and from it a bell weighing about 140 pounds was suspended, deeply submerged. Attached to the bell was a heavy hammer, so arranged that at will of the operator it could be made to strike the bell with considerable force. On board the vessel a heap of powder was laid, and a match was so connected with the mechanism of the hammer that the instant the bell was struck the powder was fired. Off Thonon another vessel was moored, and on it was one of the observers, furnished with a "stop-watch," and provided with an ingenious contrivance whereby the sound conducted by the water could be conveyed to his ear. This contrivance was a large curved ear trumpet, the bell of which was covered by a stretched membrane and submerged in the water, with the membrane accurately placed facing the distant bell. The upper end of this trumpet was brought to a small opening which fitted into the ear. It will be noted that the water had no immediate contact with the drum of the ear, and perhaps it is well it had not, for sound traveling nearly five thousand feet a second might not prove quite an agreeable visitor, but that the sound had to travel through the column of air within the trumpet, between the membrane and the ear. With the trumpet properly placed, and "stop-watch" in hand, the observer at Thonon watched for the flash of the exploding powder. Starting the watch the instant the flash appeared, and stopping it immediately the sound reached his ear, the interval occupied by the sound in traveling the distance between the vessels was accurately recorded. After several trials, the interval was found to be invariably nine seconds. Dividing the known distance by nine, it was determined that the sound traveled at the velocity of 4,708 feet a second. Radau, alluding to these experiments, tells us that they "gave rise to many interesting remarks upon the propagation of sound in water. Instead of the prolonged resonance that is produced in air, the sound of the bell was short and flat, like the clashing of two steel blades. The water, which is but slightly compressible, had robbed it completely of its ringing tone. At one time the lake was rough and stormy, and they (the observers) had great trouble in keeping the boats to their moorings, but this had not the slightest influence on their experiment."

39. Subsequently Wertheim made an elaborate series of experiments with the view of determining the velocity of sound in different liquids. In clean river-water, at the tempera-

ture of 15° centigrade, he determined the velocity to be 4,714 feet a second, practically confirming the calculation of Colladon and Sturm. At higher temperatures he found the velocity increased; for instance, at the temperature of 60° centigrade it reached 5,657 feet, showing an increase of velocity equal to about 21 feet a second for every degree centigrade above the original 15°. Wertheim found that the addition of a salt to the water increased its power of conducting sound. In a solution of common salt, at the temperature of 18° centigrade, sound travels 5,132 feet a second; whilst in a solution of chloride of calcium at 23° centigrade, it reaches the velocity of 6,493 feet. In absolute alcohol at 23° centigrade, sound travels at the rate of 3,804 feet; and in sulphuric ether, at freezing point, it has the velocity of 3,801 feet a second.

40. Wertheim's determinations of the velocities of sound in different metals are both interesting and instructive; and, as we shall have to draw special attention in the latter part of our review to certain matters connected with the conduction of sound by metals, the following short list will be useful for reference. The top row of figures gives the three temperatures at which the metals were tested, and all the other figures give the velocities per second in feet:

Metal.	20° Cent.	100° Cent.	200° Cent.
Iron	16,822	17,386	15,483
Cast Steel	16,357	16,153	15,709
Copper	11,666	10,802	9,690
Platinum	8,815	8,487	8,079
Silver	8,553	8,658	8,127
Gold	5,717	5,640	5,619
Lead	4,030	3,951	.....

41. It will be observed from the above table that, generally, an increase of temperature in metals is attended by a decrease in their powers of conducting sound; in this respect metals differ from air, gases and liquids. The most noteworthy exception to this rule is iron. In the language of the wave-theorist, *sound-waves* are propagated in iron at the temperature of 20° cent. with the velocity of 16,822 feet a second, and from that temperature up to 100° cent. the *waves* gain in an increased velocity of about seven feet a second for every degree. Between 100° and 200° it appears that the velocity of sound decreases.

42. With a few remarks on the propagation of sound in different kinds of wood, we may close our brief notes on the velocity of sound. Again, taking Wertheim as the most reliable authority, we give in the following table some of the results he obtained by careful experiment and calculation:

	In direction of fibre. Ft. per second.	Across rings. Feet per second.	Along rings. Feet per second.
Aspen	16,677	5,297	2,987
Fir	15,218	4,382	2,572
Sycamore	14,639	4,916	3,728
Elm	13,516	4,665	3,324
Maple	13,472	5,047	3,401
Oak	12,662	5,086	4,229
Beech	10,965	6,028	4,643
Pine	10,900	4,611	2,605

The most noteworthy fact in connection with the above results is the great velocity of sound as measured along the fibre of all woods in comparison to its velocity when measured either across the rings or along the rings at right angles to the direction of the fibre. Prof. Tyndall points out that such results strikingly illustrate the influence of molecular structure, and remarking that the majority of crystals show a different arrangement of their molecules as regards their degrees of proximity in different directions, he says there are in such cases "sure to be differences in the transmission and manifestation of heat, light, electricity, magnetism and sound." Doubtless, according to the belief of this scientist, all these forces of nature are *waves* and nothing but *waves*. We shall see!

43. We may, in concluding our hasty remarks on the velocity of sound, briefly point out to the general reader, who may not have hitherto studied the science of acoustics, the few facts which it is most desirable for him to remember, and to which we shall more particularly allude in our forthcoming criticism of the *wave-theory of sound*. Firstly, let him remember that sound travels in air at normal pressure, and at the freezing temperature at the uniform and never-changing velocity of 1,090 feet a second, and that at the more common temperature of 15° centigrade, or about 66° fahrenheit, it travels at the increased velocity of 1,120 feet a second. Secondly, that sound is conducted by iron at the same temperature at about the rate of 16,800 feet a second, or, say, fifteen times the velocity of sound in air. Thirdly, that sound is conducted by the wood of the aspen tree, along the direction of the fibre, at the velocity of 16,677 feet a second, or about fourteen and three-quarter times the velocity of sound in air. There need be no hesitation in accepting these calculations, for they have been arrived at by careful experiment and observation, and are accordingly outside all questions of one theory or another. The *wave-theory* certainly breaks down in a most ignominious manner in attempting to account for such high velocities, as, indeed, it does in every other matter connected with sound, but that consideration does not interfere with facts.

44. Sound as Barometric Pressure.—Before proceeding to treat of the other important properties and conditions of sound, we think it desirable to lay before our readers the hypothesis started by Sir William Thomson in support of the ancient *wave-theory of sound*. It seems ingenious, we freely admit; and its presentation is so like the action of a drowning man catching at a straw, that we almost feel regret that later on in the second part of our review, we shall have to shatter his whole argument along with the *wave-theory* it is intended to support. In 1883 Sir William Thomson, LL.D., F.R.S., delivered an address on "The Six Gateways of Knowledge," before the members of the Birmingham and Midland Institute assembled in the Town Hall at Birmingham, and it is from this lecture that we now propose making a few extracts. In the course of his address the Professor said:

45. "Acoustics is the science of hearing. And what is hearing? Hearing is perceiving something with the ear. What is it we perceive with the ear? *It is something we can also perceive without the ear;* something that the greatest master of sound, in the poetic and artistic sense of the word at all events, that ever lived, Beethoven—for a great part of his life could not perceive with his ear at all. He was deaf for a great part of his life, and dur-

ing that period were composed some of his grandest musical compositions, and without the possibility of his ever hearing them by ear himself; for his hearing by ear was gone from him for ever. But he used to stand with a stick pressed against the piano and touching his teeth, and thus he could hear the sounds that he called forth from the instrument. Hence, besides the Ear Gate of John Bunyan, there is *another gate or access for the sense of hearing.*

46. "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, there 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 drier, 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 will perfectly understand. The effect of the air in the lungs—the function it performs—depends chiefly on the oxygen taken in.

47. "But," continued Sir William Thomson, "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. If you go down five and a half fathoms in a diving-bell, your hand is pressed all round with a force of thirty pounds 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. . . .

48. "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 . . .*" We shall be glad if our readers will carefully observe the teaching of the portion we have put in italics, for it clearly records this celebrated scientist's belief that sound consists of *exceedingly sudden changes of pressure—barometric pressure*—or, as more commonly expressed by the advocates of the wave-theory, of "*condensations and rarefactions of the air*" The lecturer continued:

49. "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," said the lecturer, giving a sudden clap of his hands, "that is a sound. There is no question about it—nobody will ever ask: Is it a sound or not? It is 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.*" We really wonder if the lecturer for a moment seriously believed that the puny clap of a pair of human hands could and then and there did so condense the whole mass of air in the immense hall in which he stood, as to suddenly bend inwards the thousands of tympanic membranes of his hearers. We have no wish to be disrespectful; but we must say that a man who can believe such a thing can believe anything! The lecturer continued:

50. "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 sound. *But the same difference of pressure coming on us suddenly—a fall in 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 effect us quite like sound. A sudden rise of the barometer would produce a sound analogous to what happened when I clapped my hands.*

51. "What is the difference between a noise and a musical sound? Musical sound is a regular and periodic *change of pressure.* It is an alternate augmentation and diminution of air pressure, occurring rapidly enough to be per-

ceived as sound, and taking place with perfect regularity, period after period. . . . In the language of mathematics we have just 'one independent variable' to deal with in sound, and that is *air pressure*. We have not a complication of motions in various directions. . . . We have not the infinite complications we have in some of the other senses, notably smell and taste. We have distinctly only one thing to consider, and that is *air pressure, or the variation of air pressure*." Exquisite simplicity!

(To be continued.)

MASS AND MOTION.

BY PROFESSOR HENRY A. MOTT, PH.D., LL.D.

The present dynamic or mechanical theory devised to elucidate and explain the phenomena of nature, postulates *mass* and *motion* as the absolute, real and indestructible elements of all forms of physical existence. That there can be no doubt about this—Noiré speaking of evolution, holds with Schopenhauer that its true source is placed in the *will, i. e.*, the subjective form of what when it appears objectively is called *force*. He holds with Mayer and with Kant, that there is but one force of nature under different forms, itself eternal and unchangeable, and he recognizes in whatever we perceive that is, in all that we know of nature, whether in the form of light, heat, sound, or anything else, *nothing but variations of motion*. That motion can be changed, but it can never be lost. "Everything," says Müller, "in nature, even organic life, is looked upon as a purely mechanical process, though it is fully admitted that science has not yet mastered the the most difficult of all problems, the explanation of life as a mechanical process."

Again, it is claimed (1), that the quantity of motion in the Universe is a constant quantity, never being added to or diminished, and that when the visible motion of the mass disappears, it reappears as motion of the particles of the mass.

(2). That a mass is set into motion only by another mass in motion, in other words, there is but a transference of motion from one mass to another.

That of necessity a body must possess motion in changing its position from one locality to another is self-evident, as the term "motion" is applied to express such movements, but the question naturally arises. is it correct to attribute to such a phenomenon (*i. e.*, motion), the cause *per se* of the change in position of the body in question. It must be quite clear that although there can be no change in position unaccompanied by "motion," still, because something (a phenomenon) happens, which, according to our vocabulary is called "motion," and because such visible motion was incited by another body in motion, it is argued that it was the motion of this latter body which caused the first body *to move* or change its position. Surely, at best, all we have a right logically to admit is that it *may be so*, but the question arises, *is it so?*

Dr. Hall, in an article published two or more years ago, referred to the crushing of a building by the fall of a tree, and clearly pointed out that it was no more the motion of the tree that crushed the building than the *motion of the shadow* on the building caused by the tree in the process of being pulled towards the earth by gravity in the sunlight.

If great velocity of motion (*per se*) could induce a body to move, certainly a quickly advancing shadow directed against a building should reduce the same to atoms.

When, however, we analyze the statements in works on physics, we find that what is really meant is "*mass*" *in motion* that is capable of doing the *work* of putting another "*mass*" *in motion*. It is true that such statements do not appear prominently set forth, still such is unquestionably intended to be understood.

Tyndall, for example, says *heat itself, its essence and quidity, is motion and nothing else*, also that heat is a "mode of motion." What he evidently meant to say was that heat is a "mode of motion of the particles of a mass." It makes little difference what he meant, for, as the distinguished savant, Prof. P. G. Tait, of the University of Edinburgh, says: "Heat is no more a 'mode of motion' than potential energy is a 'mode of rest.'"

When we look upon motion as a phenomenon, the effect of a cause then will we be better able to explain not only what "heat" is, but what electricity, magnetism, gravity, sound, etc., are. As Prof. Tait says: "Heat, whatever it may be, is SOMETHING which can be transferred from one portion of matter to another."

Is motion then a phenomenon? According to the present theories of science, a body is heated to a given temperature by virtue of the fact (?) that its *supposed* particles are in a given state of vibration, or are moving with a given velocity, and bombarding one another trillions of times in a second at 60° F. (for example), and in case of hydrogen possessing at this temperature a velocity in their *free path* of over one mile in a second. Again, experiment has shown that the temperature of a body can be reduced, which means that the velocity of the particles composing the body has been diminished.

Now, we have a right to inquire, and in fact it is our plain duty to do so, as to what condition the universe as a mass would be in if deprived of all heat, or if reduced to the absolute zero of temperature.

There could be no motion, for according to Tyndall, heat is a "mode of motion." Any motion of the particles of a mass, or of the mass itself (owing to friction) would produce heat, and that would not be the *absolute* zero of temperature, so we are compelled to admit that at such a point (or temperature, *i. e.*, condition) all motion would be destroyed, and nothing but mass would remain absolutely motionless and in a state of perfect tranquillity and rest.

What then is "motion" but a phenomenon?

None but an omnipotent power could store up in such a universe the necessary force to set the same in motion and maintain it so.

Just as by winding up the spring of a clock we store up force within it, which is liberated when unwound, or just as force is stored up in a cannon-ball when liberated from the explosive, so that the ball will possess *energy* by virtue of the *stored up force*, thus enabling the mass to do work. It is not the "motion" of the mass that does the work, for such motion is incidental—but it is the constantly liberating force stored up in the ball that does the work—and if the cannon-ball in motion sets some body in motion in its path, it is because it has

stored up in that body some of its force, thus enabling this newly moving body to do work itself.

The claim, therefore, that matter has always been in motion, and that the quantity of motion in the universe is a constant quantity, is irrational—for "motion" is not a "thing," it is a *phenomenon*, it has to be created, as Dr. Hall has said; it "never existed," but sometimes "occurs."

Given a man who can just lift 550 lbs., and who attempts to impart an upward *motion* to a weight weighing 600 lbs.—he does not succeed; a child who can lift 50 lbs. joins him in his effort—when suddenly the mass has a *motion* upwards to the height they see fit to raise it. What became of the energy expended by the man when attempting to lift the weight alone? We know what science would say—but let us look at the problem in a more advanced light.

Surely it was not the child who lifted the weight, neither was it the man alone, but it was the energy expended by both—the child overcoming a gravital pull of 50 lbs., and the man overcoming a gravital pull of 550 lbs., *and just that amount of gravital pull was counterbalanced by the man when attempting to lift the weight alone, although he imparted no motion to the mass which remained at rest.*

When we inquire into the nature of *force*, we find a different state of affairs as compared to *motion*. The quantity of force in the universe is a *constant quantity*. Force is indestructible, can not be added to or subtracted from; it is *persistent*—it is always active, observed or unobserved, always at work tending to establish an equilibrium in nature.

Force is the "thing," the "entity" not motion, which it can "produce," "create," cause to "occur" in a mass. Prof. Tait has said: "It has been definitely established by modern science that heat, though not material, has objective existence, is as complete a sense as matter has." But the distinguished professor looks upon heat, light, sound, electric currents, etc., as "forms of energy"—and here is where we will have to differ, for "energy" can only be the power, ability, capacity of force acting through matter to do work.

Matter is the vehicle in which force can be stored and made to do work, and when force is thus stored-up, we speak of the energy of the mass, and just in proportion as there is more or less stored-up force within it, just in the same proportion is it capable of doing more or less work, or, in other words, is it possessed of more or less energy.

The two entities in this world are, therefore, *force* and *matter*. One active possessed of kinetic energy, the other possessed of inertia or inability to act.

More confusion, absurd and irrational hypotheses have been introduced into science than a few by attempting to ignore the *infinite*, and attempting to explain the phenomena of nature on a purely dynamic or mechanical basis.

If there was no other argument than the inability of the *finite* mind to grasp the immensity of space, which knows no boundaries, we would be compelled to admit of the existence of the infinite.

The *infinite* can no more be separated from his works than a *part* can make up a whole.

If the God I have the individuality to worship is not, as Savage said, "in the dust of the streets, in the bricks of my house, and in the beat of my heart, then he is not infinite." This, however, does not make the dust of the street, the bricks of a house, or the beat of one's heart a God, any more than my hands, my feet, my stomach, which, although quite necessary to make me a human being, are quite unnecessary to make me a living thing. Neither does it make my hands or feet or stomach the ever-living "*Ego*," the "I," which proves that there is "something" within my material frame not acquired from outside of it.

In the same way does the universe find its existence in God—all force and matter being made out of His infinite substance. By this admission we are not led to say with Hæckel—"There is no God but force," but rather as Dr. McCosh has said—"There is no force but God." And in slightly modified words of a distinguished writer: Just as an image is sustained in a mirror by the constant succession of the rays of light, so nature is sustained by the putting forth of the power of God, which, if for one instant withdrawn, nature, in all her grandeur and complexity, would sink back into that simple condition from whence it arose.

There is one mystery that science must acknowledge and bow in respectful recognition to, and that is the mystery of the infinite, and it is far better to admit one great mystery, and send back to that source such problems which surpass finite analysis for solution in the future, than to attempt to ignore the Infinite in His works.

The universe is not a machine, and it can no more be run without the constant exercise of the Will of God than a steam engine can be run with all the fuel in the world, except it be directed by the will of man.

OUR NEW YEAR'S OFFER TO CLERGYMEN.

(From the January Number.)

We are so anxious that every minister in the United States and Canada shall have the benefits of our Health-Pamphlet, that we now offer to send it free of charge except postage (8 cents) to any regular clergyman who will send us the required promise not to reveal the treatment outside of his own family, and who will enclose the 8 cents in postage stamps. We are thus willing to become a missionary in using a large portion of our income from the sales of the pamphlet for the personal benefit of this noble band of workers in the cause of religion. Surely no class of our readers will demur to this liberal proposition, which applies alike to the clergy of all denominations. This offer, of course, only applies to such ministers as have not previously seen the pamphlet.

THE EDITOR'S PORTRAIT.

(From the February MICROCOSM.)

Many of our agents and purchasers of the Health-Pamphlet have been urging us for some time to have Dr. Hall's photograph taken, imperial size, as he now appears, that they may know at a distance exactly how a man looks who has followed this new treatment uninterruptedly for forty-one years, and who was saved thereby from a consumptive's grave. We have just had prepared such a portrait by one of the first photographers in this city, which represents the doctor as natural as life itself, a copy of which will be sent at cost (25 cents) post-paid to any address.

ASSOCIATE EDITOR.

MORE WORDS OF ENCOURAGEMENT CONCERNING OUR HEALTH-PAMPHLET.

Would that we could spread out our mails before every man and woman in the United States and let them read what hundreds each month testify concerning this rapidly spreading treatment. As we can not do this, we give another drop from the ever overflowing bucket:

Dr. G. M. Peebles, of Hammonton, N. J., proprietor of one of the most celebrated sanitariums in the United States, author of many volumes on physiological and therapeutical science, and admittedly one of the most learned M. Ds. of the country, continues his unqualified indorsement of our drugless treatment Feb. 18th as follows:

"My Dear Dr. Hall,—* * * Your remedial discovery is sweeping through the land a very terror to the calomel venders and drug poisoners,—a class of men who are pleading for 'legislative protection' and 'medical boards' to aid them in their unprogressive work of drug medication. Truth never pleads the baby-act of protection. * * * But I only took my pen to say that during the last few months I have received over 300 letters from all parts of the country asking if my signature to the indorsement printed in the MICROCOSM is genuine. Without exception I have answered in the affirmative, thus re-indorsing the remedy. I inclose a sample of these letters from different States. What a skeptical age! I am glad of this opportunity of replying to so many inquiries, only wishing in addition that I could aid otherwise in bearing a portion of your burthens. The world can never pay you for what you have already done. Most truly yours, J. M. Peebles, M. D."

Eld. Miles Grant, the distinguished evangelist of Boston, Mass., who recently so enthusiastically indorsed the Health-Pamphlet, now writes from Belfast, Ireland, Jan. 17th:

"Dear Dr. Hall,—* * * I have given several of the pamphlets I bought of you to poor preachers. One came in the next morning after the first trial of the treatment and almost danced for joy because of the benefits he had received. Another exclaimed 'It is *wonderful!*' A devoted Christian lady of Adrian, Mich., to whom I commended the use of your treatment writes me that it is worth ten times the price she paid for it, and adds that she has no fears of sick headache now; that she has not felt so well for years; that she can do all her work in the morning and then travel all over the city visiting the sick and then attending meeting in the evening without feeling a bit tired. * * * One minister from Salem, Mass., writes me: 'I am more than pleased with the result. I was not able to walk down-town from where I live (about a mile) when I commenced the treatment. Now, after working hard in my study during the forenoon, I can walk four or five miles making calls. You can quote me right and left in favor of Dr. Hall's treatment. I would not be without it if its cost had been $50 instead of $4.' I am using your health preserver regularly three times a week, and never before felt so fortified against disease. I have a continuous freshness of feeling that is truly delightful.

"Your Bro. in Christ, Miles Grant."

Rev. S. C. Orchard, Luling, Tex., writes Feb. 14th:

Dr. A. Wilford Hall,—* * * I have not found a single person dissatisfied with your hygienic treatment who has given it a trial, and there are many such in this vicinity. For my own part I would not give up the treatment and bind myself never again to use it for one-half of the State of Texas. * * *

"Yours truly, S. C. Orchard."

Harriet C. L. Hopkins, M. D., Phil., Pa., writes, Jan. 22:

"Dr. Hall, Dear Sir,—* * * The numerous orders for pamphlets you have received through my personal recommendations to friends, will somewhat assure as to the benefit I have derived from your treatment. After less than three months' use my gouty rheumatism is nearly routed. After practising medicine twenty-one years and realizing the utter insufficiency of drugs to relieve, much less cure, many of the common ills that afflict humanity, I hail with heartfelt gratitude any new discovery that will tend to mitigate human sufferings. I wish I were a Vanderbilt, I would give you a round million for the discovery and would then publish it to the world. Very truly yours,

"Harriet C. L. Hopkins."

Rev. Wm. Newman, Glen Cove, Tex., writes, Jan. 28:

"Dr. Hall,—* * * I can safely say that during forty years of experience and observation among the afflicted, I have never known the equal of your simple remedy for the cure and prevention of disease. My wife has suffered severely from sick headache for many years, and is now at the change of life, and but for this invaluable treatment I do not know what we should have done. My daughter, now twelve years old, has been suffering from catarrh for five years, becoming so bad at times that we have despaired of her life. We had her tonsils cut out, but to no purpose. Your treatment came just in time. Since using it she has so far recovered as to be able to go to school regularly, in the meantime she has gained twenty pounds in flesh, and is as good as well, thanks to this priceless discovery. You are at liberty to use this unqualified indorsement in any way you choose.

"Gratefully and fraternally, G. W. Newman."

An intelligent lady's opinion: Mrs. Wm. A. Olney, of Friend, Col., writes, Dec. 26:

"Dr. Hall,—My daughter who lives in Chicago, heard of your Health-Pamphlet, purchased a copy, and sent it to me. I saw at a glance that you had struck the very thing I needed. I have of late become greatly prejudiced against drug-medication, and have only used medicine as a last resort; therefore was well prepared mentally for anything that would take its place, as I have studied medicine for years and have attended several courses of medical lectures. I confess that from all my reading and observation I have never seen anything embodying so much reason and common sense as your little work on hygiene. My chief afflictions for the last ten years have been rheumatism, constipation and weakness of nerves. * * * I have been taking your remedy but one month; the rheumatism left me after the third treatment, and I am now gaining rapidly in every respect, not having felt so well for many years. You have my sincere gratitude for the benefit I have derived from your discovery.

"Respectfully yours, Mrs. Wm. A. Olney."

Rev. W. P. Hall, of Point Peninsula, N.Y., writes:

"Dr. Hall, Dear Sir,—I have just answered a letter from Utah Territory. A friend wished to know if my testimonial was given correctly in the MICROCOSM? I answered yes; that it was true to the letter, and that my indorsement was nowhere near as strong as I could now truthfully make it. I told him that your treatment had cured me of rheumatism, kidney disease, catarrh and other complications of disease, so that from crutches and helplessness, I am now as well and free from disease as fifty years ago. Some have accused me of being a relative of yours and of trying to favor you. This is not true, except so many generations back that it can not be traced. And further, I have no financial interest in the business, and only desire to make the treatment known to benefit suffering humanity. I have already received and answered more than sixty letters from all parts of the country, re affirming the truth of my testimonial, and I will gladly answer a hundred times sixty if thereby I can induce sufferers to try your treatment, as I declare before God my unfaltering conviction, both from my own experience and observation in numerous cases, that your discovery, if properly used and persevered in, will cure any form of curable illness flesh is heir to. I am ready now to proclaim to all men unreservedly that your treatment as set forth in your Health-Pamphlet and without drugs of any kind is the healing balm for the afflicted that is capable of supplying health to every suffering son and daughter of Adam. Let me know how I can serve you, and command me freely. Your friend gratefully,

"W. P. Hall."

Rev. Dr. John Crawford, a prominent Baptist minister at St. Thomas, N. Dak., writes, Feb. 21st:

"Dr. Hall,—I have had your Health-Pamphlet since it was first issued, and have given it a conscientious test, having used it for weeks at a time, and then omitted it for awhile to test its real and varied merits. I can now, after such a test, unqualifiedly declare in favor of your treatment as of great value, both in sickness and health. During a recent blizzard I was exposed, and for a week my health was seriously affected—I applied your remedy, and its first application completely restored me to my usual good health. You are at liberty to use this voluntary testimonial in any way you please, as it is the first and only indorsement of a remedy I have ever given, though often solicited to do so.

"I remain, dear doctor, fraternally yours,

"John Crawford."

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.

A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
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THE MOTION-THEORIES OF SCIENCE; EVOLUTION, ETC., WITH REMARKS BY THE EDITOR.

BY R. BEWLEY, M. D.

December 13, 1889.

Editor of the MICROCOSM.

Dear Sir,—Through the courtesy of a friend, I have seen the last five numbers of the MICROCOSM, and have derived much pleasure from the masterly way in which you demolish the current theories of physical science. I have never gone deeply into the wave-theories; because, at the outset, they did not appeal to my understanding. Perhaps Substantialism may be more satisfactory; but at present I do not know enough about it to entitle me to give any opinion.

Will you allow me to state what has always been a difficulty to me with respect to light, in the hope that you, or some of your correspondents, may help me to a better understanding of the matter. In a room which is illuminated by a single lamp or gas flame, we have rays of light issuing from the flame in every direction, which rays strike every point on the surface of the walls, ceiling and floor of the room, and are reflected from each of these points in every possible direction. Now I never could understand how these innumerable rays, waves, vibrations, undulations, or whatever is the right term to use, could exist in the room without getting badly mixed, and yet vision is distinct in all parts of the room. But in addition to the light-motions there may be sound-vibrations, rays of radient heat, motion of air caused by convection, and currents of electricity, all actively at work at the same time. Now I think any one who says he understands how all these different motions take place, or says he believes that they do, should be the last to cry "impossible" to any statement, however improbable it may appear. If light, heat, sound, etc., are so many "immaterial substances," or different manifestations of one such substance, which is in no way amenable to the laws which appear to govern ordinary matter, the whole difficulty is removed; but still the inquiring human mind would not be satisfied with that assumption without inquiring how the various phenomena were produced. Will Substantialism answer this inquiry?

It is curious how the exclusive study of one branch of knowledge contracts a man. He may be an excellent lecturer, an expert experimentalist and an acute observer, and he may render good service to mankind by discovering and demonstrating hitherto unknown facts of Nature; but, after a time, if he has constructed a theory to fit his facts he is apt to become so bound up in it as to be unable to admit the truth of any other fact that does not harmonize with his ideas—he then ceases to be a philosopher and becomes a crank. I think human knowledge is like a serial publication—it comes out in daily, weekly and yearly numbers; but the work is not nearly complete yet.

Don't you think the heads of "the Church" are unduly frightened at such scientific atheists as Tyndall? Surely the Almighty is able to take care of them and himself, too. Take the doctrine of evolution, for instance. I should suppose the existence of matter, endowed with the power of evolving something different from itself, would necessitate the existence of a creator and preserver, and whether we are evolved from a monkey, a cabbage, or anything else, I should think the final result, man, redounds as much to the Creator's honor and glory as if he was "made out of clay and set up against the palins to dry," as the colored preacher explained the matter.

Philadelphia, Pa.

REMARKS BY THE EDITOR.

Dr. Bewley is generally correct in his ideas, and for one who has such a short acquaintance with the principles of Substantialism comes more nearly hitting the bull's eye in his objections to the motion-theories of the physical forces than do many who have been studying the subject for years.

But the doctor should read up on the Darwinian evolution discussion, and look into the inconsistency of supposing this method of producing men and animals as we now find them in lieu of the direct and miraculous creation theory. To this end we would suggest that he read the last five chapters of the "Problem of Human Life," in which the probabilities of the truth of that round-about system of peopling the earth are fully discussed.

We have not space here to enter elaborately into that discussion, but would simply remark, as we have frequently done before, that the endowment of matter with power to evolve man out of a monkey, the monkey out of a tortoise, the tortoise out of an oyster, and the oyster out of a lump of dirt, requires just as positive miraculous interpositions on the part of God as to have made each link in the chain complete by a direct act of creation. Nothing, as we have repeatedly shown, is saved by such theistic evolution as Dr. Bewley suggests, in the way of miraculous interventions on the part of an intelligent and omnipotent Creator,

by a system of the gradual development of man from the lower animals, and thus of the transformation of all living species from those below them in the scale of being.

According to Darwin, the profoundest reasoner on the subject that ever wrote, it takes tens of thousands of slight modifications of struction by natural selection, taking advantage of corresponding slight variations and through enormous periods of time, before the most trifling specific change in a race of animals can be effected. Now if theistic evolution be true, or if it be attempted to redeem Darwinian evolution from downright atheistic materialism, it requires the miraculous intervention of the Creator in each of these innumerable variations to assure their modifying influence in the right specific direction, as much so as if God had made the first pair of elephants out of a heap of sand stones.

To our mind it exhibits a greater display of divine power and is a grander exhibition of infinite wisdom for God to have made man by a single miraculous fiat, as Moses gives it, than to have built him up by an infinite succession of stages from the fish and the mollusk, and by such a tedious and imperceptible process that even Gabriel, had he been watching it for 400,000,000 years would not have been able to detect anything miraculous about it, or even to suppose that God personally had anything to do with it. Yet if theistic evolution be the solution of man's present existence instead of the designless materialism as set forth in Darwin's "Origin of Species," God had to work out countless millions of these same slight but direct miracles in man's progress from the asidian, each one of which, imperceptibly small, was as really a miraculous fiat as was that of the Mosaic account of placing Adam in the garden of Eden in a single day.

Thus we see that theistic evolutionists, in their attempts to escape Darwinian materialism and at the same time to escape the charge of involving the Deity in so many miraculous creations as would be necessary to form the different animal and vegetable species by direct creative acts, absolutely involve themselves in countless millions of equally direct miracles for each and every specific form that has ever appeared on this earth.

If, on the contrary, Darwin's view of a law of designless natural selection be adopted to avoid miraculous intervention after the first few simple forms had been created as he assumes, it must involve the establishment of a natural law at the time of the creation of these simple forms, by which matter itself was endowed with the inherent power of variation and selection, in such directions as to achieve all the intelligent results that might reasonably be expected to come from the wisest personal supervision on the part of an infinite designer. To suppose such power of variation and selection conferred upon lifeless matter, or with life consisting only of the motions of its particles, and then left forever to itself to carry on its own intelligent processes, would necessarily involve the present continuance of evolution and the constant production of new forms and species as much, or even more so now than in former ages, since there are more specific forms now than formerly upon which this perpetual law of variation and selection can act. Why, then, do we not now see new species coming into life? As no sign of such power in matter has ever been witnessed by man it is but fair to infer that no such inherent power, without the direct supervision of intelligence ever existed in matter.

The truth is, the Christian minister who adopts Darwinian evolution, with theistic supervision added to keep within it the pretense of religious faith, necessarily repudiates the scriptual account of the creation of man as the most puerile fable and baseless fiction ever written; and if the creation of man and woman, as given in Genesis and indorsed by Paul, was a fable, then the fall of man was a pure myth, growing out of such romantic creation; his required redemption was another myth, growing out of the cunning plot of the fall laid in the Garden of Eden; consequently all necessity of an atonement is a preposterous sham, and the concomitant legend of a crucified Redeemer as a propitiatory sacrifice for sin is but a superstitious fraud imposed upon the religious credulity of mankind.

Clearly if there were no real Garden of Eden, no literal forbidden fruit and temptation, and no actual transgression and expulsion from Eden, as evolution demonstrates, if it be true, then there was no fall of man to be atoned for, no necessity for a Redeemer or Savior, and all our hopes of a future life based on the teachings of Christianity are a fabrication which has grown out of ignorance, fiction and fraud.

How such clergymen as Prof. Witherow, of the Southern Presbyterian Church, Joseph Cook, of Boston, President McCosh, of Princeton, or the late Henry Ward Beecher could have accepted evolution, even in its most theistic sense, thus repudiating the account of the creation of man, as set forth in Genesis, and still graphically prating about a pretended Redeemer and Savior in the person, death and resurrection of Jesus Christ, and shed tears of joy over the hope of a future life for our departed friends, all growing out of the fall in Eden, and the bogus consequent redemption and atonement described in the New Testament, is a mystery which nothing short of the absence of all logic and consecutive common sense can explain.

Convince us of the truth of man's evolution from the monkey or from any other lower form of animal life, and at once we say goodbye to all hope of a hereafter for humanity based on Scripture evidence. Convince us that we developed from the physical and mental structure of the baboon, and at once we shall feel an inherent right as much to repudiate all responsibility for sin against God as has the baboon or his great grandfather, the oyster. Convince us of our lineal descent from and blood relationship to lower animals, and at once you make of us a conscienceless cannibal, for we can see no more moral impropriety in eating our brother man than in eating his blood relative, the ox, the turkey, or the striped bass. We say to the clergy, stop where you are and retrace your steps before it is too late.

THE ANGELS.

BY J. I. SWANDER, D. D.

Dr. Hall has very properly intimated that more brevity in our articles would tend to bring them within the limited space afforded by the MICROCOSM. We have received the gentle hint in the spirit of ready obedience, and in order to bring this paper within the com-

pass of the space allowed we have selected a subject concerning which we know but little. In doing so we were not, however, unmindful of the fact that men are sometimes prone to multiply their words in exact proportion to their ignorance of the topic discussed. Thus the materialists are tempted to write voluminously about that indispensible little molecule which they have never seen and whose imaginary motion with its astounding velocity gives propulsion to the whole machinery of the visible universe. So too, upon the other hand, some of the scholastic philosophers in the middle ages exhausted the patience of the world by the jargonic verbosity of their attempts to demonstrate just how many spirits could dance upon the point of a needle without crowding the outer circles of the cotillion from the platform.

Angelology is, however, a branch of science, which will not permit itself to be crowded back into the realm of absolute mystery. It falls within the proper scope of human investigation. Indeed, if man has any reason whatever to suppose that there is an elder brother belonging to "the whole family in heaven," common family pride should lead us to institute an inquiry in that direction. Even if the Scriptures had kept silent as to the existence of an angelic order of beings, it would still be reasonable for man to push his inquiry in the light of science, and along the assumed line of an ascending scale of finite beings. It will be conceded on all hands that if there be such an ascending series of creatures, the gradation must of organic necessity culminate in some order of rational and personal intelligence. To assert that no created being ranks higher than man, would be to render the verdict before the hearing of all testimony obtainable and admissible in the case. Right reason rather suggests that there are spirits a little higher than man. Such concession helps to widen the field and clear our vision as we seek to soar away and behold with wonder and admiration the apex of all finite things.

Aside from the light of revelation, it would be a difficult task to show in just what respect the angels are superior to men; and yet it should not be regarded as without reason to assume that such superiority consists, at least partially, in the absence of all crude material substance from the angelic constitution. In some other respects man may be possessed of superior possibilities, as a consequence of the superior majesty in the essential elements of his nature. According to the record man was created in the image of God, and there is no evidence at hand in either reason or revelation that any other order of creatures were ever enriched with such wealth or endowed with such dignity. Neither does it follow that because man is now, by an admixture of matter with the immaterial substance of his being, a little lower than the angels that he is always of necessity to remain in this inferior relation to his elder brother. The very opposite hypothesis would seem to be the more rational. Who will dare to say that man's incorporation of and his experience with matter here was not designed by the great Father of all to prepare him to "judge angels" hereafter? It is at least safe to say that man's dual nature makes his possibilities greater than they otherwise would be. He was thus constituted capable of arising on the stepping-stone of his more material self to higher things.

At this point in our inquiry concerning both the fact and mode of angelic existence we find ourselves confronted with the question of visibility. May angels be seen? If so, in what sense and through what organ of vision? We fearlessly lay down the statement that, according to the common meaning of language, angels are invisible. We follow this declaration with the apparently self-destructive proposition that the invisible may be seen, and that neither Christianity nor science can endure without a clear view or perception of some invisible things.

Even Prof. Tyndall says that "scientific education ought to teach us to see the invisible." But after making the above true statement, the professor immediately flies off the handle of truth, and passes on a tangential rampage through the kingdom and power and glory of his productive imagination. He tells his pupils and his readers "to look at the atoms of matter in motion, and follow them forth into the world of senses, and see them there integrate themselves into natural phenomena." Right here the facts of nature arise with a thundering protest. They refuse to be thus falsified. The Substantial Philosophy joins issue with Tyndall and his co-materialists. Matter never "integrates itself into phenomena." It neither makes motion nor becomes motion. Just as little does it "enter the world of senses," and become a sensation, as the wave-theory of sound teaches when such construction is its most convenient and plausible form of jugglery.

Substantialism distinguishes between two distinct realms of being. The one is the realm of material substance; the other of substance immaterial. Matter can be seen through the sensuous organ of sight. Even the smallest atom of matter is not constitutionally invisible to the eye. It only remains unseen because the eye lacks constitutional power to bring such atom within the compass of sensuous view. On the other hand, immaterial things are constitutionally invisible through the mere sensuous organ of sight. They can not be magnified so as to bring them within the angle of sensuous vision. Neither can the eye of the body be so radically adjusted or so sufficiently strengthened as to enable it to take a perception of that which belongs to the immaterial realm of being.

Coming back to a more direct relation with our subject, we assert that angels belong to the immaterial world, and are, therefore, constitutionally invisible to man as to the sensuous side of his being. Their presence or absence has nothing to do with the question of their invisibility. Has man the organ through which to see angels, and are the powers of such organ commonly or ordinarily developed into actual *vision*? These are the questions that lead us to the pearly portals of the subject now under discussion.

At this point a hint from the inspired record of history may be helpful. See 2 Kings vi., 17: The Lord opened the servant's eyes. In what sense? 1. He did not awaken him out of sleep, for he had "risen early and gone forth." 2. The Lord did not operate as an oculist upon the servant's sensuous organs of vision, for through them he was already able to see the material horses and chariots of Syria. 3. Neither did the Lord readjust the lenses of the servant's eyes so as to change the angle of vision in such a way as to enable him to see

objects in the far-away distance. Such treatment the servant did not need, for the "horses and chariots of fire" were "round about" him. Instead of a new visual angle, there was an opening of a new visual organ, which he already had in possibility. It was the eye of his own immaterial self. This inward organ of the inner man the Lord opened, enabling the servant to see that "the chariots of God are twenty thousand, even thousands of angels."

We repeat, therefore, that angels are neither visible by virtue of their nearness, nor invisible on account of their distance. They belong to the immaterial realm of God's great and diversiformed universe. The same is true of all immaterial substances, whether animate or inanimate, rational or irrational, personal or impersonal, divine or human.

The high priests and prophets of materialism, like Balaam of old, do not recognize the existence of this immaterial realm. Their eyes are kept closed by prejudice, the divinations of the Midianites, and the rich rewards that Balak still offers to those who are willing to sell themselves to ignore the truth of God and to curse the rising cause of Israel. But it will not alway continue so. Some of their once miserable asses have decided to be asses no longer. They see the angel of the Lord standing in the way that leads to "the high places of Baal." The way is already getting narrow, as the issue becomes more clearly defined. Balaam's foot will soon be crushed against the wall of everlasting truth. Then look out for a paroxism of rage. If he still fails to see the angel, he will at least see a whole constellation of shooting stars.

For those who are willing to know the way of the Lord as he reveals himself in his word and works there is no such blindness. The distinction between two grand realms of being lies at the foundation of all proper and legitimate philosophic research. In the light of the Substantial Philosophy this distinction is clearly made, consistently held and logically explained. Under this view there is plenty of room for all proper principalities and powers. Passing upward from the chemical domain through every intermediate order of substantial entities in God's great handiwork, the devout student has a royal road to that kingdom which ruleth over all, and in which he will find an innumerable company of angels, and the mediator or "angel of the covenant" in whom there is absolute being, personal truth, supreme goodness and superlative beauty.

Fremont, Ohio.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 3.

Passing upwards from the Laurentian series of heavy beds, we meet with strata kindred in composition, but strikingly different in appearance, and with constantly decreasing specific gravity. Among these beds there are two, and in many places three, well-defined geologic boundaries, for the origin of which I am compelled to look out into the earth's annular system. They are annular in time and in position, and strikingly so in character. In addition to the regular gradation in gravity, there is the clearest proof that these were abrupt and sweeping and universal changes in the world-oceans of those periods. So that, before we cross the confines of the silurian beds, we find the faunæ of the seas universally changed again and again. For these sweeping world-changes of the oceans and their accompanying life-forms, there must have been *vast additions* of water. Nothing else, I am persuaded, could accomplish it, and in vain may we look for a competent source of water supply, if that source was not in the world-rings of those periods, the grand downfalls of whose vapors increased the oceans in depth and volume, and forming new environments, started new life on a new plane.

The old and primitive Laurentian waters, with their giant protogeans, had their own age of prosperity, and the cause that produced them passed away for ever, and new scenes, the result of new environments, come before us. But new life-forms could not have come into existence except in a new ocean; and a new ocean must have come from on high. But an ocean of vapors could not have existed on high unless it revolved about the earth.

Here, then, on the boundaries of paleozoic life we are looking upon a page wholly distinct from all others that precede it; and as we enter the broad and marvelous prospect of the silurian the scenes intensify, and the ocean with new boundaries abounds with new life. The base of the silurian gives, everywhere, the most indubitable evidence of violent rushing floods. In our country the Potsdam sand, and its correlatives in other lands, could not have come from older beds. They are *new* and *unworn* materials that settled down as a stupendous dust or sand shower from the earth-rings, involving pebbles and other worn and older materials, which we find included.

As we move upward in the silurian we pass through different beds, and constantly come in contact with new forms of life, showing that the oceans were constantly changing, pointing to new additions of water.

In the silurian series there are two grand divisions of life-forms. Near the middle is a *sudden, almost complete* and *universal*, termination of lower silurian organic forms, while in the upper series the forms are almost wholly new. Some terrific revulsion swept whole dynasties of oceanic organisms from existence, and some new environments planted new life-germs, and lifted the world upon a higher plane.

No philosophic geologist will for a moment doubt that in the very midst of the silurian age, the ocean was universally changed. The new forms could not have lived in the old waters. The old forms passed away as with a stroke, which could not have occurred if the ocean had not been suddenly changed in condition, and what but sudden and vast additions could have done it; just such additions as Jupiter's belts must add to his oceans, as they fall? But the most overwhelming testimony of the silurian beds is the character of the rock-beds themselves. As a geologist I unhesitatingly aver that the greater part of the silurian beds were not derived from pre-existing rocks. Take, for instance, the great continental lime-beds of both the upper and the lower silurians, so far as the eye of the geologist has penetrated: these pre-existing lime-beds do not exist, neither in quantities nor in kind. Here there are limited magnesian lime-beds below, but the lime-beds of the lower silurian, nearest to these older beds, *are not magnesian*, but almost wholely lime carbonates; and what is still more

remarkable, on an average of more than a thousand feet above these carbonate beds, in the upper silurian, are vast reaches of magnesian lime-beds in many parts of the earth. Thus, after the lower lime-beds of the oldest rocks were covered up—sealed away by many thousands of feet of impervious beds—the silurian ocean was twice filled with lime dust from on high.

In the great primitive earth-laboratory these elements commingled, and continued just as they would to-day under the direction of the chemist. They went up into the primeval, and then into the earth-rings, and when those rings swung from their anchorage they descended to the earth, from whence they had come, and found a resting place in the bottoms of many seas. I know it is generally claimed that these lime-beds are of animal origin. The idea is unphilosophic. The lime had to exist in the oceanic waters before a lime-secreting animal could exist there. The living environment preceded the organism that fed upon it, so that the animal does not in the remotest sense point to the origin of the lime.

Now, it is plain that if this lime had been obtained from pre-existing beds it must have been in the ocean during all the countless ages preceding the silurian. Then why did not the animals make the lime-beds ages before? Why did they come upon the scene during certain definite periods and pass away when the lime was deposited?

Now the question is very timely: Where is the limey product of the earth's primitive fires? We are simply forced to admit that somewhere in the aqueous beds of the earth that fire-born product *must be found!* The earth could not exist for a moment in a molten condition without forming it, no more than the sun, or sirius or aldebaren.

Admitting, then, that the products of the great world-furnace, gravitated into an annular system, and finally back to the earth, the whole science of geology becomes so readily explained, that I marvel that geologists have not long since seen it. If the waters of the silurian age were peculiarly a habitat of mollusks, it would have been so for ever if they had not been changed. If those waters had been fitted for fishes, they would have been an ocean of fishes. But we do not go very far out of the silurian till we meet the pioneers of the "fishy sea." The ocean became a peculiar home of vertebrates. Then the old ocean ceased to exist, and a new one rolled by, which simply means a new augmentation of waters. We also find abundant evidence that the oceans were deeper than before. The earlier oceans were *shallow*, as universally admitted. The Devonian waters were *universal* and *deep*. These repeated changes and increase of oceans affirm the truth of the annular idea of world evolution.

We have never before been able to know why there ever was a Laurentian, Huronian, Silurian or Devonian age. If there never had been rings about the earth, there never had been a succession of ages.

Elsinore, Cal.

THE ORIGIN AND SOURCE OF MATTER.

BY REV. F. HAMLIN, D. D., PH. D.

With remarks by the Editor.

With the majority of thinking men it is unnecessary to stop in the consideration of this question to prove that matter is not eternal. If it be insisted that matter always was, and is the cause of all things, it remains to be shown how the force originated which moves and shapes it, or if it is claimed that both were from eternity we wish to be informed how matter hitherto lawless, became thus subject to law without the existence of a lawmaker or executor, who may perhaps have been the originator of what is thus moved and shaped. Indeed, all law presupposes pre-existing intelligent organization; and intelligence presupposes personality which in this case must have been omnipresent, and that is one characteristic of infinite personality. That present being necessitates eternal being of some kind is evident; for, as a noted author has well said, "if at any time there had been pure non-existence, existence could never have been a fact;" but that the eternally existent was mere matter or force is disproved by the fact that "that which was without mind could not evolve an orderly cosmos which implies mind." Nor can we admit that matter originated from or even had its source in nothing. There are those (and many they are) who are ready to insist that while matter had its origin in God, it had its source in nothing; that is to say, that while God is the originator or cause of its existence *as matter*, its source of being was really the will of God, and nothing more. We must remember that many universal beliefs have been founded in error, and that therefore if the belief of "creation from nothing" were universal that fact would not prove the belief true. Universal beliefs "prove nothing but their own existence." There are those who talk as glibly about the "creation of a world out of nothing," as though it were as easy to understand as the making of a garment from some well-known fabric. The truth is, that to us it is as reasonable to talk of a world originating itself, as of any being bringing it into being by a mere word of mouth. In the former case we lack a cause, and propose that *nothing* shall become a creator; while in the latter we assume that from that which has no existence, something shall be made. Indeed, we can not conceive being to appear from nothing either as to its cause or as to its source. Therefore we hold that unless there is some well-grounded reason in the inspired word for holding such a belief we have no right to assume that to be the case. I know we are told that "we find in this cosmic order not simply matter in which an ordering mind is displayed, but an ordering mind of such inconceivable power that creation itself [I suppose the author means from nothing] might not be an incredible thing;" but I submit that if any more plausible theory of the origin or source of matter can be found, based either in reason or in the philology of scripture, we should accept it. Nor can it be truthfully said that "the power which is adequate to raise into existence a mind, and which has power to handle matter, could originate the stuff itself;" for, in the former case, that of raising "into existence mind," there is no real creation from nothing, but an evolution from the essence of God himself; and therefore the argu-

ment from analogy would point to some similar origination of matter. There is great force in the language of Bishop Foster when he says in his "Theism," "Effect tells to the extent of its contents what is in the cause" (pp. 360); and "when God is said to create out of nothing, we construe this to thought, by supposing that he evolved existence out of himself." And that latter remark we shall see means reasonably more than we are as a rule ready at first thought to grant. Whence then came the primitive universal substance from which body or matter was evolved? What information, if any, does the Bible give upon this important question? It teaches among other things that the creation was a formation, or moulding of that which *already was;* and therefore not a speaking into being from nothing. Dr. Terry in his "Hermeneutics" (p. 548) says, "the word בָּרָא Bara to create does not according to Hebrew *usus loquendi* signify the original production of the material or substance of that which is brought into being. This is merely the notion of some writers. In Genesis i., 21, the word is applied to the bringing forth of creatures which are expressly said to have been produced from the waters, and in verse 27 it is used of man who was formed in part of the dust of the ground (comp. Gen. v., 2). According to both Gesenius and Fürst, the radical signification of ברא bara is that of cutting, carving and separating. We may therefore properly understand it, in Gen. i., 1, as denoting the forming or construction, out of pre-existing material, of the heavens and the land contemplated in the biblical narrative of "the beginning." That this Hebrew verb does not mean creation from nothing appears if we consider that in Isaiah xlv., 7, where we read, "I form the light and create darkness; I make peace and create evil," we can not possibly put such a construction on it without making the passage meaningless; for neither darkness nor evil are entities, and can not therefore be productions of something from nothing. The truth is that "to form, to *produce*, and to carve" are the real translations of the word; and the two verbs are used not because they here have a different meaning one from the other as regards origin, but as Lange says, speaking of the word here translated "formed;" it indicates as compared with the word translated "create," that God "gave it (light) its greater variety or *beauty of form.*" In the light of this latter statement we may with some degree of interest consider the words of an author before quoted to the effect that "The proof of God's existence would not in the least be affected if we were compelled to admit that matter itself was eternal. The eternity of matter admitted or made out does not at all effect theism." And we may add, nor would it effect theism if it were made out that that from which matter was at first formed, was the eternal environment of God. Now as creation was (as we have seen) not "creation from nothing" but formation from something, we must look for that something either in the essence or the environment of God, and possibly in this search we may find a new meaning attaching to the words of the great Apostle to the Gentiles "Because OUT of HIM, and through him, and for him are all things." Of this we are certain; "that every cause carries in itself the entire effect; for as the effect can have nothing in it which it does not derive from its cause, it must then have been in the cause;" and as all the forces of nature must have been at first in some form in the giver of them, reason would suggest that that in which and through which these forces reveal themselves, namely, matter, must in some way have originated from him or his environment. Somehow the grounds of the universe must have been in that which evolved it. What then was there present with God when as yet he was alone in the awful depths of eternity, with the sublimities of the universe present with him only as a thought, and a purpose? Undoubtedly Light was from eternity his natural environment. The Old Testament revelations of God were frequently accompanied by this; not alone to Israel in her journeyings, and to Moses when in presence of God's glory his face shone (קָרַן—horned) rays shot out from it like horns, but as well to Ezekiel when the divine glory had the "appearance of fire and it had brightness round about." And in the New Testament how forcibly does this thought impress us as Jesus shines under the splendors of the transfiguration hour; or, as John on Patmos declares of the "City of God," that the "Lamb himself is the light of it." And in view of this thought, that light was the eternal environment of God, the natural efflorescence of his glory as thought was of his mind, we see that in Genesis we have in the reference to the coming of light to this world, and the first illumination of the earth, the presentation of the fact of the birth of light generally *in this world*, without declaring thereby that the date of the genesis of the earth's light is also the genesis of light *universally;* or, in other words, that light was not an emanation from nothing, but from God himself. Nor must we be charged with irreverence at this point in making matter a part of God, and so God himself; for that reasoning would make every man a god. For if soul finite may be taken from the infinite and yet not be divine, so may light, which is but the enswathement of God. And if it be insisted that light is but the symbol of the Divine, the mere temporary means of revealing his presence on Horeb or on Patmos, we have only to reply that the proof of that statement is wanting. Even the universality of such a belief would render it none the less likely to be false.

And that light is the original from which all matter is created seems to us a more acceptable view than that which teaches the "creation of matter out of the force elements of nature, by an infinite personal power," not alone because it is more simple and reasonable, but also because it leaves the gulf infinite between force and matter; and thus prevents infidelity saying that because other force is transmuted into matter therefore soul force may at last do the same, and thus make an argument against soul immortality; while to posit the origin of matter in light leaves us open to no such attacks. While we "can not conceive the necessity or propriety of gross matter in any form as a part of God's environment without its being, as certainly it was not, a part of his own substantial existence," we can conceive of, and have revealed to us as a fact, light "as eternally present with deity; constituting his environment or external being," and it may be the agency and the instrumentality of his power. How easy for God to take this immaterial substance,

and "by infi nite synthesis construct matter by an abrogation of its immaterial properties; and by giving to it the new properties of inertia, tangibility, ponderosity, etc. Now with this statement of the probable origin of matter, it remains to be considered whether light is after all an entity—a real thing, or a mere "mode of motion," as some scientists would have us believe. On the one hand, we are far from admitting that the "mode of motion," or undulatory theory of light is true; for while Jevons espouses it and declared that "by its power of prevision the truth of the undulatory theory of light has been conspicuously proved (pp. 538, Principles of Science), he is also compelled to admit that even Newton's corpuscular theory of light was not rejected on account of its absurdity or inconceivability, *for in these respects it is far superior to the undulatory theory.*" —(pp. 667). Now a theory, but by such absurdity, a theory which is compelled to assume the existence of an "absolutely solid" luminiferous ether, having a pressure per square inch of seventeen billions of pounds; which insists, according to Tyndall that 699,000,000,000,000 of material "jelly waves" must enter the eye and dash against the retina in one second of time in order to produce the sensation of violet light; thus driving mechanically this optic membrane to and fro, the same almost inconceivable number of times in a second, and compelling it to travel backward and forth an aggregate distance of more than 10,000 miles in a second—an operation which a membrane made of steel could not stand;—a theory, I say, which makes such demands as this upon the membrane of the eye, must not talk about the putting out of eyes by the emission of material corpuscles. On the other hand, we do not accept the corpuscular theory of Newton. The idea that any material particle, however diminutive, could enter the eye at the enormous velocity of light without injury to that delicate organ, is too absurd for patient consideration. We hold, however, that light is none the less an entity because it is not material and visible; and that as an immaterial substance it exists and acts as can rays of magnetism or gravitation, and thus enter the eye without injuring it. Newton's discovery that the action of light was measurably in harmony with the first law of motion, by which a moving particle moves in a straight line when undisturbed by extraneous forces; that under certain conditions its angles of incidence and reflection will be equal; and that his theory gave a plausable explanation of the inflection of light as discovered by Grimaldi; all these things pointed unmistakably to the fact that although not material in its nature it was nevertheless substantial and an entity. Then, too, the fact that light is stopped almost instantaneously by opaque substances, extreme as its velocity is; and is to a considerable extent absorbed or deflected by transparent ones; the fact that in an experiment by Prof. Bell, "when intermittent beams of light were thrown upon an instrument designed for the purpose," the sound was so loud as to be actually painful to the ear placed closely against the end of the hearing tube; the chemical effect upon a metallic plate, changing it into what we call a daguerreotype, and numerous other phenomena, compel the unbiased thinker to believe it an entity. We can not wonder that when Dr. McCosh considered how the undivided beam of light fell on the green leaves of the plant, and saw the green reflected and the red absorbed only to come out in russet bark, or in red flower or berry, he declared that he fondly "clung to the idea that sooner or later color will be found by physical investigation to be a reality in every material object." Thus with the Hebrew Scriptures teaching us that creation was but formation, production, shaping or moulding from that which already existed as the eternal environment of God; and with the Substantial Philosophy revealing to us the true nature of light, we are not entirely "at sea" concerning the possible origin of matter. But in the rock rose with its yellow petals melodizing into crimson and striped with purple, as well as in the lovely "forget-me-not," with its reddish blue and its yellow orange; we behold but the threads of that garment which from the eternities lay about the shoulders of the Universal King; and from which at will he shaped and moulded "the things that do appear."

Dr. M. R. Vincent, in his "Word Studies," commenting on 1st John, i., 5, where we read "God is light" says, "The expression is *not a metaphor.*" And he quotes Ebhard as declaring that "*All that we are accustomed to term light in the domain of the creature* with a PHYSICAL or metaphysical meaning is only an effluence of that one and only primitive light which appears in the nature of God." And then Vincent adds, "Radiating from him, it is diffused through the *universe* as a *principle of life.*"

REMARKS BY THE EDITOR.

In the February number of the MICROCOSM we assumed in our reply to Mr. Johnson that the substantial but immaterial force-element of nature, as the fountain from which all forms or manifestations of the physical forces were derived, must have been the eternal environment of the deity from which, rather than from nothing, he formed matter and all material things.

We assumed that the infinite process of thus forming material things was rationally explicable by the abrogation of immaterial properties and the substitution of properties belonging to matter, and that such process was by no means inconceivable since man at will can totally destroy certain properties in matter by aid of the natural forces, and thereby substitute other properties which before were absent.

Our excellent contributor seems to adopt this view, except that he thinks he has made an improvement and sees an advantage in rejecting the force-element or fountain from which all force is derived as the eternal environment of the Creator out of which matter was formed, and adopting in its stead a single manifestation of force—that of *light*—in its stead. A friendly word of criticism here may not be out of place.

How the creation of matter out of light "leaves the gulf infinite between force and matter," as the doctor assumes, any more than to have used some other form of force or even the fountain of all force, is a problem we fail to solve. *Light* being one form of the substantial force-element of nature, would seem to span "the gulf between force and matter" in the hands of the Infinite just as completely as if he had used heat, electricity, gravitation, or cohesion—other forms of the same force-element and which could just as readily have been included in God's eternal and substantial environment, and still matter have been exclu-

till it was created by the infinite process supposed.

How "it is more simple and reasonable" to select one form of physical force in preference to the elemental fountain in which all force primordially existed as the supposed substantial but immaterial environment of the deity, as the probable substance out of which to form matter, the doctor gives us no good and sufficient reason.

The doctor further assumes that this view of the selection of one form of physical force—*light*—as the substance out of which the Creator formed the material universe, would stop the mouths of infidels who might say, if the force-element could be changed into matter then soul-force and mind-force could be changed in like manner, thus upsetting the doctrine of human immortality, Yet, how the selection of one form of force in preference to another, or in preference to the force-element as a basis for the creation of matter, could overturn such objection of infidelity, the writer fails to comprehend.

Surely, if the original conversion of the force-element into matter by the deity justifies the infidel in claiming that mind-force can also be changed into matter, then where is the logic in thinking that by using one form of force only (light) out of which to make matter, infidelity must be completely silenced? Plainly, if God made matter out of light, one of the physical forces, it would simplify things for the infidel to claim that mind could be converted into matter as easily as this most ethereal form of all the physical forces. Yet the doctor tells us that "to posit the origin of matter in light," one of the physical forces, "*leaves us open to no such attacks*"!

We add here that most of the Scripture texts which speak of God as the Father of lights, as the source of light, as being clothed with light as with a garment, etc., do not refer to light in its literal sense as one form of the physical force-element, but to light in its spiritual or heavenly sense, as the wisdom, knowledge and truth of God. In that sense Christ was spoken of as the light of the world, the light of life,—which lighteth every man that cometh into the world, etc. The light which in a special manner environed the Creator from eternity, was the divinity of his omniscient self-consciousness. God needed no literal enswathement of light in its physical sense to enable him to see, since light and darkness are the same to him in their literal aspect. And his only use for the force-element of nature, as his eternal environment, was as the agents of his wisdom and power, the instrumentalities of his creative work, his hands, so to speak, by which and from which the worlds were framed by the word of God.

But we are not writing a sermon. We are mildly protesting against unnecessary changes in the basic principles of the Substantial Philosophy merely for the sake of a difference of views, or unless some real and essential advantage can be gained by such fanciful divergence.

THE COLLEGE OF SUBSTANTIALISM, AND A UNIVERSAL SANITARIUM.

It has been suggested by friends of the MICROCOSM and of the work which it has in progress that when the College of Substantialism is started there be associated with it a *Sanitarium* on true physiological and hygienic principles, repudiating all drug-medication, and based on the broad foundation of the teachings inculcated in our Health-Pamphlet.

An eminent practicing physician, who has long contemplated the establishment of a Sanitarium on a national scale, called recently at our office on purpose to discuss with the editor the above-named project. He is a thorough convert to our new system of treatment, and has repudiated drugs of every description. His name is withheld for the present, from business policy, but will appear in the near future no doubt prominently associated with the scheme here foreshadowed. He had no hesitation, he said, in believing that a Sanitarium founded on the prestige of the new treatment and with the co-operation of its founder, built with all modern improvements in a suitable location and with ample accommodations and facilities for boarders, would, if properly managed, soon become an institution of world-wide fame and usefulness. As proof of the correctness of this view, he referred to the fact of the astonishing spread of the new system of treatment since our pamphlet was first announced some ten months ago, since which time more than two hundred and fifty thousand intelligent men and women have adopted the remedy throwing medicine to the dogs forever. And even now, as we write the demand for the little book as a messenger of peace and comfort to suffering humanity is so rapidly on the increase, that an edition of four thousand copies per week has failed to meet these calls from all sections of North America, with the demand already started in Great Britain.

The doctor referred to declared that with such a wide-spread and universal fame for the new treatment as already established and so deeply grounded in the affections of all who have adopted it, a treatment so beneficial to those in health and so effective as a remedial agent for those suffering under any form of the ordinary diseases which afflict humanity, there need only to be announced a capacious Sanitarium based on this broad foundation ready for patients and boarders, when the afflicted from all parts of the nation, who may wish permanently to build up their constitutions and secure rest from all care and anxiety, would flock to such a retreat of genuine health and longevity.

We believe he is right, and in a word we have already associated in our thoughts the long contemplated College of Substantialism with such a Sanitarium as here outlined, the possibility of both of which we see more clearly now than ever before. Let the friends of our work thank God and take courage.

MR. AUDSLEY AND SQUARED DISTANCE INVERSE.

Editor of the English Mechanic:

My attention has been called to your issue of January 31, in which several writers, including one signing himself "Elag," page 460, attempt to criticise my position concerning the decrease of sound-intensity inversely as the square of the distance from its source, as quoted by Mr. Audsley.

In the first place, it is but justice to myself to state that my argument was imperfectly printed in the "Problem of Human Life," the "source" or "start" being intended for the

start of the measurement or the first unit employed instead of the sounding body itself. With this correction borne in mind, I now purpose demonstrating by figures which will defy criticism that the amount of theoretic decrease of sound-intensity, according to current acoustics, depends largely upon the size or denomination of the unit of measurement employed. And I now respectfully ask all readers of the *E. M.* to lay aside their prejudices as well as their ridicule for a brief space while I give the demonstration in such plain figures that there can be no excuse for misunderstanding the opposition to the wave-theory of sound.

Take a large bell as our sounding body, and we remark first that the sound produced by the blow of a hammer is fully as loud with the ear one foot from it as one inch or even one-sixteenth of an inch from it. The reason for this is obvious, because what is gained in sound-force by the close proximity of the bell is equaled a foot away by the greater area of the bell's surface exposed to the orifice of the ear. We have tried this experiment repeatedly, and know whereof we speak, that practically there is no perceptible difference observed in the loudness of the clang with the ear at a distance of one foot, one inch or one-sixteenth of an inch from the bell, so it does not touch.

Now for the prelude to our demonstration: Let us begin with *feet* as the unit of distance, and see where it leads us. According to the wave-theory, as all science agrees, the sound at two feet is but one-fourth as loud as at the start of the measurement, or one foot from the bell. At three feet it is but one-ninth as loud; at ten feet but one-hundredth as loud, and at one thousand feet it is but one-millionth as loud as at the first foot.

No dispute thus far as to the theory. But here we come to the first serious trouble for wave-theorists, and something, we venture to assert, that not one of them has ever thought of, namely, *the prodigious and even preposterous theoretic decrease of the sound-intensity during its passage through the last foot of this distance, or from the 999th foot to the 1,000th.* Let us now look at it, and thus at a single stroke of the pen see if an extinguisher can not be put upon this entire law of squared distance inverse, as applied to the decrease of sound-intensity.

While at 1,000 feet from the bell the sound has decreased to 1,000,000th of its intensity, yet at 999 feet its decrease has been but the one 998,000th in round numbers. That is to say, in traveling through the last foot of this distance, it lost 2,000 times the intensity it had on reaching the 999th foot-circle! In other words, a man standing at the 1,000th foot circle, has only to move his head one foot toward the tolling bell, and instantly, according to this highly scientific theory, the sound increases 2,000-fold in intensity! Yet it is a stubborn fact that the keenest ear can not distinguish the slightest difference in the intensity of the tolling-bell at that distance away in moving fifty feet back and forth from and toward the bell! Was ever a more monstrous and self-evident fallacy exposed and fastened upon an accepted scientific theory? Yet "Elag" and his half-dozen assistants, in attacking Mr. Audsley's positions in the *English Mechanic*, join hands in charging him with "utter ignorance" of the physical laws, because he could no longer accept as true science such a jumble of mechanical nonsense as just pointed out. We will see where the "utter ignorance" applies before we are through.

Let us now complete our promised demonstration by proving that the theoretic decrease of sound intensity, according to the law of inverse squares, must vary largely according to the size of the unit of distance employed. Instead of *feet*, as just tried, let us use *inches*, with the fact before us that there is no appreciable difference in the intensity of the clang of the bell, as just shown, at one foot or at one inch, and for the reason given.

In order to save time and come directly to the culmination of our argument, we say, that instead of one million-fold decrease in the sound-intensity at 1,000 feet from the bell, the sound, as calculated by the inch-unit, has actually decreased to the 144,000,000th of its intensity as compared with the start of the measurement at one inch from the bell; and instead of 2,000 times greater intensity at 999 feet than at 1,000 feet, we actually have at the 999 foot circle 287,000 times greater intensity than at one foot farther on. That is to say, the sound at 999 feet from the bell, calculated by the inch-unit, is 287,000 times louder than at the 1,000 foot circle.

Gentlemen of the wave-theory side of the house, make your own figures and you will see, perhaps to your mortification, that the sound of the same bell at 999 feet, if calculated by inch-units, is 287,000 times louder than at 1,000 feet, while if calculated by the *foot*-unit it is but 2,000 times louder.

There is no dodging the force of this argument. Stand 1,000 feet from the tolling-bell with your beautiful theory of sound-decrease calculated by inch-units, then step one foot toward the bell, and instantly the sound will augment its intensity 287,000-fold if there is a grain of philosophical truth in your theory; while with the foot-unit in your scientific ears the intensity will only be augmented 2,000-fold! If such puerility as this can survive the present century as science it will be because common sense has been banished from the land.

But here we reduce the absurdity of the wave-theory to zero by employing the *sixteenth* of an inch as our unit of distance, the sound of the bell being substantially as intense at that distance from it as at one inch. With this unit we have the decrease of the sound at the 1,000-foot circle,—instead of 1,000,000-fold as with feet for units, or 144,000,000-fold as with inches—actually reduced in round numbers to the one-36,000,000,000th of the intensity it had at the start of the measurement; while the sound, under this unit, in traveling through the last foot or from the 999th to the 1,000th foot-circle positively loses 73,000,000-fold of its intensity. In other words, a man standing at the 1,000-foot circle has only to move his head twelve inches toward the bell to increase the intensity of the sound 73,000,000-fold!!! Where now does the charge of "utter ignorance" properly apply? Remember that this enormous, impossible and ridiculous decrease of intensity in passing through the last foot *is the doctrine of the wave-theory whatever unit of distance is employed*, and that the smaller the unit the more monstrous the theory becomes.

But the unbiased reader may properly ask, if this exposure of one of the basic laws of the wave-theory be correctly founded, how was it possible for grave physicists ever to have

fallen into such astonishing misapprehensions?

We answer, that the law of inverse squares, which is a correct law when properly employed, was applied erroneously to the decrease of sound intensity in order to harmonize the theory with the supposed mechanical movement of the air. Surely no one disputes the fact that the quantity of air in concentric shells around the sounding body increases as the square of the distance from the centre. Physicists knowing this fact, and taking for granted that external sound consisted in the motions of the air-particles and nothing else, naturally enough concluded that this motion necessarily should become less intense in exact proportion as the quantity of matter to be moved should increase. Hence, this law of squared distance inverse was a necessity to the wave-theory, and was naturally and logically applied to the decrease of sound-intensity. This undoubtedly would have been a correct application had not physicists been wholly mistaken in regard to the truth of the motion-theory of sound. But as substantial sound-force, like substantial though immaterial electric-force, travels on a different principle from that which governs the mechanical movements of matter, it is easy to see that the law of squared distance inverse is in no wise applicable to any of the physical forces.

Physicists, in applying this law to sound-intensity, acted precisely as they did in adopting the wave-motion on the surface of water as an illustration of the supposed action of sound-waves in air. Observing as they did that two equal systems of water-waves, running together half a wave-length apart, would naturally destroy each other by interference, they at once seized upon this fact, and without waiting either for experiment or observation in regard to sound, jumped to the conclusion that the same law of interference must necessarily apply to sound-waves in air, the existence of which had been taken for granted; and hence, that two equal sounding-bodies placed half a wave-length apart would mutually neutralize each other's sound and produce total silence.

As the result of this mischievous habit of jumping at conclusions without first testing by experiment, it is astonishing to observe that the highest authorities on acoustics actually record this law of sound-interference based on the well-known action of water-waves, and present elaborate illustrations of two unison forks sounding half a wave-length apart, and producing "absolute silence" by the interference of the air-waves supposed to be sent off! (See Tyndall's Book on Sound,)

Of course there is no more truth in this law of interference in atmospheric sound-waves which in reality have no existence, than there is in its twin sister—the supposed decrease of sound-intensity inversely as the square of the distance. Both laws were conceived in that "total ignorance" of which "Elag" speaks, and applied to sound under the inexorable demands and necessities of the wave-theory, and both now die under the fall of the same axe.

The decrease of light-intensity according to the law of inverse squares is just as absurd and indefensible as when applied to sound, and can be exposed in much the same way as shown above, by estimating what must be the decrease in passing through the last foot in a mile under different units of measurement.

For example, let us take the arc-light, which is as near a mathematical point as we can get and still have a light centre, and then calculate the square of the distance by inch-units and we will see the astounding fallacy of this law of squared distance inverse as applied to light, which never before was called in question or doubted. At 1,000 feet away the light, according to theory, is reduced 144,000,000-fold below that at one inch from the spark. No one of Mr. Audsley's critics can doubt this, and some wave-theorists in their desperation to save the law may claim even this almost inconceivable reduction as reasonable. But we take all the wind out of them when we record the fact, if the theory be true, that in passing from the 999th foot to the 1,000 foot circle the light necessarily decreases 287,000-fold. Or, as in the case of sound, if we stand at the 1,000th foot circle and move our head one foot toward the arc-light, *it is exactly equivalent to the addition of 287,000 arc lights of a similar candle-power!!* Gnash their teeth as they may, and cry "total ignorance" to their hearts' content, advocates of the wave-theory of sound are here tied hand and foot and placed at Mr. Audsley's mercy by their own mistaken application of a correct physical law to the forces of nature where it does not belong.

Of course the reader has only to substitute sixteenths of an inch as the unit of distance from the electric spark, and then apply our figures as in the foregoing discussion of sound, and he will have a similar preposterous result of a decrease in passing the 1,000th foot of 73,000,000 times its intensity—all these varying amounts of decrease during that last foot resulting from the different units employed. We are very thankful to the editor of the *English Mechanic* for affording us this opportunity of cracking a few scientific nuts with the physicists of Great Britain.

A. WILFORD HALL, Ph. D., LL. D.,
Editor of the MICROCOSM,
New York, Feb. 16, 1890.

Comparative Weight at the Poles and the Equator.

BY REV. JOHN CRAWFORD, D. D.

I agree with Mr. Lyle, in the last MICROCOSM, in opposing the common teaching, that a body weighs more at the poles than at the equator, because it is nearer the centre of the earth. It is not the *centre* but the *general mass*, that attracts.

Were there a tunnel through the centre of the earth, a stone dropped in would diminish in weight as it approached the centre; and, when there, it would weigh nothing, being equally attracted by the mass of the earth on all sides.

Were the earth at rest, a body would certainly weigh more at the equator than at the poles; because a larger mass of material would draw it in a direct line, and the other lines of attraction would diverge less from the direct line than at the poles.

Take an oblate spheroid, and draw an axis from pole to pole, and another from equator to equator; and the respective lengths of these axes will represent the *relative* power of attraction, and consequently the relative weight, at the equator and the poles, providing the earth were at rest.

As it is, however, a body weighs precisely

the same at the poles as at the equator, because the excess of attraction at the latter is exactly counterbalanced by the centrifugal force.

Had the earth been created of plastic material, and a perfect sphere, it would have taken the form of an oblate spheroid as soon as it began to turn upon its axis; and the bulging at the equator would have continued until weight at the poles and the equator had become exactly equalized.

Indeed, some foolishly imagine that this was the real *modus operandi* of the earth's creation; but, if the Creator knew, as he certainly did, that an oblate spheroid is the only form suitable, to keep the waters in their proper position on a revolving globe, why would he not create it in this form in the start? Would it not be as easy for the Omnipotent to create an oblate spheroid as a perfect sphere?

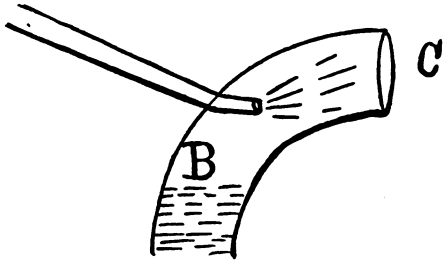
St. Thomas, N. Dakota.

Editor MICROCOSM, 23 Park Row:

My Dear Doctor,—A very pretty little toy has appeared on the streets and is worth a passing notice at your hands, not alone on account of the merit of "the mystery" as it is termed, but in reply to the extravagant claim that it has "baffled the scientific world, and contravenes the laws of gravitation"!!! The "mystery" has the appearance of the ordinary child's cup and ball, and such I at first took it to be, but when the ball was placed in the socket, the exhibitor blew through the handle, which proved to be a hollow tube, and showed that the harder he blew the stronger was the ball retained in its place, although it revolved with lightning rapidity.

In explaining the philosophy of this seeming paradox, I take it for granted that the readers of the MICROCOSM are familiar with the principle of the injector pump, and will therefore give the well-known results without dwelling upon the why and the wherefor. We all know that a minute current of air or steam entering with force into a large tube sweeps out the air and forms a vacuum which will lift water and force it to any height.

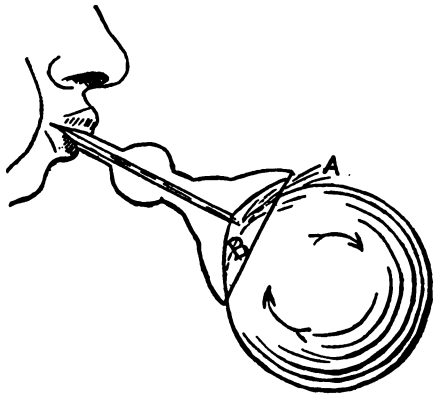
A simple illustration will show that a small jet forced through the injector A will create a vacuum at B, which will raise the water and propel it with great force from C.



A careful examination of "the mystery" proves that the same principles are involved, and a simple sketch will show that the cause and effect is identical in both.

The air current enters like a concentrated jet and striking the ball glances upwards escaping at A, sweeping out the air and forming a vacuum at B which attracts the ball.

The ball is made to revolve by the repellent force above and the suction below, and is held all the stronger in proportion to the power of the injected current. In fact, the ball could not be blown away except by an



immense force, wherein the blow at the minute point of contact is prepared to overcome the outer surface of resistance which should exert an approximate pressure of fifteen pounds to the square inch.

It is a pretty little problem, full of suggestive themes, but scarcely of sufficient depth to encroach further upon your space. I thought it well, however, to turn one little ray of the light of the Substantial Philosophy upon "the mystery" on account of the extravagant statement of the inventor that "the person who gives the true scientific explanation of this phenomenon will be a public benefactor."!!

Yours truly,

SAMUEL LOYD.

DR. AUDSLEY AND HIS ENGLISH CRITICS.

Those who enjoy the privilege of reading the great London journal the *English Mechanic* have the perennial amusement of an intellectual circus. Dr. Audsley by his series of crushing articles against the wave-theory of sound, printed semi-monthly in that journal, has aroused an acoustical excitement among scientific investigators such as never before has been witnessed in Great Britian or anywhere else. And what is more, the excitement is on the increase as each new installment of the doctor's invincible arguments against the current theory of acoustics is printed, sometimes nearly one dozen letters from different critics appearing in a single number of that magazine.

But these criticisms are by no means all on the wave-theory side of the question, many of the writers having already begun to weaken in their faith in present acoustical science, while they do not hesitate so to express themselves in plain English.

From letters just received from Dr. Audsley, we are glad to know that some of the most prominent acoustical professors in England have already renounced the wave-theory of sound as a fraud upon the scientific education of the times. Their names, and no doubt many others, will soon be given to the public. The pressure thus brought to bear against the absurd motion-theories of science is rapidly accumulating from Dr. Audsley's pen, and it is in vain for the adherents of Tyndall, Helmholtz & Co. to attempt to resist the gathering storm.

We are requested as the originator of this crusade against the wave-theory of sound, to contribute our mite to the literature on the subject for the columns of the *English Mechanic*, a specimen of which appeared in last month's MICROCOSM on the formula of density and elasticity as worked out by Sir Isaac Newton, and another specimen of which appears in the present number on the great underlying law of the claimed Decrease of Sound Intensity as the square of the Distance from the Centre, which presents some startling results of that essential phase of the wave-theory.

We are sorry we have not room in our little MICROCOSM for the entire series of Dr. Audsley's excellent papers in the *E. M.*, as we at first contemplated. We shall, however, continue to print salient portions of his arguments, and, in addition, will keep our readers posted in this most important revolutionary controvertial work of Dr. Audsley, in the reconstruction of acoustical science as at present taught in all colleges of the world.

The following are the concluding remarks in Dr. Audsley's eighth paper:

87. We may now direct attention to some curious facts connected with the conduction of sound and solid substances. We gravely question if many professors or students of acoustics have ever seriously considered the ordinary watch as a sound-producing machine.

It is certainly not a musical instrument, but it produces regularly repeated sounds—noises if you like—which require the operations of *sound-waves* just as much as the sounds of the strings of the violin, or the tones of the flute, according to the old theory. Well, let us open a watch and see by what means its regularly repeated sounds are produced. Aided by a magnifying glass, we soon find that every portion of the works move silently except that known as the *escapement*. In the case of a "lever watch" this consists of a small rocking piece of steel, called the *lever*, to which is attached a curved piece with a *pallet* at each end. The lever rocks upon the arbor of the pallet piece. It has at its inner end a notch, into which a pin in a small disc on the *verge* of the *balance* works. The pallets engage a small *'scapewheel*, which has long, pointed teeth. The outer end of the lever strikes against two vertical pins which bound its action. Now the sound produced by the watch proceeds entirely from this tiny rocking lever striking the teeth of the 'scapewheel and against the vertical pins. It seems difficult to decide where we are to look for the vibrations which send off the *sound-waves*, and "carve the air into condensations and rarefactions" which generate heat, etc. Do they take place in the teeth of the 'scapewheel, in the steel of the lever itself, or in the pins against which the latter strikes? Under any circumstances one can not examine this tiny piece of mechanism without marveling at the accommodating nature of the air to be carved into anything at all by its minute and weak motions. However, we see the minute motions, and hear the sounds, and, of course, the *sound-waves* are passing between the water and our ears and bombarding their tympanic membranes. We close the inner cap, and still the sounds are perfectly audible. This strikes us as strange, for there are only very narrow chinks through which the *sound-waves* can possibly pass to "shake the drum of a distant ear." We completely close the watch within its solid gold case, and still the sounds are perfectly audible. As there is now not even a chink for the *sound-waves* set in motion by the tidy escapement to find their way through, we can in deference to the *wave-theory*, come only to this conclusion: Firstly, that the waves from the vibrating parts of the escapement set the inner metallic cap into corresponding vibration; secondly, that this cap sets the air between it and the outer metallic case into corresponding vibration; thirdly that this air communicates its vibration to the outer case; and, lastly, that this case carves the surrounding air into *condensations* and *rarefactions*, sending off *sound-waves* at the velocity of 1,120ft. a second to "shake the drum of a distant ear." This seems a big job for the air-waves sent off by the vibrations of the parts of the tiny escapement to do; yet if the *wave-theory* is true, all this and more is done by those air-waves.

88. We have the watch held against a solid brick partition wall with its two-fold coatings of plaster, and we place our ear against the other side of the wall. The sound of the watch is still perfectly audible. Accordingly, in addition to the big job done by the air-waves from the vibrating escapement, as detailed in the previous paragraph, they have now, through the double metallic cases and inclosed sheets of air, to shake into *sound-waves* the solid brick-and-plaster wall, and that so forcibly that it in turn generates *sound-waves* in the air between it and the tympanic membrane of the listening ear. The watch is now held against the end of a long pine log some tons in weight, and our ear is placed close to the distant end; again its sound is distinctly heard. Now it must be realized that according to the *wave-theory*, thus sound can only be conducted through the many feet of solid wood by means of *sound-waves* set up in its structure and propagated therein at the velocity of 10,900ft. per second. Further, be it noted, that the vibrations of the pine log set up by the *sound-waves* from the watch, have to be sufficient at the distant end to create *sound-waves*, in the air between it and the tympanic membrane of our ear. Is there one sane man who believes in the preposterous idea of *sound-waves*, with their condensations and rarefactions, generation of heat, etc., being sent forth by the vibrations of the tiny escapement of an ordinary watch; or in the equally preposterous theory of the conduction of sound as taught by the wave-theorists?

DR. SWANDER IN THE ENGLISH MECHANIC.

In the same number of the *English Mechanic* in which our reply to Prof. Grey was printed, as copied in last month's MICROCOSM, appears the following terse and characteristic letter of our able and versatile contributor, Rev. Dr. J. I. Swander.

The editor of that leading London scientific journal is certainly treating Dr. Audsley with all fairness in thus admitting to his columns such lengthy contributions from the American friends of the great author and artist.

Our second letter to the *E. M.*, which appears in this number of the MICROCOSM, will surely open the eyes of Dr. Audsley's critics as they learn that the electric arc-light, no larger than the head of a common pin and which can be distinctly seen ten miles away, is reduced in that distance 100,000,000,000,000 fold, while

still visible to the naked eye, if this fundamental law of the theory be true and taking the *sixteenth of an inch* as the unit of distance.

But the absurdity of the theory is still further reduced toward infinity when we consider, if this law be true that the light in passing through the last foot of the ten miles must actually decrease 3,000,000,000 fold; or in other words, that the movement of the eye from the ten-mile circle one foot toward the light should positively increase its brilliancy to 3,000,000,000 times what it is at the ten-mile circle, *making it precisely the same as if* 3,000,000,000 *similar arc-lights had instantaneously been added to the central spark while the eye remained at the ten-mile circle.*

There is no mistake about this monstrous showing of the wave-theory of both sound and light, as any mathematician can demonstrate in five minutes. We expect, as a matter of course, adverse criticism, as we have already received from three wave-theorists; but all attempts by them to weather this storm of figures must end in swift disaster to the theory.

We trust the friends of Dr. Audsley in England, will show wave-theorists no mercy while prodding them with these figures which so terribly expose the law of squared distance inverse as applied to the normal decrease of the intensity of the physical forces.

But here is the highly interesting letter of Dr. Swander which we commend to our readers:

"To the Editor of the *English Mechanic:*

"As an interested and edified reader of your magazine I desire to say that I have recently experienced new pleasure with the "World of Science." The articles on "Acoustics," by Mr. Geo. A. Audsley, are read with emotions of peculiar anxiety on this side of the Atlantic Ocean. He seems to be laying a broad foundation for the new edifice intimated by the architect. More strictly speaking, he is just now professedly engaged in clearing away the gilded rubbish of a crumbling cobhouse to make room for something more in harmony with the forces and laws and facts of nature. I admire the wisdom of the suggestion made by "A. C. G." on p. 440 of the present volume, that the writer of those incisive articles be not interrupted "before he has had his full say."

"I hope, however, that it will be regarded as neither an interruption nor an unwarranted interference with the discussion to say that many thousands of American thinkers are already in partial sympathy with Mr. Audsley on account of the very vital scientific principle involved, as well as the tremendous task which he has undertaken to perform before the most intelligent audience upon our planet.

"In this country the wave-theory of sound is now rather tolerated than admired; indeed, it would not be even tolerated in the absence of the fact that its age gives it a claim upon the respectful consideration of acousticians. It abides with us for no better reason than that it has been in the world for centuries. Because its roots are in the soil, the sap goes up the upas tree, while its deleterious germs continue to poison the atmosphere of science.

"It is hoped that the discussion may be permitted to go forward in the interest of truth. Not all the scientists of England and America are so servile as to pin their faith to that which is venerable in nothing but the antiquity of its claims to respectability. Many are now pausing to examine the ground upon which the wave-theory of sound is built. They are not yet fully converted to the substantial theory advanced by Dr. Hall, of New York; but they already begin to "see men as trees walking." Others are fully convinced that the undulatory theory has no foundation in truth. They are satisfied as to the essential correctness of the new theory. With them the year of jubilee is come; they now enjoy the pleasurable sensation of laughing the old theory out of countenance. Mr. Audsley's articles have temporarily modified this tickling sensation.

"Americans are just now awaiting a more full maturity of the impending crisis in the home of Tyndall. The crisis is bound to mature. The battle is on in earnest. Prejudice and cowardice will now find their proper ranks in the rear; truth and courage are stepping to the front.

J. I. SWANDER, A.M., D.D.,
Author of "The Substantial Philosophy."
Fremont, Ohio, U.S.A., Feb. 13."

P. S.—Since the above was in type we have received the *English Mechanic* of March 14th, containing our second letter to the editor, on "Squared Distance Inverse," as printed elsewhere in this number. In the same *E. M.* is another terse letter from Dr. Swander, which we also copy as follows:

"What wonderful sharp lances are thrown by your English critics! The American readers of the *E. M.* are much delighted in witnessing the skill that they display in hurling their harmless javelins. Pages 484 and 485 are really entertaining—in some particulars amusing. Mr. Audsley is charged by James Quinn with being a *theorist*. Is he not rather an *iconoclast?* He has promised us a theory, but he has not yet undertaken to build one. At present he seems to be engaged in breaking down a theory, and if we are to judge from the amount of rubbish already on exhibition, there will soon be room for something more substantial than the old wave theory of sound.

"A Science Teacher" says some things worthy of consideration. It is hopeful to the cause of truth to see a disciple of Tyndall emphasize the proper distinction between sound as something objective in its nature, and any subjective sensation produced thereby. Let him continue to make such distinctions all along the line of Nature's correlative forces—such as light, heat and electricity—and Mr. Audsley will soon be obliged to look after his laurels as an iconoclast.

"W. C. E." is quite interesting. He states: "There are professors *and* professors: in America, I am told, they are as numerous as the sand on the sea-shore." The above is even more true than witty, and its truth is easily accounted for. America has never chartered a narrow way to eminence in scholarship. We have several professors in this country, and the records of history show that we at least formerly had some *sand* on the sea-shore. Remnants and results of the aforesaid sand are still seen scattered along the beach from Bunker Hill to Yorktown, and on to New Orleans. Yes, the American professor is quite numerous; yet the records of history do not show that any of them ever blew out a candle with a puff of air, and then claimed that the windy exploit was a demonstration in acoustics. Such professional legerdemain belongs to the kingdom and power and glory of England's great apostle of acoustical jugglery.

J. I. SWANDER."

FORCE, MOTION, SUBSTANCE, ETC.

BY THE EDITOR.

No idea connected with physical philosophy involves so much confusion in the minds of different thinkers and writers as that of *motion*, and next to it comes the nature and character of force. It is one of the chief missions of Substantialism to set the scientific world right on these subjects, and we feel safe in congratulating the MICROCOSM upon the fact that its pages contained the first correct definitions of force, motion and substance that were ever presented in any publication.

There is scarcely a book printed in any degree bearing upon physical philosophy, that does not represent motion as equivalent to force and force as about the same thing as motion, with no end to the jumbling of these two phases in the discussions of physical, metaphysical and mechanical science.

Some writers make motion so important in the economy of nature and in carrying on the mechanical order of the universe, as almost entirely to ignore force as having anything to do with the operations of the physical laws. Such writers go so far as to assert that there are but two things in the universe,—matter and motion,—and that motion is the sole cause of all the phenomena and achievements in nature.

Others say that matter and space are all that really exist in the universe; while still others insist that motion, time and space constitute the all of nature's procedure and make up the sum total of universal phenomena. Let us try to bring order out of this confusion by a few simple and fundamental definitions, thereby presenting such philosophical continuity in the relations of cause and effect as will partly at least tend to satisfy the logical demands of the inquiring and investigating mind.

In the first place *motion* is absolutely *nothing* as an entity or as a cause of any observed effect. Motion, so far from being the most important agency in universal achievement, is in reality no agency at all, never caused anything or produced anything, because being absolutely nothing in fact, it never had and never can have any existence except in name. Motion, so far from being a cause even in its remotest sense, is itself caused as a nonentitative phenomenon or an effect of some real substantial cause.

We have just said that motion does not exist except in name, since any such admission would imply that motion was really something. Motion, correctly speaking, does not exist but simply *occurs*, just as a shadow occurs as a phenomenal effect of the partial absence or obscuration of light.

By a familiar license of common speech we may say that a shadow exists, yet all concede that this is for want of a more complete vocabulary. A shadow intrinsically is nothing but a negative phenomenon which occurs, as just intimated, by a partial absence or withdrawal of light. No one of ordinary intelligence believes that a shadow—an absolute nonentity—exists, except in linguistic accommodation, or that a shadow ever accomplished anything or can produce any effect whatever in nature.

One man writes us that the shadow of a passing object frightened his horse. It did nothing of the kind, except as expressed in our imperfect use of words. It was the light in a broken or interrupted condition that frightened the horse.

In like manner motion never accomplished anything since motion *per se* is an effect, and is itself accomplished by some efficient cause. Motion is but *position in space changing*, and position in space to be observed as changing, must be occupied by something. Hence, motion is the act of changing the position of some substance by the application of force which is of necessity as really substantial in order to effect such change as is the object moved.

We have said that motion never produced an effect of any kind. The motion of a train of cars for example, absolutely does nothing in the case of a collision with another train. What is it then, asks the reader, that works the destruction? Manifestly it is the substantial contact of the two trains brought together by the moving force of the substantial heat which has converted the water into steam, and thus by other substantial and mechanical contacts and connections moves the piston and the wheels, and thus causes the collision.

The motion of the train being absolutely nothing had no existence, even in the poverty of our technology, before the train started, and absolutely ceased to exist the moment the train came to rest. It is manifestly inconceivable that an agent or cause, as important and effective as motion is claimed to be by superficial writers, should cease to exist after doing such destructive work. It is only because motion is absolute nothingness that we know it has no existence before and no persistence after a body has started and stopped.

If the motion of the train really exists as a cause of the destructive effects of the collision, then the motion of the train's shadow on the opposite side from the sun should create devastation in its path, because the shadow has literally and truly all the motion that the train has. Why, therefore, does not the shadow of the train, in passing at a velocity of a mile a minute, kill a man when it strikes him, if motion *per se* is anything and can produce any effect? We answer, because the shadow being nothing and motion being nothing, the two nothings can produce no more effect than one of them singly.

Scientists who are so weak and superficial as to attribute all the physical and mechanical effects of the universe to motion, instead of force as the cause of motion, had better hereafter keep out of the way of the shadow of a moving train, because such motion is as real and as effective *per se* as is the motion of the train itself. There is absolutely no difference in the nature and character of the motion in the two cases. But while motion is nothing and can do nothing we advise all such shallow reasons to keep out of the way of the substantial force and the substantial physical contacts of which such force is the moving cause.

Nothing exists as an entity throughout the entire universe, whether material or immaterial, whether vital, mental, psychical or spiritual that is not a real *substance*. The two grand divisions of universal substance include all material and immaterial objective existences. To the first of these classes belong matter and all forms of ponderable substances however dense or rare,—solid, liquid, and gaseous,—including the very chemical elements of which material bodies are composed.

To the latter class belong the physical forces of nature, as well as the vital, mental and spiritual forces which actuate men and the lower animals, even including the vital force of vegetation at one extreme, and the divine substantial essence of the angels and the deity himself at the other. As these forces in the very nature of existence must be *something*, since as causes they produce effects readily observed, and since they are beyond the range of all material things, they must therefore all be constituted of some grade of *immaterial substance*.

The classification so often observed in the writings of the adherents of Emanuel Swedenborg, by which *spirit* and *substance* are placed in antithisis, shows a manifest want of a true philosophical discrimination. It is the same as admitting that spirit is nothing, since that which is not in some sense, a substance is absolute nothingness. If God as pure spirit is not substantial he is nothing, and the "New Church" writer who thus denies the substantial existence of God by making spirit antithetic to substance, is a virtual atheist by denying the existence of God as a substantial entity.

As all material forms of substance differ in character and quality, in many respects besides their grossness and refinement, so the forces of the universe, though all substantial in essence differ in their quality, from cohesion, heat, magnetism, etc., up through vitality and instinct, the lowest form of mind to the highest forms of intellectual and spiritual personality.

The quality or property of a substance, whether material or immaterial, is no essential part of the thing itself, though such properties and qualities go to make up the characters of all substantial entities, since they are the foundation of all the phenomena which substantial entities produce and exhibit.

Even some of the most elaborate writers on the constitution of universal nature speak flippantly of the action of the forces without the slightest conception of their substantial existence as objective things. They mix forces and phenomena with motions and properties in a promiscuous jumble without the least regard to classification, sequence, or the orderly continuity of cause and effect, and then protest against the Substantial Philosophy because they can not grasp the difference between the nonentitative character of motion and the substantial character of the force which causes it,—all because they are incapable of such a conception as an immaterial substance.

Such writers will pretend to combat materialism as dangerous to religion while admitting many of the forces of nature as modes of motion, thus virtually conceding to the rankest materialists that the vital and mental forces which move and control our bodies may also be modes of motion as Prof. Hæckel teaches, thereby denying the substantial existence and consequent immortality of the soul, and in this way admitting that *death ends all*. These are the blind leaders of the blind spoken of by Christ, and we protest that until the principles of Substantialism are more carefully studied and more accurately understood, no headway whatever will be made by such leaders against the materialism of the present degenerate times.

OUR HEALTH-PAMPHLET IN GREAT BRITAIN.

The following indorsement from James Robertson, M. D., the distinguished physician and surgeon of Birmingham, England, dated March 18th, 1890, ought to embolden American doctors to speak out in like manner:

"Dr. A. Wilford Hall, Dear Sir,—I have just read your pamphlet with great interest and satisfaction. The idea is a brilliant one, physiologically sound, and most beneficent in practice. I say beneficent in practice, for though I only received your pamphlet this morning, I have been personally using, and professionally recommending the treatment in a *small way* for many years, the good results being exactly in proportion to the extent to which the treatment was applied. Now that you have demonstrated the value of the more thorough and systematic application of the remedy, I intend to apply it in a wider range of cases of disease, and even to the healthy as the most valuable prophylactic means I know of. I consider it a simple certainty, that if your treatment was generally carried out and anything approaching a reasonable and pure manner of life adopted, we doctors would find our occupation gone, and life on earth become much more like what God would have it to be.

I hail the advent of this and every such safe and simple measure for the amelioration of human suffering, and congratulate you on crowning your life-work in the cause of truth, by a practical discovery and demonstration which can not fail to work for the health and happiness of millions. Respectfully yours,

"JAMES ROBERTSON, Surgeon."

Also see the following from Belfast, Ireland:

Robert Blakely, 15 Erin Terrace, Belfast, Ireland, writes, March 14:

"Dear Dr. Hall,—Through a recent visit of the Rev. Miles Grant of Boston to this city, I have become acquainted with your treatment for health and longevity. I have used it for about four weeks, and the results are simply marvellous. My friends are telling me how well I look, and I surely am feeling as well as I look. I really can not help speaking of the merits of your treatment to numerous persons who would be benefited by it. But they are very skeptical as I was myself till overwhelmed with the testimony of so many who had been restored to health by it. Mr. Grant told me if he were going to die, and wished to leave me his best legacy it would be Dr. Hall's Health-Pamphlet. This was the final blow that broke my skepticism. * * * One lady here who obtained the treatment from Mr. Grant had just spent £33 with a doctor for his services which did her no good. At the third application of your treatment she was entirely relieved of a terrible pain in the region of the stomach from which she had suffered for eleven years. My wife is also using your treatment, and has been greatly benefited by the same. I am thus deeply indebted to you for this wonderful discovery, and I hope you may live long to see the fruits of your work in its relief of the sufferings of humanity. Yours gratefully, Robert Blakely."

M. W. Rushton, Register in Chancery, Rutledge, Ala., writes:

"Dr. A. Wilford Hall,—* * * I have tested your most wonderful remedy, and regard it as a great blessing to mankind. Truly yours, M. W. Rushton."

A TELLING KIND WORD.

The editor of the *Platte City* (Mo.) *Argus* volunteers the following brief but kind remark concerning the Substantial Philosophy as set forth in this journal:

A. Wilford Hall's substantial theory of the forces of nature is shaking the very foundations of materialism, and the learned world can not longer afford to close its eyes to keep from seeing the incontrovertible facts which he presents. His theory that sound, heat, light, electricity, etc., are immaterial substances is the only theory known to science which remains uncontradicted by the observed phenomena of these forces. His monthly MICROCOSM, published at New York City, at fifty cents per year, is within the reach of all, and is worthy a place in every intelligent home.

☞ The MICROCOSM is not forced upon any reader. Sample copies are sent to many who are not subscribers. No one is held for subscription by taking out such copies and reading them. Still, we want every reader to subscribe if he thinks the paper worth fifty cents a year.

OUR MONTHLY INSTALLMENT OF VOLUNTEER TESTIMONIALS.

So uninterrupted has been the stream of testimonials in favor of our Health-Pamphlet and the wonderful effects of the treatment unfolded therein, that it has become an old story to all connected with these headquarters. Out of our mail of about 2,000 letters a day, scores of these indorsements are selected each night and filed away, all breathing the same enthusiastic praise of the treatment and its effects in alleviating human suffering. The entire sixteen pages of the MICROCOSM could be filled each month and scarcely be missed from our files. Here are a dozen or so as a sample:

Mr. James S. Green, Notary Public, Nashville, Tenn., Vanderbilt Building, writes, March 18th:

"Dr. A. Wilford Hall,—My wife, I am glad to say, is numbered among the patrons of your most valuable treatment, and of so much benefit has it proved to her as well as to myself, that I have had no hesitancy in saying to my friends and acquaintances that I would not part with the knowledge of the remedy for any money. Many have come to me for your address. * * *

"Yours truly, James S. Green."

Rev. George Martin, Lindenville, Ohio, writes, March 18th:

"Dr. Hall, Dear Sir,—For many years I have suffered from frequent attacks of billiousness, sour stomach, sick headache, dizziness, constipation, etc., so that I have had frequently to give up study for several days at a time. I had used cathartics until the doses had to be so much increased that I felt myself approaching the point when they would lose their effect on me. And now after much discouragement I can not be too grateful for having learned of your treatment, without drugs, for these and other troubles. After one month's application of the remedy all these troubles have left me, and I can now work without interruption. I assure you I never expect to return again to drug medication. Many persons to whom I have recommended your treatment have found similar relief.

"I am yours truly,

"Geo. Martin, Pastor of the Cong. Church."

Dr. W. B. Forden, M.D., St. Louis, Mo., 706 Pine Street, writes, March 2:

"Dr. A. Wilford Hall,—I have just finished reading your health brocure. To say that I am *amazed* does not express it,—to think of the stupidity of our profession to have overlooked this factor in the physical economy for so long, and at last leave it to a layman to make the discovery! I had already an experience with a partial application of the remedy, but your pamphlet has convinced me that I did not know it all by half, and yet I thought I was in the van. I am fully convinced, however, that my partial application of the treatment has saved my life, and I now as fully believe that your advance application of the same will prolong it. Although a graduate of medicine and regarded as a successful practitioner, I have a supreme contempt for drugs, and for some time had contemplated changing my business, etc., etc. * * * Very truly yours,

"W. B. Forden, M.D."

Dr. John Kaufman, M.D., of Hazleton, Pa., writes, March 16th:

"Dear Dr. Hall,—I received your Health-Pamphlet yesterday, and have examined it sufficiently to grasp the rationale of your treatment. Please accept my thanks for the valuable little work. Your reasoning is logical and your conclusions are strictly physiological. I believe your discovery, as elaborated in your treatise, has more intrinsic value than all other pathological theories. Very truly yours, John Kaufman, M.D."

[We have received hundreds of similar indorsements of the Health-Pamphlet from physicians who have accepted our offer to send it free, except postage—eight cents—as published in last month's MICROCOSM.—EDITOR.]

F. H. Miller, cashier of Merchants' Bank, Appleton City, Mo., writes, March 3d:

"Dear Dr. Hall,—I have been troubled with liver complaint and constipation for years, and after a thorough application of your treatment I am glad to report that I am entirely relieved of these troubles. My wife had been under the doctors' care more or less for about eight years with a complication of difficulties, and could receive little or no real benefit. Since she began the use of your drugless remedy last September she has not taken a dose of medicine, and is now enjoying better health than she has for years past. In a word, I regard your treatment as the greatest discovery in the healing art ever made. Very truly, F. H. Miller."

"P. S.—You are at liberty to use this testimonial, and to publish it to the whole world. F. H. Miller."

L. Haworth, Dayton, Tenn., Real Estate Agent, writes, March 12th:

"Dr. A. Wilford Hall,—Some months ago I purchased your pamphlet with the understanding that if not satisfactory after a month's trial, I could return it and receive my money. I now tell you that, after using it thirty days, I would not have returned it and agreed to abandon the treatment for any amount of money. * * * I was diseased through and through, and had been given up to die by different physicians. All they could promise, was to ease me down to the grave in a month or two at farthest. Suffice it is to say that I began your treatment immediately on receiving the pamphlet, and on the third application I felt better, and have continued to improve in health ever since, though I am seventy-one years old, till now I am a well man, and can walk as far and with as little fatigue as I ever could. I continue to treat myself with your remedy every alternate night, and have not taken a drop of medicine since I commenced it. Very truly yours, L. Haworth."

Rev. J. Kern, Detroit, Mich., 310 16th St., writes, Feb. 4th:

"Dear Dr. Hall,—On Saturday last I received your Health-Pamphlet as per your generous New Year's offer to ministers, and last night I made its first application. The effect was marvellous, and as a token of my gratitude and confidence in the treatment, I herewith inclose $12 for pamphlets, $4 of which are for my own, as I do not feel justified in accepting so valuable a discovery as a gift. The other pamphlets are for members of my congregation, who desire me to send for them. I stand ready to help you spread the news of this remedy among the afflicted. Very truly yours,

"J. Kern."

Rev. C. C. Rigdon, Petersville, Ky., writes, Feb. 24th:

"Dear Dr. Hall,—I have had a complication of ailments for about twenty-four years that have made me miserable, and I have spent much money for medicines which have only tended to give temporary relief. I have had dyspepsia, neuralgia, rheumatism, piles, etc., and you can judge of my condition. I have now been using your treatment for about five weeks, and am so much improved, that under its application, I feel sure of soon being restored to good health, which would indeed be marvellous. I know of several others in this vicinity who are using your remedy, and all are well pleased with its effects. Gratefully yours,

"C. C. Rigdon."

E. M. Smith, Unionville, Mo., writes:

"Dear Dr. Hall,—I have been using your treatment one month, and according to agreement, could return it and get my four dollars back. But I assure you I have no inclination to return the little book. Indeed, if you should offer me $50 in addition to the $4 I paid, it would be no inducement for me to abandon the treatment. Respectfully yours, E. M. Smith."

Eld. J A. Clark, Thorp Spring, Texas, writes, Feb. 20th:

"Dear Dr. Hall,—I inclose money for another copy of the Health-Pamphlet, subscription to the MICROCOSM and Text-book on Sound. * * * But for your Health-Pamphlet I do not know what myself and my large family would have done during the prevailing siege of La Grippe. Nearly every member of my family has shared in this epidemic. But your treatment has brought us all through safely. It was providential that we had learned of your wonderful remedy in time for this severe trial, and we pray that you may be bountifully rewarded both here and hereafter for your priceless benefaction to the afflicted. Yours truly,

"J. A. Clark."

[Texas is our banner State for the purchase of the Health-Pamphlet, more copies having been sold there than in any other State of the Union. More than one thousand orders have already been received from there during the month of March alone. We attribute this tremendous demand to the senseless ravings of the notorious Dr. Briggs, to whose fevered vision the Health-Pamphlet is like a scarlet rag shaken in front of a Spanish bull. Let him pant and rave; it will soon be over; his traffic in poisonous drugs is about ended, when he can, if he will, engage as agent for the sale of the Health-Pamphlet, and make an honest living thereafter.—EDITOR.]

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
Address all communications to A. WILFORD HALL, 23 Park Row, New York.

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VOICE-PICTURES, OR THE WONDERS OF SOUND-FORCE.

The Phonograph Explained.

BY THE EDITOR.

Through the kindness of Mrs. M. S. Organ, M.D., we are furnished with the following authentic account of a most refined application of sound-force in its action upon a tensioned diaphragm, which, in its marvelous effects, surpasses even those of the phonograph. Mrs. Hughes, the patient experimenter, has certainly achieved immortality by thus working out such startling results of one of the natural forces as here set forth, all of which entirely harmonize with the principles of Substantialism as our remarks following the article will show. We leave out the numerous cuts accompanying the description which represent flowers of various kinds, trees, forests, and even insects, which were formed by the delicate combinations of the various sounds produced in their magical distribution of the powder employed over the surface of the sensitive diaphragm:

Mrs. Watts Hughes, in her youth a well-known Welsh singer of much promise, who was compelled by her health to withdraw from the concert stage, has since devoted herself to scientific music and charitable work among her countrymen. In the department of vocal science she has made some discoveries that promise to be of intense interest, if not of any particular importance. She has discovered, or thinks she has discovered, that pictures can be made by the voice alone, and exhibits in proof of it a numerous collection of works of art which she says are the result entirely of the action of sound waves upon the material used instead of ordinary paint. That sound waves, acting upon a sensitive plate, would cause grains of sand or other similar material to group themselves after certain geometrical figures varying with the nature of the sound had already been discovered, but Mrs. Hughes has carried the idea much further, and declares that by the use of certain notes and combination of notes she can change the formation of these figures into accurate reproductions of the forms of palms, trees, flowers, and similar natural objects, and that by using moist pigments, colored liquids, and other materials she can give color to these voice pictures and render them permanent. She made an exhibition of her pictures at a recent art show in London, and they attracted much attention. Asked a few days ago as to how she came to make her discovery of the possibility of sound pictures, she said:

"They were the immediate result of a great deal of previous thought given to the study of vocal sounds. I should tell you that from my earliest childhood I have always been particularly sensitive to sound. At Dowlais, in Glamorganshire, where I lived when a child, I had the roar of the great ironworks day and night in my ears, and I heard the music in the deep thunder of the steam hammers and engines. It was perhaps this which made me interested in, and sensitive to, every kind of sound, and this interest was intensified when, later on, my musical education was begun. I had long been trying to test, as it were, the strength of individual notes of my voice by various means. While trying to discover some means by which to register visibly the vibrations of the voice, and for testing its quality and tone, I saw one day with intense surprise that the grains of sand with which I experimented formed themselves into a geometrical figure not unlike those which Chladni discovered. In fact, the figures which I then produced were Chladni's figures discovered over again. I continued my investigations, and slowly and gradually discovered that by singing certain notes into the eidophone over the mouth of which the disk is placed, I can sing various substances, such as sand, lycopodium, or colored liquids, into certain figures. Every single note produces a figure, on which the vibrations of the voice are recorded by clear and regular lines. According to the pitch, intensity, and the duration of a note, however, the form of the voice figure differs.

"To show how she makes the pictures Mrs. Hughes sat down before her eidophone, on which a small quantity of fine powder had been scattered, and sang a deep full note into the tube. Immediately there was a miniature storm upon the powder-covered disc. Tiny clouds of dust arose, and were driven hither and thither as if by hurricanes, and as the commotion gradually lessened the dust settled down into what was seen, when the last note had died away, to be a perfect geometrical figure. To change it to another figure Mrs. Hughes sang another note into the tube, and the dust storm began all over again, to die down with a new form outlined upon the disc. The dust forms are, of course, destroyed by a breath, but when moist color is used instead they become permanent as the color dries. Long observation has made Mrs. Hughes familiar with the effect of each different note upon the material on the disc, and by this means she is able to make any form at will. When a daisy is wanted by one note she makes all the substance creep together into a solid mass in the centre. Then by another note she causes little petals to creep out on every side of this solid mass. If the first attempt is not perfect enough to suit her she uses another note, at the command of which all the particles of matter rush back again to the centre, to come out into petals once more at a different note.

"Some of the forms that Mrs. Hughes has preserved are reproduced here. She has hundreds of similar ones preserved in her home in Wales. Some are transparent, having been done on glass; others have been photographed on china and put to various decorative uses. The panes in the windows of her own room are decorated with the voice-pictures, some of them rarely beautiful. On one a shell, pearly gray and beautifully shaded, lies half hidden in a bed of dainty green seaweed, through the branches of which the water of a clear pool can be seen. On another, twigs of delicate ferns droop over the entrance to a little cavern. On a third a small palm tree grows out of the side of a steep rock over a plain. Mrs. Hughes is confident that what she has discovered is only the beginning, and that some time the mysterious force that she has to such a slight degree brought under control will become an element of great importance in science and the arts. In just what direction its usefulness is to be developed she can not, however, at present conceive."

REMARKS BY THE EDITOR.

It has been a marvel to thoughtful acousticians how the phonograph diaphram, with its central needle-point, was capable, under the action of the human voice, of mechanically reproducing that voice even to the most minute articulation and inflection of the spoken words. It is known to almost everybody that such a diaphragm, if spoken to with its central steel point bearing against a foil or wax cylinder revolved under it, will produce a line of hol-

lows and ridges as the cylinder rotates, while the vocal words are being directed against the diaphragm. Then if the needle be replaced in this groove of indentations at the start and the cylinder rotated as before, the friction of the needle-point, rubbing against the indented wax or foil, will so cause the diaphragm to repeat its original vibrations as to reproduce the very same words that were spoken against it, even to the slightest modulation of articulate speech.

It has been roughly assumed by physicists that the whole thing was explicible by the action of air-waves sent off from the vocal organs, thus causing the diaphragm to vibrate thereby to make the vocal impressions in the wax by the point of the needle.

We confess that this was our own superficial view from a first examination, as we originally gave it in the "Problem of Human Life." But we wish it now distinctly understood that we have since revised our conclusion and repudiated air-waves as having anything to do with the effects of sound known as sympathetic action upon diaphragms, tensioned strings, or anything else. Indeed we deny that a sounding instrument sends off air-waves at all, even for a single inch, as a mechanical cause of the vibration of a sympathetic diaphragm such as that of the phonograph, mechanical telephones, etc.

Sound-waves, however, or sound-pulses are sent off or may radiate from a sounding body, and such sound-waves are pulses, not of air but of the sound-force itself which is really as substantial and objective, though immaterial, as is electricity which will shiver a tree to splinters, or magnetism which will lift a piece of iron at a distance from the magnet.

Then it certainly becomes a most important question as to how such substantial sound-pulses can act upon the diaphgram of the phonograph, so to press the needle into the wax cylinder as to render its line of indentations capable of reproducing the spoken words.

One thing is as sure as the laws of simple mechanics, that air-waves sent off from a vibrating body could no more transfer to the diaphragm such complexity of movements as to involve articulate speech than could simple water-waves if close enough together. The highest authorities (Helmholtz and Tyndall) admit that a sound composed of air-waves from the voice will not stir a diaphragm unless in unison, or very nearly in unison with its vibrational number. Here are the words of Helmholtz, which will forever settle this matter:

"The *intensity* of *sympathetic vibration* with a *semitone difference of pitch* is only *one-tenth of what it is for a complete unison*. . . . Hence, when we hereafter speak of individual *parts of the ear vibrating sympathetically with a determinate tone*, we mean that they are set into *strongest motion by that tone* [unison], but are also set into vibration *less strongly* by tones of *nearly the same pitch, and that this sympathetic vibration is still sensible for the interval of a semitone*."—*Sensations of Tone*, p. 216.

Now the various sounds in articulate speech, including singing, whistling, etc., all three systems of which are recorded at the same time in the cylinder of wax by the single needle-point of the phonograph diaphragm, and all of which are reproduced at one time by the reaction of the same needle-point traversing the same line of wax indentations, may actually contain all varieties of pitch, intensity, and vibrational numbers of the entire musical scale, and hence it is certain that something besides the gross air-wave of the current theory of acoustics is necessary to produce all these sonorous effects upon this wonderful instrument.

As air-waves, by the admission of the highest authorities of the wave-theory, can only act on and move the diaphragm as a unison body, the same as it can move a pendulum, and since a dozen varying pitches of tone are recorded by this same diaphragm, at the same time by a single needle-point, it amounts to an absolute demonstration that the so-called air-waves of the current theory have nothing to do with the observed results in the phonograph and mechanical telephone.

Having thus proved that mechanical air-waves, according to the wave-theory of sympathetic vibration, can not produce the result witnessed in the operations of the phonograph, it follows that it can only be attributed to pulses of sound-force as an immaterial substance in some mysterious way, acting on the diaphragm as claimed by the Substantial Philosophy.

Even if the *modus operandi* could not be clearly set forth and explained, still it would be vastly more probable as the result of immaterial force-pulses than simple mechanical waves of matter, knowing how inexplicable are the operations of electricity, magnetism, gravity and other immaterial but substantial forces.

But we have good and substantial reasons why sound-force, as an immaterial substance, can accomplish the results witnessed in the phonograph, which have just been shown to be impossible by simple air-waves dashed against the surface of a diaphragm. We will try here to give some of these reasons.

While air-waves, as contacts of material substance striking the entire surface of the diaphragm, could not, as Helmholtz admits, move such diaphragm except bodily in synchronism with its own vibrational number as a whole, it is absolutely necessary that the diaphragm must be acted upon and the needle moved by something that is not confined to this law of bodily unison or synchronism as laid down by the wave-theory. Is such action as this possible with sound-force as an immaterial substance? Let us see.

In the first place, sound-force is likewise assumed only to act sympathetically on a body in unison with its vibrational number; but while this is true, it is also a fact that *a tensioned diaphragm is really composed of many sections or subdivisions of tensional sympathy, each one of which is actuated by a tone of corresponding pitch or sychronism.*

This is proved by common experience in speaking to a tensioned diaphragm with light powder sprinkled over its surface, different varieties of pitch and peculiarities of tone distributing and arranging the powder differently according to the portions of the diaphragm most powerfully influenced by the given tone employed. And here is the sole explanation of the wonderful effects described in the beautiful achievements of Mrs. Hughes, which we have copied, by so pitching, directing and gauging the voice as to call into sympathetic action the minute tensional and unison portions of the diaphragm in such manner as to form the pictures of leaves, flowers,

etc., by her peculiar distributions of the powder.

Now, it is manifest that no such sympathetic selection of tensional and unison portions of a diaphragm could be accomplished by mechanical waves of air, if such waves really exist, which dash bodily, like water-waves, against the whole surface of the diaphragm whatever pitch of tone is employed; whereas pulses of sound-force can and will normally select such sections only of the diaphragm as will sympathetically respond to their pitch, *and thus will only move the entire diaphragm and its central needle-point incidentally by the more energetic movement of the sympathetic portion directly acted on by the sound.*

It is plain, if this analyses be correct, that such sectional vibrations of the diaphragm at all sides of the needle, according as the pitch and intensity of the tone should change, must give a slight warbling or lateral movement to the needle-point in its line of indentations as well as the appropriate varying degree of depth and distance apart of the individual impressions.

Such a line of indentations, composed of the requisite depths and alternate distances apart to correspond with the pitch and intensity of the producing sounds, would also have for the needle-point an almost infinitesimal lateral zigzag system of impressions, though too fine to be discovered under the microscope, by which the peculiar quality of the voice of the speaker and the articulation of words would be reproduced from the diaphragm when the needle should be caused to re-traverse the same line of indentations.

By this forced lateral and zigzag tremor of the needle-point the original sectional vibrations of the diaphragm that had actuated the needle would be reproduced, thus redeveloping the same quality, pitch and intensity of the sound force originally liberated by a similar action of the vocal organs.

To suppose that material air-waves, that act mechanically and without vibrational synchronism against the whole surface of the diaphragm, "precisely similar" to water waves, as Helmholtz puts it, should be capable of so manipulating the needle-point as to enable it in retracing the indented line to send off another system of air-waves capable of vibrating our tympanic membrane in like manner, and still without any tensional sympathy in such membrane, is to suppose a mechanical impossibility and absurdity too monstrous for any rational mind to entertain.

That the needle-point can and may actually produce the lateral zig-zag indentations here claimed while producing the line longitudinal to the direction of the needle, and still too small to be perceived under the most powerful glass, as the real cause of the quality and articulation of speech, may rationally be inferred by the fact that the tuning-fork will liberate audible sound-force when its motions are many thousand times too small to be detected under the most powerful microscope ever constructed. This was proved by our original discovery of a method for measuring the distance of a prong's travel even after sounding four minutes. (See the elaboration of that discovery, by Capt. Carter, MICROCOSM, Vol. III., page 154.)

A modification of the principle of the phonograph applies to the mechanical telephone; but in connection with the liberation of sound-force by speaking to the diaphragm, *such sound is conducted along the wire accompanied by its own corresponding vibrations to the distant receiving diaphragm, where the sound-force and the wire's vibrations combined reproduce the original speech.*

That any bodily vibration of a distant diaphragm can reproduce speech without the conduction along a central wire or cord of the sounds of spoken words, or their exact equivalent, as in the intricate movements of the phonograph needle just described, is mechanically inconceivable.

As a substantial force of nature sound, with all its phenomena of conduction by a central wire and its reproduction by a distant diaphragm, is easily explicable, and no more difficult to conceive and apprehend than are the phenomena of electricity and magnetism as substantial but immaterial forms of force. But all explanation of sound-phenomena vanishes the moment we assume air-waves or waves of any other material substance—gaseous, liquid, or solid—to constitute sound.

There are more than two dozen distinct and specific arguments at hand, any one of which annihilates the wave-theory; while no semblance of an objection, having the weight of a straw, has ever been urged against the substantial theory as finally developed and set forth in the later volumes of the MICROCOSM.

We admit, as we have often recently admitted, that when emerging from the scientific fog of the universally prevailing motion-theories of science, our perception was not entirely clear upon every part of the Substantial Philosophy or upon the full force of the fundamental objections to the old theory of acoustics. We therefore voluntarily relieve our critics from the trouble of going back to early mistakes while our more matured and settled views are read and known of all men. The very fact that a would-be critic will seize and harp upon an early slip of language or typographical error while purposely ignoring our more matured and settled arguments, is a flat confession on the part of such critic that the real arguments as finally determined against the wave-theory are beyond the reach of criticism.

THOUGHTS.

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

Thinker; Thinking; Thought; Thing. These are not always separable, but each is to be regarded as always entirely distinct from each one of the other three. Thing is the object of thought: Thought is the efflorescent product of the thinker while thinking. [See our book—"The Substantial Philosophy"—p. 289.] Thinking is mental action. Dr. Rouch, one of the brightest mental philosophers that ever enriched the pages of American psychological literature, defined thinking as "a simple and quiet activity of the mind." This activity or action must be clearly distinguished from that which acts. Motion has no propulsive power. Physiological momentum does not have its origin in mental action, but in the force which produces such action. There is an actor. That actor is the mind. The mind is a substantial being. Otherwise, it could not even think of thinking.

The brain is the organ, not the originator of

the mind. In another state of human being, and under the direction of some other law of action the mind may think without material brains. There is at least no evidence that such is not the case. Furthermore, we know that in man's present state, the action of the mind, like the product of any other form of force, depends upon favorable environments or surroundings. The life-germ of a seed will not act itself out into any other form without light, warmth and moisture. Why should the mind it its terrestrial realm be regarded as an exception to this general rule? Or why should it not, upon the other hand, be viewed as having in its entitive self the mediate source of its own phenomena, instead of being falsely regarded as a phenomenon of the inert matter and favorable environments by which it is here and now conditioned?

All substances, forces and laws, whether mental or otherwise, are traceable to a personal God, who is the great Father and fountain of all. Great care should, however, be taken by all students of Substantialism not to confound the Infinite and the finite. God's thinking is not our thinking. The creator can neither think nor will for man: Man can neither will nor think for God. Tyndall's thoughts and writings are largely the product of his own mental activity. They are not the results of cerebral secretiveness, neither are they all, directly or indirectly, the products of God's great mind. God's thoughts are all perfect. There are some recorded thoughts and things in Tyndall's writings which are rather absurd than perfect. This fact justifies us in arriving at a two-fold conclusion. 1. That Tyndall does his own thinking. 2. That we should think a little for ourselves and upon our own responsibility.

Another discrimination must be kept in constant and bold relief. In much of the thoughtlessness of the present age there is a failure to make and hold a proper distinction between the divinely ordained orders of being as they hold in the essential constitution of nature. Hence it is that so much of our earnest investigation is unserviceable in the cause of true science. Hence also the prevailing confusion between negative ideas, and conflicts which never result in victories for truth. With a booming of pop-guns, the battle proceeds in the realm of moonshine, and great is the destruction of fancied foes upon a bloodless field.

Furthermore, keeping clearly in view all proper distinctions between different realms and different orders of being, our thinking should be also logical. All true syllogisms of logic start with sound premises. Such premises need not necessarily be the conclusions of a human reasoning process. A thoughtful assumption of an undeniable fact involves better logic than a thoughtless conclusion of traditional sophistry. Indeed, all logic starts with a propositition which either need not or can not be proven. The existence of things must be assumed before the thinker can think about or reason concerning them. This is God's starting point in all the logic that the Bible contains. The whole volume of the book proceeds upon the assumption of its author's existence. Assuming the existence of such a being, we are taught to reason logically concerning the facts which He revealed to Moses, and the acts which He made known unto the Children of Israel. The same is true with respect to God's manifestation of Himself in nature. Here also we have an essential starting point in all correct thinking. What is that safe point of departure for all sound logic in both religion and science? "The invisible things from the creation of the world are clearly seen through the things that are made."

Ignoring the foregoing facts, men start from false premises and whirl themselves around in the convolutions of their false logic, until they are destitute of sense enough to realize that they have fallen into the arms of giant infidelity. Their mistake involves, as its incipient and poisonous principle, an exclusively materialistic conception of being. Moving in this materialistic trend of thoughtless thinking, even good Christians are sometimes either led to believe an unscientific lie, or forced to stultify themselves by denying the conclusions of their own miserable logic.

In the declaration of principles laid down and published to the world by the heralds of the Substantial Philosophy, all immaterial substances, or "invisible things," are classified into Infinite and finite. The Infinite is the primordial source of the finite. This finite substantial force is diversiformed in the constitution and economy of Nature. The highest form is spirit. Passing down the descending scale of finite forms of force, the category will be found to include mind, life, heat, light, sound, electricity, magnetism, cohesion and gravity.

The fair and full recognition of the existence of these substantial forces, in their several orders, as well as in their contradistinction from matter, is just that which is now challenging the Christian faith and rational thinking of the world. This is the stone which the materialistic builders have rejected, and which must yet become the head of the corner. Otherwise neither Christianity nor science need make any special preparation for an early dawn of the millenium. And this necessary concession is just what the Scribes and Pharisees of materialistic scholasticism are not yet quite willing to make, although they are beginning to realize that their old foundations are giving way, and that their false structures are destined to totter and tumble with a terrible crash.

Indeed, the stampede has already begun. What a scampering of scared rats may even now be seen fleeing before the kindlings of the inevitable conflagration which is to try every one's work of what sort it is. Edison the inventor is represented as saying that he "can not believe matter to be inert, but that every atom possesses a certain amount of primitive intelligence."

We do not agree with Mr. Edison that an atom of matter contains primitive intelligence as a property; neither do we believe, as is now claimed by some expert dodgers, that matter is manipulated and moved by an immediate application of Divine energy. In this respect the rats are running in the wrong direction for safety. There is Divine energy in the world, but in such a sense and in such a way as to remain entirely distinct from Nature in all the essential elements of its constitution.

It was an important part of our early education to think of and believe in "the everywhere present power of God, whereby he upholds and governs heaven and earth and all creatures;" but we do not confound this power of God—"this Divine Energy"—with the constitutional forces of nature. God's

thoughts are very precious, but they are not our thoughts. God made a tabernacle for the sun, but the light thereof is not to be regarded as the scintillations of "Divine Energy." The Almighty started a fire as the thermal centre of our system, yet its heat is not the same as the "Divine Energy." Jehovah uttered his voice and the earth shook, but the sound thereof is not the subject of acoustical science. God thundered in the heavens, yet electricity is a created force-element in the constitution of the universe.

In the foregoing paragraphs we have given a few of the cardinal distinctions which thoughtful Substantialists are able to make in the mingled light of God's word and works. Such distinctions can not be consistently and clearly made without a full recognition of the fact that nature involves, of constitutional necessity, immaterial elements as substantial as the sturdy rocks beneath and the stellar worlds above. Such concessions are being gradually made. It could not be otherwise under the steady and resistless sweep of this heroic philosophy. Unprejudiced and thinking men are pushing to the front. Those who persist in remaining back in the crumbling air-castles of thoughtlessness and unbelief, must expect ultimately to be laughed out of countenance for their silly attempts to continue in a position as absolutely false in science as it is superlatively preposterous in religion.

Thoughts, gentlemen, thoughts—not theories: neither thoughtless agreements with the blind theories of others. The demand is for such thoughtful investigation as will lead to a conservation of the true, and a rooting out of the false, in current theories of Christianity and science. Such thinking requires fidelity to all the fundamental truths of Revelation and all the obvious facts of Nature. This is the supreme duty of the hour. The discharge of this duty requires a measure of independence and a sense of responsibility. Such independence is not necessarily at varience with the facts and forces and laws of Nature, but with some of men's theories thereof. The Substantial Philosophy is bound to the past, but not by it. Its aim is to hold fast that which is good, repudiate that which is false, and bring into the proper purview of true science a clear recognition and candid consideration of the invisible things of God. In this particular it is like the Christian religion, before whose superior majesty it bows with reverence and respect.

Therefore, let men continue to think about Substantialism. Let them make it not only the object, but also the subject of their vigorous thoughts. They *are* thinking. It is now too late to arrest this mighty tide of the world's mental activity. The movement is simply resistless in the sweep of its power. The path of its progress is over the American continent, across the oceans, and around the planet. Even proud Albion is now pausing in its march of empire to admit that the Substantial Philosophy is worthy of a calm consideration. Many of Great Britain's scholarly minds are investigating its claims. These wise men of the East have seen its star in the West, and they are already rejoicing with exceeding great joy as higher yet that star ascends.

FREMONT, O.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 4.

The strata of the carboniferous system are so emphatically annular in all their features, that I wonder that geologists everywhere have not long ago embraced this new theory. I no sooner take my position on that geological horizon than I am forced to abandon time-honored and cherished opinions.

While the sandstones and many of the limestones of that age are similar in general features to the rocks of the Devonian age, they are specifically lighter, and therefore were not derived from the latter. The widespread and almost universal stretch of carboniferous beds placed directly upon the older rocks, *before the latter were uplifted* to any considerable extent, renders that an impossible source. We can not take five pounds of rock from a source that weighs but one; and geologists know full well that the amount of rock known to have existed outside of the carboniferous area at that time, and from which detrital matter could be derived, does not show even that proportion. If there is any reliance at all to be placed in the stratigraphy of the globe, we are *forced* to concede that the ocean of the carboniferous era was well-nigh universal. Where, then, were the lands from which the immeasurable extent of carboniferous strata were derived?

According to the regulation theory of the origin of coal, we are forced to premise an ocean of carbon in some form in the atmosphere of that age, to account for the vast accumulation of carbon beds, of which vegetable fossils form a conspicuous part. Was this carbon in the atmosphere prior to the coal period? If it was, then why was not the coal found in the Devonian, or at a former period? There are no physical reasons imaginable to explain why the carbon in the primeval atmosphere performed but sparingly its office of coal formation in the earlier ages, and made the supreme effort after millions of years had rolled by. I am sure the only way this incongruity can be explained is by admitting that the great fund of carbon necessary for vegetable growth did not previously exist in the atmosphere. For unmeasured ages it rolled around the earth in the ring or annular form, far above the atmosphere. It came down in the fullness of time. Had it come at an earlier age, there is no question but the coal would have formed then; so that if there were no other testimony afforded than the carbon beds of the coal period, we might rest assured that the carboniferous age was produced by annular declination. But we have an abundant fund of evidence independent of the coal.

The carboniferous system is full of evidence pointing to world-wide and terrific revulsions. The first we may notice is the total extinction of many specific forms of oceanic life. They lie as in a mighty graveyard on the boundary lines of the Devonian. New waters came down and new environments intervened, and necessary death resulted. Hardy forms outlived the catastrophe, but true to the demands of Nature, new forms appeared on the scene. I lay it down as a universal law, that specific and generic extinction can only be explained by a change in oceanic waters, and here is a most evident vindication of it. While it is true that the rocks of the carboniferous age con-

tain many fossil fishes and other vertebrates common to the Devonian, yet the fact is well known that the latter was preëminently the age of fishes, while the former was not. The change is a conspicuous one the world over. The investigator will ever fail to find any other cause than a change of environment, *i. e.*, a change in the oceanic waters of the entire earth, which at once calls in the aid of super-aerial vapors, waters from the earth's annular system. Again we find during this age there were great changes in climatic conditions. We find tropic and semitropic fossils stretching not only over entire continents, but from the equator to the polar circles, and immediately upon the beds containing these fossils we find unmistakably the march of glaciers and the rigors of an arctic climate. In this magnificent scene of ruin and apparent inconsistence an annular cause is readily traced.

It is very plain that when a ring of vapors and telurio-cosmic dust declines into a planet's atmosphere it must become a *belt*. It must fall toward that point where there is the least resistance. That point is in the polar world. Hence a belt in its efforts to fall to the surface of a planet becomes a canopy. But a canopy of vapors over-arching the earth would become a *greenhouse* roof, and produce a greenhouse world. Let us remember, then, that a ring entering our atmosphere in the equatorial regions would decline toward the poles and thus over-canopy the earth. Now so sure as the rays of the sun reached the surface through such a medium, it would form a greenhouse climate from pole to pole; and since we have the absolute proof that in the remote past, and particularly in the cool periods of the carboniferous era, such warm climate existed again and again, I am led to assume this annular cause as the only competent one, and look further into the testimony.

During the vast periods required for the decline and final collapse of a canopy of vapors, ample time was given for the luxuriant reaches of vegetation that characterized that age.

But it is plain that when in the polar worlds the vapors began to reach the earth, they would fall there as *snows*, and continuing for a vast lapse of time, arctic conditions would accumulate, and thus terminate the warm age. Thus upon the ruins of the Edenic world we would be able to detect the tread of winter. And thus we find in the annular system a cause at first adequate to form an Eden climate by simply forming a canopy, and then the very means that terminated it by falling, and when we see these alternations so heavily chronicled upon the rocky pages of the earth, and so frequently, we are impelled to give our old earth-rings the credit.

We see, then, as we approach the more modern geologic ages, the evidence of annular conditions accumulate. When the grand piles of the carboniferous age are laid down in succession, they simply record so many ring-falls. Step by step the earth has grown by their exotic additions, allowing at all times the present order of crust-building to follow in the more energetic changes.

ELSINORE, CAL.

All Motion-Theories of Force Inherently False.

BY PROF. D. JAMES, A. M.

The wave-theory of sound is based upon the *supposition* that there is in every kind of material substance a peculiar law of wave motion which is independent of the cause of the motion. In air, this law varies a little under the influence of heat, but is uniform for the same temperature. Experiment shows that any perceptible motion given to air is always proportioned to the cause which produces it. According to the theory, the same cause must produce two distinct effects, one of which is proportionate, and the other disproportionate to the cause. The disproportionate effect is always the same for the same temperature, no matter what the cause may be.

A certain amount of cohesive force must exist in any material body to permit the transmission of motion from a part to the whole. Gaseous bodies do not possess sufficient cohesion to permit the transmission of motion as claimed by the wave-theory. Easy experiments will satisfy any one who may question this proposition. If a great force moving with great velocity can not cause the free air to move more than a few feet away from the moving cause, how is it possible for a small force moving slowly, to accomplish a greater effect? A theory that requires us to believe in the existence of a mysterious law of wave motion that contradicts a plain law of mechanics, is evidently false.

"It has been ascertained by careful experiment, that air rushes into a vacuum with a velocity of 1280 feet a second." How are the "rarefactions" of air-waves possible, if this pneumatic law is true? The rarefactions travel 1120 feet a second, while the filling or pursuing velocity is 1280 feet a second.

An expert can tell by the quality of a sound the nature of the vibrating substance from which it emanates. If sound consisted of air-waves, this could not be done, for the reason that a wave does not partake of the qualities of the producing cause. If a cubic foot of stone were dropped into a lake, a man on shore could not tell by any peculiarity of the waves whether a cubic foot of stone or a cubic foot of lead had produced the commotion. Neither is it possible to distinguish the nature of the substance whose vibrations are claimed to cause air-waves, by any peculiarity in such waves. A wave is only a wave, no matter what the nature of the producing cause. A silver horn and a brass horn sounding the same note must produce waves "exactly similar," and to assert that the human ear can detect a different quality in the waves, is simply an assertion and nothing more.

"The motion of a material body is always proportioned to the force impressed." The mode of motion theory violates this law. "Like causes produce like effects." This is in the way of the theory also. "A certain mode of motion produces heat." If any mode of motion produces heat, or is heat, then all motion ought to produce heat and heat only. The intensity of heat may vary from zero to infinity. Therefore, all possible modes of motion ought to produce heat. If heat is an *effect* of molecular motion, it ought always to be the effect, since the cause is the same. So long as the nature of the cause is identical, the nature of the effect ought not to change. To obviate the difficulty here presented, we are

required by the theory to believe that the same molecule can move in several directions at once, or with several velocities at once, since it can produce several different phenomena at the same time; and, since we can be cognizant of the several phenomena at the same time our brain molecules must vibrate in the same way. It would be interesting to read a formal catalogue of the "modes." The theory claims that there are two forces in all bodies, called attractive and repulsive. Now, since by the theory, motion is force the molecule must move in opposite directions at the same time to suit the attractive and repulsive demand. We will suppose these opposite or antagonizing motions to be equal. The molecule, in that case, would not move at all; but motion being the only force in the case, what keeps the molecule still? Evidently, the molecular theory runs aground right here. This is the end of the molecular rope, and the whole theory hangs suspended to that stationary molecule. Substantialism can easily solve the difficulty, but the motion theory retires "baffled." A theory which is founded upon suppositions, yields to one single supposition of a molecule suspended in space by equal and opposite motions or forces. It is absolutely astonishing that, in an age of free discussion, when men may think as they please, and speak what they think, any man who is competent to think at all, will continue to believe the teachings of a theory which is refuted by its own definition. Men are gregarians in spite of reason and science. The "respectable" crowd is too fascinating to permit an odd position. Men of brains and culture are blinded by the respectability of their associations. The man who dares to condemn the error and defend the truth in the face of "respectability," is the only man who has a right to the title of scientist. A "splendid education" is too often splendid prejudice. "Divine Philosophy" is not a pharisaical creed based upon other people's opinions, but it is the pursuit of truth. Truth is evident to the simplest mind, and its discovery is the felicity of the great mind. Stanley is a nine days' wonder, but he that leads the people out of error into a knowledge of the truth, is the wonder of the ages.

Barnett, Miss.

DECREASE OF SOUND AS THE SQUARE OF THE DISTANCE.

Editor of the English Mechanic:

I am sorry to take up your valuable space in replying to the storm of criticism which appeared in your paper of March 21, assailing my letter, as printed by you on the above named subject, March 14. But it is absolutely necessary that your readers should have the benefit of this reply in order to dissipate much false and confused reasoning.

The main positions assumed in that letter I now re-affirm and purpose demonstrating in the face of my critics, and will remark, first, that the chief reason for their failure to agree with me is the fact that they attempt to deal with the large numbers involved in the decrease of sound at 1,000 feet, before they have carefully analyzed what takes place in the first three or four units of distance from the sounding body. Let us first examine into the start of the decrease as the square of the distance, and near to the "centre of motion," and it will then furnish an easy key to our comprehension of the larger numbers.

All agree that at two feet from the centre the sound has become reduced fourfold, that is to say, it is but one-fourth as loud as at one foot from the centre—*feet* being used as the unit of distance. Now, the confusion referred to results from not apprehending just what this decrease to one-fourth actually represents. Let us understand this well, and our position will be as clear as sunlight when we reach 1,000 feet from the sounding body, where the sound is reduced 1,000,000-fold.

As the sound at two feet from the centre is but one-fourth as loud as at one foot, according to the wave theory, it follows that it would require *four* bells, or four equal volumes of sound, at the centre of motion, to make it as loud at two feet with the ear at the 2 ft. circle. as it is at one. There can be no dispute about this.

At three feet from the centre the sound is reduced to one-ninth that at one foot, if the theory be correct. Hence it requires nine original volumes of sound at the centre to make it as loud at three feet as it is at one foot with the ear remaining at the three-foot circle; an assumption, by the way, wholly fallacious on its face. And thus the square of each new unit must represent the number of equal original volumes of sound at the centre that would make it at said unit as loud as it is at one foot, with one volume sounding at the centre; and so on up to 1,000 feet where the sound is reduced 1,000,000-fold, and would of course require 1,000,000 original volumes at the centre to make it at 1,000 feet equal to that at one foot. This is the only correct analysis of the ratio of sound decrease from the centre as the square of the distance by which to determine its probable correctness.

Plainly, then, the movement of the ear from two feet back to one foot must increase the sound four fold, making it the same as it would be at two feet with four equal volumes sounding at the centre. Now what takes place from two to three feet from the centre? for it is plain that whatever takes place from two feet to three feet—the next succeeding unit or step of distance—must take place from 999 ft. to 1,000 ft., only on a larger scale, as we will soon see. Here is the grand solution and key to the problem.

As the sound in passing from one foot to three feet decreases nine-fold, losing eight intensities and retaining one, so it is plain that in moving the ear back from three feet to one foot, the sound increases nine-fold, adding eight intensities to its remaining one; and as moving the ear back from two feet to one foot increases the sound four-fold, adding three intensities to the one it had at two feet, it must follow by every rule of logic and common arithmethic that in moving the ear from 3 ft. back to 2 ft. 5 intensities are added to the one at 3 ft., thus getting 5-fold increase of intensity from 3 ft. to 2 ft., and thus accounting for the admitted 9-fold increase of intensity by moving the ear from 3 ft. back to 1 ft. Can anything in mathematics be plainer than this?

As this is common-sense science, any attempt to figure out fractions of fractions to determine the ratio of one-ninth and one-fourth reduction of sound, and to find out how much is lost or gained in passing the ear back and forth from 2 ft. to 3 ft., is pure scientific folly, and will lead only to fog instead of clearing up the problem.

How much simpler and truer it is to say that there is a four-fold reduction in sound, according to the wave-theory, in passing the ear from 1 ft. to 2 ft., and 3 intensities added to the one left in passing the ear back from 2 ft. to 1 ft.? How much simpler and truer it would be to say that a nine-fold reduction takes place in passing the ear from 1 ft. to 3 ft., and that 8 intensities or volumes are added in passing the ear back from 3 ft. to 1 ft.? All this being true, it follows, as certain as that any thing in the multiplication table will bear scrutiny, that in passing the ear from 2 ft. to 3 ft. a five-fold reduction takes place, and, of course, that in passing the ear back from 3 ft. to 2 ft. a corresponding five-fold augmentation takes place, or in other words, that the sound increases 5-fold, or is 5 times as loud at 2 ft. as it is at 3 ft., if there is a grain of scientific truth in this law of squared distance inverse as applied to sound.

Having thus demonstrated that the difference between the squares of any two units (as in the case of 5, the difference between the squares of 2 and 3) represents the exact number of times the sound decreases or increases in moving the ear forward and backward between the two units, let us now examine, as a remarkable coincidence, the mathematical augmentation which must take place in these differences between squares, as we advance from the first unit up to the 1000th.

From 2 to 3 ft. the difference as we have seen between the squares (4 and 9) is 5. From 3 to 4 ft. the difference between the two squares (9 and 16) is 7—a gain of two over the previous difference. From 4 to 5 ft. the difference between the two squares (16 and 25) is 9, another gain of two over the previous difference, which was 7; and so on, with a steady and uniform gain of 2 over the previous difference up to 1,000 ft., where the difference between the squares of 1,000 ft. and the preceding unit, 999 ft., is 2000, or, to be exact, 1999.

Now, if we here turn and go back toward the start, we find that there is a uniform loss of 2 in the same way as just noted. Take the circles 999 and 998 ft., and we find the difference between the two squares is 1997—a loss of 2 from the previous difference. Take the units 998 and 997, and the difference between their squares is 1995, another loss of 2, until we return back to 3 ft. and 2 ft., when the difference between these squares, as seen a moment ago, is 5.

In making this careful calculation, we found that the aggregate of all these differences between the squares of all the units from 1 up to 1,000 ft., with their increase of 2 at each step, makes exactly 1,000,000—a discovery, we think, which never before was made.

This somewhat singular fact absolutely proves the correctness of my original assumption, that moving the ear from any unit to the next one in the direction of the sounding body, must necessarily increase the sound the exact number of times represented by the difference between the squares of those two numbers, since all these differences added together make 1,000,000—the exact number of times that sound is decreased in going 1,000 ft., according to the wave-theory (1,000,000-fold), and the exact number of times that the sound would be increased as all wave-theorists will admit, in moving the ear from the 1,000th back to the 1-ft. circle. How plain must all this be to the man who is not blinded by the stupid and confused mathematical formulas used by my critics in the *E. M.*, which gave no two results alike, as we shall show in a moment.

Thus, as it is admitted by wave-theorists that 1,000,000 intensities, minus one, is added to the sound (as reduced at 1,000 ft.) in moving the ear back to 1 ft., it demonstrates that in moving the ear from 1,000 to 999 ft. the sound (as reduced at 1,000 ft.) is increased 2,000-fold, the difference between the squares of these two units, just as certain as that moving the ear back from 3 ft. to 2 ft. increases the sound 5-fold, the difference between the squares of these two units. In the name of reason why should not this be the case, since 1,000,000-fold intensity has to be gained in moving the ear all the way back from 1,000 ft. to the first unit? Is there any other way of getting this increase of 1,000,000 intensities by foot-stages in moving the ear back toward the start?

Let wave-theorists stop their ridiculous formulas and their ridiculous ridicule of me, and tell us how to divide up by feet the 1,000,000 intensities that are gained in moving the ear back from 1,000 ft. to 1 ft., thus to determine the proportionate increase of sound for each foot as we go back.

They have either to adopt my plan and add for each foot the number of intensities represented by the difference in succeeding squares, thus adding the entire million intensities by the time the ear has reached the 1 ft. circle, or they must add an even number of intensities (1,000) for each foot as the ear recedes toward the first unit. If they adopt this latter plan, they involve their theory in the monstrous absurdity of an increase of sound 1,000-fold in moving the ear from 3 ft. to 2, or from 2 ft. to 1, making it still worse for their already preposterous theory.

Thus we are forced from scientific necessity, from the normal progression of numbers, and from their resultant sum, to the reiteration of our original statement in the *E. M.* that in moving the ear one foot toward the bell, or from the 1,000th to the 999th foot circle, 2,000 intensities, out of the 1,000,000 lost, are gained back; in other words, that the sound at 999 ft. becomes 2,000 times louder than it was at 1,000 ft., if the wave-theory law of decrease of sound has any foundation in fact.

If it be true as say my critics that some "inappreciable" fraction of one intensity is the entire increase of sound that takes place in moving the ear 1 ft. toward the bell, then how in the name of mechanics, are they to gain the 1,000,000-fold increase of intensity in going back only 1,000 ft.? If it is only an "inappreciable" fraction of *one-time* louder at 999 ft. than at 1,000 ft., then surely the sound can gain no more between any other 2 ft. in moving the ear back to the first unit, making a gain of but an "inappreciable" fraction of 1,000-fold instead of a full gain of 1,000,000-fold as all wave-theorists admit as the gain in moving the ear clear back from 1,000 ft. to the first unit! They threaten to "pillory" me upon my figures, but their own self-contradictory formulas have pilloried them.

So much for the argument; and we now ask if there is an unprejudiced scientific thinker in England who is incapable of seeing this conclusion as the only possible explanation of sound-decrease as the square of the distance, or sound-increase by the same law in coming back toward the start?

I have intimated that no two of my critics agree as to the actual proportionate increase

of sound which takes place in moving the ear back from the 1,000th to the 999th foot circle, though they all agree that I am an ignoramus of the first water. We will excuse them for their unflattering opinion, as this seemed to be necessary as an argument for the wave-theory, now on its last legs. One critic, signing himself "Sigma," [30,960], says:

"The effect of moving the head (or *block head*) from the 1,000th to the 999th foot-circle would be only to increase the sound by 2,000ths, not 2,000-fold."

Another—F. B. Allison, [30,963]—calls our statement a "ridiculous mistake," and says the difference of sound intensity between 999 and 1,000 ft." is $\frac{1}{499,000,000}$ of the intensity at the first foot, a quite inappreciable quantity, and therefore agreeing with experiment"!

Another, "H. P." [30,955], gives it thus: "If a person at 1,000 ft. moves one foot nearer to it, he will find that the sound is 1.002 times as intense 999 feet from the bell as it is at 1,000 feet away"!

Another, signing himself "Ignotus," [30,966], by the way, the most fair-minded and candid critic of the whole lot, and with the most elaborate array of figures, gets altogether a different result from the others. He says: "Therefore, if we advance from 1,000 ft. to a distance of 999 ft., the intensity of the sound is increased $\frac{1}{50}$ part of its amount at 1,000 feet."

Yet all these critics are mathematicians, all wave-theorists, and all use elaborate mathematical formulas! What better proof do rising young physicists in Great Britain need that the wave-theory is inherently false, than a fact like this where four of its leading advocates, in trying to explain the fundamental law on which it is based, get so ridiculously by the ears? Why do they not ridicule one another and let me alone?

"Sigma" asks if we have ever studied photometry? We answer yes, enough to know that it has nothing to do with this discussion. While the photometric bar serves the purpose of comparing imperfectly the difference in the strength of weak lights, such as gas-jets, and for short distances, it does not touch the question of the decrease of powerful lights at great distances from the centre. Let us here "pillory him" as he said he would do by me, and give him that "caning" which he says he ought to have had when a boy had he been as ignorant as I am supposed to be by him.

An electric arc-light, no larger than the head of a common pin, and which can be seen with the naked eye ten miles away, must decrease 256-fold in one inch, using *sixteenths* of an inch for the unit of distance, a result that is simply absurd on its face; while at ten miles away it has decreased, if the theory be correct, 100,000,000,000,000-fold, while in passing the last foot it decreases 3,000,000,000-fold, and of course the movement of the eye from the 10-mile circle one foot nearer to the electric spark makes the intensity 3,000,000,000 times what it was at the 10-mile circle, or the exact equivalent of the instantaneous addition of 3,000,000,000 arc-lights of equal candle-power at the centre, while the eye remains at the 10-mile circle.

Make your own figures, Mr. "Sigma," and begin your measurement *one-sixteenth* of an inch from the center of the arc-light, using that distance for your unit. As certain as that this light has decreased in 10 miles to the 100,000,000,000,000th of the intensity it had at the first unit, and while still visible, according to your highly scientific theory, just so certain must its intensity be increased 3,000,000,000-fold by moving the eye one foot (192 units of a 16th of an inch each) toward the electric spark, *as that is the difference between the squares of these last two foot-circles in the ten miles.*

The confusion of my critics in attempting to grasp the different results I obtain by using different units of measure from the centre, all comes from their unwarrantable assumption that sound must necessarily decrease as the square of the distance according to the same ratio, but inversely, as the quantity of air increases. No one disputes that the air, in concentric shells, increases as the square of the distance from the centre, *and precisely the same whether we use feet, inches or miles as units of distance;* but neither sound, light, heat, magnetism, nor any other force of nature decreases by this law. A magnet, for example, that will pull an ounce at one-eighth of an inch, will not pull the one-hundredth part of an ounce at a quarter of an inch away, whereas it ought to pull a quarter of an ounce if this law of inverse squares applies to the natural forces.

But I must close my already too long letter, and leave others over there to carry out my arguments. There are plenty of Englishmen who can *think*, and who are not so blinded by prejudice but that they can see the force of an argument; and I look to them to vindicate my positions as they shall be assailed from week to week,—my great distance from the seat of war rendering my replies in time impossible.

A. WILFORD HALL,
Editor of the MICROCOSM.

New York, April 15.

A SCIENTIFIC HORNET'S NEST.

BY THE EDITOR.

This is what the editor of the MICROCOSM seems to have stirred up by his new and original position on the decrease of sound as the square of the distance from the centre, as set forth in his letter to the *English Mechanic* printed in the April MICROCOSM, and as more fully elaborated in his second letter on the same subject to the *E. M.* printed elsewhere in this number.

Since the April number was sent out we have received dozens of earnest protests from professors of physical science, many of whom are substantialists and who lament over our letter to England, because as they claim we have committed a grievous error in teaching as we do that if the wave-theory be correct, the sound of a bell must actually decrease in round numbers 2,000-fold in passing from the 999th ft. to the 1,000th ft. circle; and that in moving the ear back from 1,000 ft. to 999 ft., the sound must increase 2,000-fold or become 2,000 times louder than it was at the 1,000th foot circle.

In our letter to the *E. M.* printed in this number, we reply to many of these critics in England who have attacked us in a similar way to those of our own readers to whom we have referred. But what is singular about this concurrence among mathematicians in condemning our views, is the fact as we shall now show, that they are all by one consent ridiculously wrong and wide of the mark, as we purpose proving by a new and common-

sense view of the case which must open the eyes of all these critics unless they willfully keep them closed.

But first, in order to prepare the way and let our readers see exactly what all this trouble is about, we copy the following letter from Dr. I. A. D. Blake, a bright mathematician of Wilton, Me., who, by the way, is an old and tried friend of the cause to which we are devoting our life:

Wilton, Me., April 14th, 1890.

"Dr. A. Wilford Hall, Dear Sir,—Six years ago I read your 'Problem of Human Life,' became a substantialist, subscribed for the MICROCOSM, and have eagerly read every number since. But when I took the April number from the office this afternoon and read your mathematical statement on page 73, repeated on page 57, I was astonished and grieved. Grieved, not because any mathematical error therein would endanger Substantialism, but because you give your enemies too good a chance for criticism in the very demonstration in which you 'defy criticism.'

You say 'while at 1,000 feet from the bell the sound has decreased to 1,000,000th of its intensity, yet at 999 feet its decrease has been but to the one 998,000th in round numbers. That is to say, in traveling through the last foot of this distance, it lost 2,000 times the intensity it had on reaching the 999th foot-circle!' Do you not see that to get the 2,000 above you have called 1,000,000th and 998,000th whole numbers instead of denominators of fractions, each of whose numerators is unity? According to the theory of 'Squared distance inverse,' the correct difference in intensity between the two given points one foot apart would be $\frac{1}{998,000} - \frac{1}{1,000,000} = \frac{2,000}{998,000,000,000} = \frac{1}{499,000,000}$ of its intensity at one foot distant, a quantity too small to be appreciated by the human ear. * * * I write this in no fault-finding spirit, but simply for the correction of errors in the interest of truth. Yours, etc, I. A. D. Blake."

The foregoing is the substance of the mathematical calculation and argument against our view, though really no two of our critics, as we show elsewhere, agree in the result of their fractional explanation of the real decrease and increase of sound in passing forward and backward through this last foot of the 1,000.

Let us say here, and once for all, that this claimed fractional increase, $\frac{1}{998,000} - \frac{1}{1,000,000}$ equaling $\frac{1}{499,000,000}$ of the unit of sound at the first foot from the centre, is the most monstrous error that could be put into a mathematical formula. We assert, further, that there is not the slightest necessity for a fractional formula to be used at all, but the simplest possible whole numbers, as we will see in a moment.

But if fractions must be resorted to, then it will be correctly stated thus: The sound increases in moving the ear from the 1,000th to the 999th ft. $\frac{2,000}{1,000,000}$ of its intensity at the first foot from the centre, equal to $\frac{1}{500}$ of that unit of intensity, if there is a word of truth in the wave-theory or in this law of inverse squares as applied to the decrease of sound, light, heat, magnetism, etc. If we do not now demonstrate this to be correct, we will cheerfully permit all our critics to write us down as a veritable ignoramus.

To make it perfectly plain to a beginner in arithmetic, let us first copy the law of the ratio of sound-decrease as the square of the distance from the centre as taught by that highest English authority on acoustics—Prof. Tyndall:

"You have, I doubt not, a clear mental picture of the propagation of the sound from our exploding balloon through the surrounding air. The *wave of sound expands on all sides*, the motion produced by the explosion being thus diffused over a continually augmenting mass of air. It is perfectly manifest that this can not occur without an *enfeeblement of the motion*. Take the case of a shell of air of a certain thickness with a *radius of one foot*, reckoned from the centre of explosion. A shell of air of the same thickness, but of *two feet radius*, will contain *four times the quantity of matter*; if its radius be *three feet* it will contain *nine times the quantity of matter*; if *four feet* it will contain *sixteen times the quantity of matter*, and so on. Thus the quantity of matter set in motion augments *as the square of the distance* from the centre of the explosion. The *intensity* or *loudness* of sound *diminishes in the same proportion.*" —*Lectures on Sound*, p. 10.

Now, every one knows that the quantity of matter in the first shell of air of a foot thickness around the centre, is the unit of calculation for the air, and that the intensity of the sound at one foot from the centre is the unit of calculation for the sound. The increase of the quantity of air as we advance from the centre is in the precise ratio required by this law, and if the wave-theory be correct (which we flatly deny) the quantity of sound must decrease exactly in the same proportion by parts of a unit as the quantity of air increases by whole units, since this motion-theory of sound teaches that the more air there is to move, the less must be the motion or amplitude of the vibrating air particles which is supposed to be sound. And if this proportionate relation between the increase in the quantity of air and this claimed decrease in the intensity of sound breaks down, then, of course, the wave-theory is proved to be false. This has been the purport and aim of our entire argument exposing the absurdity of sound-decrease as the square of the distance. Let us now see who is right as to the general position we have assumed.

At 2 ft. radius the shell of air contains 4 units or 4 times the quantity of matter of the first shell or unit, while the quantity of sound at 2 ft. is but one-fourth. At the 3-foot shell the quantity of air has increased 9-fold and contains nine units; while at the same distance the quantity of sound has decreased 9-fold, and consequently contains but one-ninth of the full unit of sound at the first foot. At the 4 ft. shell the air has increased 16-fold, containing 16 units of air, while the sound has decreased 16-fold, having but one-sixteenth of the first unit; and so on up to 1,000 feet, where the shell of air has increased 1,000,000-fold, containing 1,000,000 units, while the sound has decreased 1,000,000-fold, having but 1,000,000th of the first unit. So far there is no dispute on the part of our critics, but see if these facts do not annihilate their criticisms when carried out.

Let us now return to the 3 ft. shell of air and see what actually takes place in going back toward the centre of motion. If we go back from the third foot to the first foot we, of course, decrease the quantity of air 9-fold, while the sound in going back is increased 9-fold, or exactly in the same proportion. No wave-theorist will pretend to dispute this fact. But in going back from 3 ft. to 2 ft. the quantity of air is necessarily decreased 5-fold or 5 units (the difference between 4 and 9), becoming 5 times less in quantity than at 3 ft. or again containing but 4 units; in like manner the sound, in moving the ear back from 3 ft. to 2 ft. increases 5-fold, becoming 5 times more in intensity or quantity than at 3 ft., in the same proportion as the quantity of air diminishes, or else the law as laid down by Prof. Tyndall is not correct.

This true statement of what actually takes place between the two adjacent steps, 2 and 3 ft., and *vice versa*, both with the air and the sound, *is the simple and indisputable key to what takes place between the two adjacent steps 999 ft. and 1,000 ft. with both the quantity of air and the intensity of sound*; and hence, as we will soon see, the confusion of complicated

fractions of fractions, which has so muddled the brains of our critics, is but the essence of nonsense and of no manner of use in obtaining the true result, but on the contrary, is misleading in every particular.

Now remember, before we attempt to start up to 1,000 ft., what we have stated in our letter to the *E. M.* printed elsewhere, that the number of times the air increases in going from 2 ft. to 3 ft. is determined by the difference between the *squares* of these figures (2 and 3—4 and 9) which is 5. Then remember, that the difference between the squares of each two adjacent numbers as we go on up from 3 ft. to 4 ft., from 4 ft. to 5 ft., and so on to 999 ft. and 1,000 ft., *increases by 2 at each new step.* Thus, the difference between the squares of 3 ft. and 4 ft. is 7; between 4 ft. and 5 ft. is 9; between 5 ft. and 6 ft. is 11; between 6 ft. and 7 ft. is 13; and so on, augmenting this difference by 2 at each step, up to 999 ft. and 1,000 ft., where the difference is 1,999, *each one of these differences expressing the exact number of times that the quantity of air is increased from any foot below to the one next above, and also in like manner, each one expressing the exact number of times that sound is decreased from any foot below to the one next above.*

Thus, in going from 999 ft. to 1,000 ft., the air increases 1,999 fold; that is, the 1,000th foot shell contains 1,999 more original units of air than the previous shell. In like proportion the sound, as a matter of course, decreases 1,999-fold, or contains 1,999 millionths less intensity at the 1,000th foot than at the 999th foot circle. We defy the hardihood of mathematicians to dispute this.

Now for the culmination of the argument: As the air increases 1,999-fold, or full units of quantity, in going from 999 ft. to 1,000 ft., it necessarily must decrease 1,999-fold, or equal millionths, in going back from the 1,000th to the 999th ft.; and consequently as sound decreases 1,999-fold, or equal millionths of the original unit, in going from 999 ft. to 1,000 ft., just as the quantity of the air increases, *so the sound must increase 1,999-fold, or equal millionths, in moving the ear back from the 1,000th to the 999th-foot circle, just as the quantity of air decreases in moving back the same distance!*

Thus the sound should be 1,999 times louder at the 999th circle than it is at the 1,000th circle, if there is any truth in the wave-theory. Why? Because, first, as all wave-theorists admit, the quantity of sound at 1,000 ft. must be but one-millionth that at 1 ft., according to the law of squared distance inverse; and second, all these million parts of sound lost in receding 1,000 ft. from the bell must be restored in moving the ear back to the first foot, and that, too, foot-by-foot according to this same square of the distance. That is to say, as 1,999 units or millionths of the air at the 1,000th ft. shell are gained in passing through the last foot, or from 999 to 1,000 ft., so 1,999 millionths of all the sound lost in advancing the 1,000 ft. from the bell are restored, if the wave-theory be true, in returning the ear through this last foot, or from 1,000 ft. to 999 ft. How plain and consistent with itself is true science! What, now, becomes of the ridiculous fractions of fractions such as those of our good friend Dr. Blake—"$\frac{1}{998,000} - \frac{1}{1,000,000} = \frac{2,000}{998,000,000,000} = \frac{1}{499,000,000}$ of its intensity at one foot?"

The fraction of the increase of the sound, if we must have a fraction, in passing the ear from the 1,000th to the 999th circle, as we gave it at the start, 1-500, in round numbers, of the intensity at one foot, is proved to be correct by the foregoing analysis. There are really nothing but whole numbers in the increase of the air from one unit up to the 1,000,000 units contained in the 1,000th shell; so there is nothing but a loss of 1,000,000 small units of sound, minus one, which were embraced in the one large unit at the first foot, in advancing the same distance. As the 1,000,000 whole units of air in the 1,000th foot shell are reduced by 1,999 whole units, without any fraction whatever, in going back 1 foot toward the start, leaving exactly 998,001 whole units in the 999th shell, without any such confusion as "$\frac{1}{998,000} - \frac{1}{1,000,000} = \frac{2,000}{998,000,000,000} = \frac{1}{499,000,000}$," so the sound at 1,000 ft. is increased in moving the ear 1 ft. nearer the bell by 1,999 small units (of a 1,000,000th of the first unit each) precisely as the 1,000,000 whole units of air are diminished.

What more can our critics need than simply to look at this orderly decreasing number of the units of air in going back from 1,000 ft. to 999 ft. to enable them to understand the same order and proportionate quantity of sound increase in moving the ear back from 1,000 ft. to 999 ft? Surely, as Prof. Tyndall says: "*The intensity or loudness of sound diminishes in the same proportion.*"

Then, in order to open the eyes of the critics who have so unceremoniously assailed our position, let them first carefully note the fact that the 1,000,000 whole units of air in the 1,000th foot shell are reduced by 1,999 in moving 1 ft. toward the start, making 1,999 whole units, or 1,999-fold less air in the 999th shell than in the 1,000th shell. Then let them observe that the next step of 1 ft. reduces this 1,000,000 units of air 1,997-fold more, this being the difference between the squares of the next two adjacent numbers—999 and 998. The next 1 ft. step reduces this original 1,000,000 air-units by 1,995 more. The next ft. reduces it by 1,993 more. The next by 1,991 more. The next by 1,989 more; and so on down to the first foot from the centre where there is but one unit of air left, and, as will be seen, in absolute confirmation of our view, all these reductions of air-units, diminishing by 2 at each step, if added together, will make exactly the 1,000,000 whole units of air which were in the 1,000th ft. shell!

Then, as sound must increase in exactly "the same proportion," in moving the ear back toward the start, as the quantity of air decreases, it amounts to one of the most complete demonstrations ever seen in mathematics that in moving the ear from the 1,000th foot-circle 1 ft. toward the bell the sound must increase, if the wave-theory be correct, 1,999-fold or become 1,999 times louder than at 1,000 ft., for the simple reason that at 1,000 ft. it contains but 1,000,000th the intensity at the first foot, whereas at the 999th foot it contains 1,999 millionths of such intensity, the same precisely as the volume of air loses 1,999 millionths by moving the same distance!

What an almost infinite absurdity it would be to say that the quantity of *air* gained and lost in moving forward and backward through the last foot of the 1,000 is "$\frac{1}{998,000} - \frac{1}{1,000,000} = \frac{2,000}{998,000,000,000} = \frac{1}{499,000,000}$ of its intensity [quantity] at one foot distant" or any other small fraction of the first unit, when the gain

and loss of air in passing back and forth between the 1,000th and the 999th ft. circle are known to be 1,999 full first units!

Now we are enabled to see the monstrous absurdity of the claimed infinitesimal fractions of sound-increase in moving the ear toward the bell as figured out by our critics, making this increase as they do, obtained in coming from the 1,000th to the 999th ft. circle, but the "$\frac{1}{499,000,000}$ of its intensity at one foot!" If this really is all the increase which is gained in coming back this 1 ft., surely no other single ft. in the entire 1,000 ought to yield any more increase of intensity than this; and therefore, according to Dr. Blake and a score of other profound mathematicians, the entire increase of the sound in coming back from the 1,000 ft. circle with the ear directly at the first ft., would be only 1,000 times "$\frac{1}{499,000,000}$,"—equaling altogether only $\frac{1}{499,000}$ of the single intensity at the first foot! This is but another illustration of the contradictory involvement which results from the use of elaborate mathematical formulas where no fractions or algebraic symbols are required.

We are not surprised, however, that wave-theorists all over the world should explode into fiery indignation and ridicule at our exposure of the laughable consequences that necessarily result in carrying out the law of squared distance inverse as they have applied it to the decrease of sound and light. And no wonder that they conspire, though in the most self-contradictory manner, to belittle this variation of intensity at 1,000 ft. almost to nothing, knowing as they well must that if we are right there is not a microscope in existence powerful enough to reveal the grease spot that would be left of the wave-theory. Our only regret in the premises is the fact that so many good substantialists should have been caught in this ridiculously exposed trap without being able to see their way around it.

Now to conclude this reply to our critics, and thus to garner the fruits of the victory which our figures have achieved for the benefit of substantialists young and old, let us recapitulate in a few words the results of our reasoning. As sound must increase, as we have seen, 1,999-fold in moving the ear 1 ft., or from 1,000 ft. to 999 ft., if the wave-theory be correct, it demonstrates that theory to be a prodigious burlesque on science, since the actual movement of the ear 50 ft. toward the bell from the 1,000 ft. circle would not increase the intensity enough to be perceived by the keenest auditory nerve.

As the movement of the ear from 1,000 ft. to 1 ft. must necessarily increase the sound 1,000,000-fold as all our critics admit, or be exactly equivalent to the instantaneous addition of 1,000,000 equal volumes of sound at the centre while the ear still remains at the 1,000 ft. circle, it follows that the movement of the ear 1 ft. (from 1,000 to 999 ft.) should be exactly equivalent to the instantaneous addition of 1,999 equal volumes of sound at the centre,—that being the number of *millionths* sound is increased in that single foot if there is a grain of truth in the wave-theory and if this law of squared distance inverse is applicable to the natural forces. No one dares now to dispute this increase since positively that is the exact proportionate increase and decrease of the volume of air, as just shown, between the 1,000th and the 999th foot shells, according to the law of squared distance inverse.

This law of inverse squares—being the underlying and basic law of the motion-theory of sound, it follows that in overturning such application of the law, in the very face of a hundred mathematical critics, we have totally demolished the wave-theory by thus crumbling its foundation principles.

The absurdity of the theory, as based upon this law of inverse squares is, more vividly exposed by reference to our exposition of the decrease of light as the square of the distance as seen in our letter to the *English Mechanic* in this number, and as first elaborated in our articles last month, which our scientific readers must not fail to study.

We rejoice, with exceeding joy, that by no accident has our life or mental power been cut short before we were able to place on record this crushing and crowning quietus to the wave-theories of sound and light; for now we can rest serenely calm with the belief that if we should fall asleep to-morrow, never again to awaken in this world, thousands of young investigators will be ready at any time to flock into the scientific arena at the blast of the bugle of Substantialism, any one of which, with these arguments well in hand, will be more than a match for the ablest champions of the materialistic hosts. To such young substantialists we now transmit our benediction, with our prayer that they may never be known to lower the standard of the Substantial Philosophy in the presence of the enemy.

P. S. A large majority of the readers of the MICROCOSM who have criticized our view of inverse squares, have superficially concluded that we oppose the law of squared distance as it applies to given spherical shells of air around a central point. This is simply ridiculous. We only repudiate this law as relates to the normal decrease of the natural forces, especially that of sound. Plainly, if sound decreases as the quantity of the surrounding air increases, according to the law of inverse squares, it agrees precisely with the claims of wave-theorists, that sound is but the motion of the air, decreasing necessarily as the quantity of air to be put into motion increases. Convince this humble editor of the MICROCOSM that the intensity of sound and light decreases in the distance as the quantity of the atmosphere increases by the law of squared distance inverse, and our opposition to the motion theories of science will immediately cease.

PROF. D. JAMES, A.M.

We call attention to the very thoughtful and critical paper of Prof. James in this number of the MICROCOSM. It does us good to observe such fine scientific distinctions as are made in that brief paper. We do not know the age of our contributor, but hope he is not an old man for the sake of the cause he so ably represents. Substantialism needs all the help within reach to give it a fair start in the midst of so much false conception of the nature and character of force; and to note these fine discriminations of our contributor is certainly very encouraging.

While Dr. Audsley is starting the Substantial ball to rolling in England in his public lectures and in his masterly series of papers in the *English Mechanic*, it is hoped that every Substantialist in America will arouse to the work of letting the masses know that the Substantial Philosophy is no mere whim of the

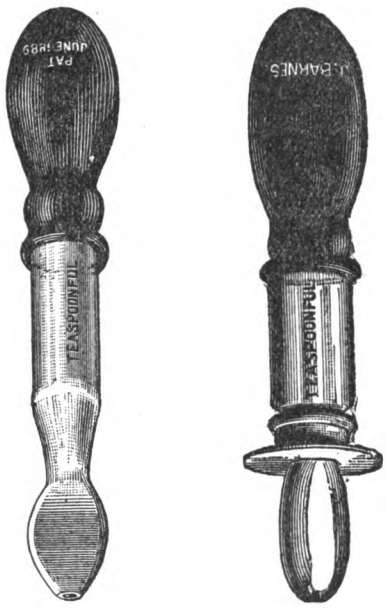
passing hour, but a revolution in physical and metaphysical science which has come to stay.

We are glad to learn that Prof. James has also taken the lecture platform, at least to the extent of several set papers on Substantialism before educational conventions; and we hope to have from his incisive pen many page-articles, similar to the one here given, before this volume shall close.

A BEAUTIFUL LITTLE INVENTION.

The accompanying engravings show a small and very useful device for feeding infants and persons too sick and weak to sit up in bed. Under such circumstances every one knows how inconvenient it is to administer nourishment or medicine with a teaspoon. The little instrument here shown takes the place of the spoon, and is infallible in doing its work exactly as it is required for any purpose.

The top of each instrument, as shown, consists of a hollow rubber bulb which, after being pressed together with the thumb and finger, will suck up into the tube milk, beef tea, or any liquid to be administered, none of which will run out, only as the bulb is again pressed, which can be so gauged, as in the case of medicines, as to allow one to count the drops.



The lower end of one of these instruments consists of a soft rubber nipple for feeding infants, while the other is of glass for adults who are very weak. As they sell at twenty-five cents each they are within the reach of every family, and no family should be without one.

As we do not take advertisements at all, we refused advertising space for this instrument or any pay for the notice we here give, believing it our duty to make known free of charge such a useful device.

Address Dr. Joshua Barnes, the inventor and manufacturer, 130 Fulton Street, New York, enclosing the price, and it will be sent by mail.

SHALL THE HEALTH PAMPHLET CHANGE HANDS?

A syndicate of capitalists are now negotiating for the purchase of all right and title to our Health-Pamphlet for a sum that will handsomely endow the College of Substantialism. The chief objection to this deal is the fact that it is proposed to raise the price from $4.00 to $10.00, and stop off all free copies to the poor and to others, while keeping the commission to agents the same as now given. For the present we have declined this offer, believing that the good we are doing to the world will accomplish more in the end for the cause of Substantialism than would even a hundred thousand dollars in ready cash. As a sign of this beneficient preparation for the accomplishment of the grand work of our life, the distribution of the Health-Pamphlet is already adding about 1,000 new names to the subscription list of the MICROCOSM every month.

Those intending to secure our great remedy, without drugs of any kind, should send the four dollars at once.

A POINT FOR AGNOSTICS.

BY THE EDITOR.

Atheists declare their inability to believe in the existence of God as a personal intelligence because such existence, separate from a bodily and material organism, is too mysterious for the intellect to grasp or accept. Yet these very agnostics accept the fact that a young carrier pigeon only a few months old, and that has never been outside of the dovecote, can be taken in the dark a thousand miles away and liberated, and it will infallibly find its way home at the first trial. This mystery is equal to that of a self-existing, all wise and personal God as the creator of the universe, and can no more be grasped by the human intellect than can the immortal personality and conscious existence of man separate from his material organism. Yet the astonishing fact of such an unknown sense possessed by the homing pigeon, with its incomprehensible intelligence, has to be accepted by the boasting skeptic and confessed in defiance of his agnosticism. Such knowledge as that of the carrier pigeon, possessed by man to a degree and extent commensurate with his superiority over that bird intellectually, personally and spiritually, would almost constitute him an infinite being, and would make it still more foolish for the atheist to say in his heart, "There is no God."

The homing pigeon, however, is only one marked case of incomprehensibility with which every department of nature abounds. We can not enter into details. One only will we name as a very trifling illustration of natural mystery, but one nevertheless as difficult of solution by our puny intellects as would be the existence of God himself, and that is the ability a bird possesses of making two distinct and sustained notes of different pitch and character, and of equal force at the same time. We have always regarded such a musical feat as impossible as it would be for an opera-singer to achieve a similar result. Yet our own ears have forced us to accept this double-note mystery as an absolute fact, notwithstanding its incomprehensible character. A friend of ours has a canary bird which is thus continually singing in two distinct notes at the same time, the one not being a musical chord or over tone

of the other. When the agnostic will suggest any hypothesis upon which this phenomenon can be grasped and comprehended by the human intellect, then may he with more consistency than at present repudiate all evidence of a personal God, or the entitative existence of his own immaterial soul separate from his body.

DR. AUDSLEY'S LECTURES.

We are glad to learn from the *Musical World*, London, that Dr. G. Ashdown Audsley has begun lecturing on the new departure in the science of acoustics. The editor of the *Musical World*, though terribly at sea on the subject of "Material and Immaterial Substances," nevertheless gives a fairly creditable notice of the doctor's first lecture, as follows:

"Those who may be interested in the new theory of sound submitted to the Musical Association on Monday, an account of which will be found in another column, may be referred to the "English Mechanic and World of Science," in the pages of which a series of articles on the subject, by Mr. G. A. Audsley, F.R.I.B.A., is now appearing. The 'Substantial Philosophy,' of which the acoustic theory is but a branch, is due, we are told, to an American, Dr. A. Wilford Hall, Ph.D., LL.D. 'The central and cardinal proposition of this philosophy,' says Dr. Hall, 'is that every force of nature as a phenomena-producing cause must, in the very necessities of true science and of the relations of cause and effect, be a substantial entity or an objective existence.' He goes on to say that force, so far from being, as generally taught, an *effect* of the motion of matter, is really its *cause*. But, as force can pervade matter, the difficulty presented itself of explaining how two substantial entities can occupy the same space at the same time. This Dr. Hall coolly disposes of by dividing the entities of the universe into *material* and *immaterial substances*. Not having seen Dr. Hall's book, we can but hope that it provides for the difficulty which ordinary minds will experience in forming the conception of an '*immaterial substance*,' *i.e.*, that which *is* and at the same time is *not* matter; but as Mr. Audsley is silent on the point we are just a little doubtful. One thing, at any rate, is clear. The new theory will have small chance of acceptance if it is to start handicapped by such an absurdity as, without a further explanation, the phrase 'immaterial substance' seems to be. It is to be hoped, however, that those musicians who are interested in the scientific basis of their art will be willing to weigh carefully Mr. Audsley's suggestions, which should neither be derided nor too readily accepted *for the sole reason that they are new*."

It is plain that the editor of the *World* does not realize the result of his superficial and unphilosophical remarks in the above comment, in which he weakly confines every entity in the universe to matter.

We are glad that physicists in America are becoming better educated in the principles of sound science than to expose themselves so vulnerably to criticism as does this English editor. They are beginning to open their eyes to the philosophical truth that there exist all around us real substantial entities that can not be matter in any sense of the word, since they occupy and pervade the densest material bodies in full force as if nothing were present. But of course this superficial writer sees magnetism lift a piece of iron, exerting exactly as much power through a dozen sheets of glass as if they did not intervene, yet he can not realize "such an absurdity" as that this magnetic force is a real substantial or objective entity, or even anything at all because it is not matter.

Plainly he believes with all his soul that he does not possess a soul at all, unless perchance it happen to be a lump of matter hidden away some place in his physical cranium. We very strongly suspect, however, if he shall continue to attend Dr. Audsley's lectures, he will be able after a little to apprehend that the idea of an "immaterial substance" is not "such an absurdity" as it now strikes him to be.

We are looking for a special report of Dr. Audley's first lecture for the MICROCOSM; but it was not in time for this number. We expect to print it next month.

The last paper of the doctor's in the *English Mechanic*, was devoted to an explanation of the Substantial Philosophy, and was full of excellent points.

A RED-HOT CONTROVERSY.

BY THE ASSOCIATE EDITOR.

I feel that about sufficient has been said upon this exciting question of the "Increase of sound as the square of the distance" to convince an unprejudiced mathematician that the critics of the editor are all at sea in their calculations. I have read the proofs of the two articles in this number, and have examined dozens of adverse criticisms of Dr. Hall's novel position as printed in the April MICROCOSM, besides listening to any amount of verbal discussion on the subject in this office, till I begin to think I see broad daylight through the entire problem involved in the controversy. Let me now try to state the case concisely.

In the first place, what does Dr. Hall claim as to the teaching of the wave-theory on this subject, which, as he insists, manifestly contradicts the facts of science and observation? The particular position of the doctor which has raised the present storm of criticism both in England and in this country, was his statement that if this fundamental law of the wave-theory be accepted, it involves the belief that in passing the ear through the last foot of 1,000 from a sounding-bell, a change of intensity 1,999-fold must take place. In other words, if the ear, stationed 1,000 ft. from the bell, be moved one foot nearer to it, the intensity of the sound should become 1,999 times greater than at the 1,000 ft. circle, if the wave-theory be correct; whereas there is no appreciable difference in the intensity of the sound even if the ear should move a distance of fifty feet nearer to the bell.

Dr. Hall restates the case thus: If the wave-theory be correct the movement of the ear from the 1,000th to the 999th ft. circle, should have the same effect on the augmentation of the sound as if 1,999 bells had simultaneously been struck at the centre, with the ear still remaining at the 1,000 foot circle. I believe he has demonstrated this position beyond all possible doubt, by reference to his second article on the subject in this number. Let me present the gist of his argument in a new way:

First, as to what all wave-theorists admit: They admit without exception that at two feet from the centre, in order to make the sound as loud as it is at 1 foot, 4 equal bells should be sounded. They admit, secondly, that if the ear should be moved back from 2 ft. to 1 ft. while the four bells are sounding, it would augment that one intensity of sound 4-fold; and that if the sound of the bells were to be stopped off while the ear was moving through this foot, and in such manner as to keep the one intensity uniform, three of these bells must gradually be silenced while the ear is thus moving through the 1 ft.

This being so, the same principle applies at three feet from the centre, where, in order to make the sound equal to that at one foot, it

would require 9 equal volumes at the centre. All wave-theorists admit this. And they will also admit that in moving the ear from 3 ft. back to 1 ft. in such manner as to keep the single intensity uniform, 8 of these 9 bells would have to be stopped off within that distance.

Now the gist of what Dr. Hall claims in addition to the above admitted teaching of wave-theorists, is that in moving the ear from 3 ft. back to 2 ft. (the next adjacent number) while the 9 bells are sounding and in such manner as to keep the single intensity uniform, *five of these nine bells must be stopped off within that one foot travel of the ear, leaving four of the 9 bells still sounding in order to maintain the one intensity at two feet.* This position seems positively self-evident on its face, since the five bells stopped off, to keep the sound uniform while moving the ear from 3 ft. to 2 ft., represent the *difference* between the squares of 2 and 3 (4 and 9) which is 5.

All this being true, he simply applies the same principle to the two adjacent numbers,—the 999th and the 1,000 ft. circles,—and that, too, with irresistible force. Here again, wave-theorists admit that it would require 1,000,000 bells at the centre to make the sound as loud at 1,000 ft. as at 1 ft. with one bell sounding, because at 1,000 feet the sound is reduced a million-fold in intensity. They also admit that at 999 ft. it would require only 998,001 bells to make the sound as loud there as at 1 ft. with one bell sounding, as this is the square of 999, the same as 1,000,000 is the square of 1,000.

Now Dr. Hall insists most correctly, that in moving the ear from 1,000 ft. to 999 ft. (while the 1,000,000 bells are sounding) in such manner as to maintain the one uniform intensity, it would require 1,999 of these 1,000,0000 bells to be stopped off, *that number being the difference between those two squares.* Surely nothing can be plainer than this.

If, however, there be but 1 bell at the centre with its sound reduced to one-millionth of one intensity at 1,000 ft., as all science teaches, the doctor insists, and it seems entirely plain, that in moving the ear back to the 999th ft. circle, the same 1,999-millionths of sound (the difference between the two squares) must be added to the one-millionth retained at 1,000 ft., thus increasing the intensity of the sound 1,999-fold, *or making it 1,999 times* louder, than it was at 1,000 ft. This seems to be the only possible conclusion, if the wave-theory be correct—that is, if sound really decreases as the square of the distance from the centre; and this was Dr. Hall's original charge, thus proving as he claims, the wave-theory to be a monstrous absurdity. If he has not sustained his charge to the letter, in his editorial in this number, I frankly confess my entire inability to comprehend any principle of exact science.

THE MICROCOSM ON THE INCREASE.

Thousands of new names of subscribers are pouring into this office as we write, so that it is difficult for our clerks to keep the books even. This encouraging increase in our subscription list results chiefly from the grateful appreciation felt by the tens of thousands who have come into possession of our Health-Pamphlet, and who have thereby been restored to health. These grateful readers of that little book feel that its author, having done so much for suffering humanity, is entitled in return to their aid, and that he should be sustained in his effort to spread and defend the Substantial Philosophy. This is the reason why no paper in New York is so rapidly increasing its circulation as is the MICROCOSM. Back numbers of the present volume can be had from the beginning, and sample copies will be sent free to any address.

OUR PRIZE ESSAY CONTEST WITHDRAWN.

So little interest is taken in writing prize essays for the present volume of the MICROCOSM, that it seems not worth while to continue the proposed contest. A very few essays have been received, but these are in most cases but a rehash of previous discussions hardly suitable to come within the scope of our original programme. We had hoped that young and rising Substantialists would try to delve into the secret archives of Nature and bring forth new and original arguments in support of the Substantial Philosophy; but we are disappointed. It seems that gems of great value are nearly always more apt to be stumbled upon by accident than found purposely even by the most diligent search.

APPEAL TO SCIENTIFIC STUDENTS.

BY THE EDITOR.

Having as we believe totally demolished the law of inverse squares, as applied to sound and light, in our two articles on that subject in this number, we now appeal to every scientific thinker in the land, after a careful study of both articles, either to sustain or condemn our reasoning, and in the briefest possible manner to give the reasons why. Much of the future of the scientific revolution involved in the Substantial Philosophy hinges upon this very discussion. So let every man competent to weigh the subject speak right out. Those who do not think that they see their way clearly had better keep silent.

ISAAC HOFFER, ESQ.

We have in type an able and exhaustive paper bearing on Substantialism from the pen of our old contributor, Mr. Hoffer, but it was crowded over till next month by the critical and vital discussions of the wave-theory of sound.

OUR NEW "SUPPLEMENT."

As we intend limiting our notices of the Health-Pamphlet in the future to one page of the MICROCOSM, in order to give our subscribers all the space possible devoted to scientific, philosophical, and educational discussions, we have issued a *Supplement* in connection with our "Extra" MICROCOSM to be sent as third class matter and to be prepaid by stamps. Those who may wish to learn all about the Health-Pamphlet, or who may desire their friends at a distance to know about it, can send us a list of names and addresses for any part of the world, and the "Extra" MICROCOSM as well as *Supplement* will be sent free.

Persons wishing to learn also of our Scientific Library of ten volumes, at greatly reduced prices ($6), will receive a special circular on the subject. These volumes relate chiefly to the Substantial Philosophy, interspersed with various collateral discussions both scientific and religious. Address all communications,

A. WILFORD HALL,
23 Park Row, New York.

ANOTHER PAGE OF TESTIMONIALS.

The demand for our Health-Pamphlet is still enormous, exceeding anything ever known in the history of remedial revolutions. Our free offer to doctors and ministers (now withdrawn) has taken well on toward one hundred thousand copies, besides the tens of thousands that are being sold monthly. We want agents everywhere to call the attention of the afflicted to this drugless remedy.

The Hon. John D. Townsend, the eminent lawyer of this city, sends us the following unqualified indorsement:

"My Dear Dr. Hall,—Having tested the merits of your hygienic treatment upon myself during the past six months, I feel that it is but fair that I should give you a candid statement of my belief in its great value. During the years in which I have been familiar with you through the pages of the MICROCOSM, you have advanced many ideas which to me have been new and impressive; but in my view your Health-Pamphlet, relating as it does to the promotion of the health and longevity of the entire race, exceeds them all. The reasons in favor of the new treatment which you present in your little book are so full of common sense that I was induced to make the trial, and I frankly confess that I thoroughly appreciate the system. You may make such use of this letter as you choose, and if it shall be the means of advancing your discovery I will be pleased.

"Very truly yours, John D. Townsend."
April 15th, 49 and 51 Chambers St., New York.

Prof. I. L. Kephart, D.D., Editor of the *Religious Telescope*, Dayton, Ohio, and former president of Westfield, Ill., College, writes April 9th:

"Dr. A. Wilford Hall, My Dear Sir,—For some time I have thought of writing you, but desired to delay until such time, as I had given your 'health treatment' a satisfactory, prolonged trial. That time is here now; and I only wish to say that my confidence in its efficacy and great value is unbounded, I take pleasure in endorsing all that Dr. Stevens, of Syracuse, N. Y., has said in its favor, and more, too. In my humble judgment, by your discovery and by your bringing it to the notice of the public, you have become one of the great benefactors of the race. You are at liberty to make any use of this testimonial you desire. Wishing you many days of unalloyed happiness and prosperity, I remain, with gratitude. Very truly yours,

"I. L. Kephart."

Rev. Dr. James A. Buck, Rector of St. Paul's Church, Washington, D. C., now nearing eighty years of age, closes a long letter of April 11th, in these words:

"* * * I feel much interested in your proposed sanitarium in connection with the college of Substantialism. Oh that rich men knew and would feel what great and good things they might do with their money! But I must close. Before I do so, however, let me say, that I have cause to bless God for all that you have done for me, both in mind and body. After a twelve months' use of your treatment, I consider your Health-Pamphlet of such inestimable value that no earthly consideration would induce me to part with the knowledge I have derived from it, if such a thing were possible. It is not only a great comfort to me, but it enables nature to fulfill all her offices and do her work so thoroughly that it is the nearest approach yet made to a 'universal panacea.' The whole world should know of it—the sick that they may be cured, and the well that they may be kept in good health. More than this in behalf of any treatment can hardly be said.

"With love, I am, yours truly, Jas. A. Buck."

Rev. Ira C. Mitchell, Mansfield, Ohio, writes, April 24th:

"Dr. A. Wilford Hall, * * * On Saturday last, I found one of my parishioners very low with a malignant type of fever, with tongue coated till it was almost stiff and pulse above 90. His physician had told him that he did not know that he could do anything more for him. I called his attention to your treatment and he immediately desired to try it. As no time was to be lost I took his pledge and pay for the Pamphlet and loaned him mine till I could get another from you, and the treatment was immediately applied. The result was that in two days his fever had left him, his tongue was as clean as that of a little child, his pulse was 72, and he was up and dressed and with his family at the table. He now declares that he would not take the city of Mansfield for the knowledge he has derived from that Pamphlet. Yours Fraternally,

"Ira C. Mitchell."

Rev. Dr. H. Z. Adams, Orange, Cal., writes, April 2d:

"Dear Dr. Hall,—I have been, and still am receiving so many letters of inquiry in reference to your Health-Pamphlet, (all of which I have answered) that I am constrained to write an additional testimonial for the MICROCOSM, and for the benefit of all whom it may concern. In January, 1863, I was forced to retire from the army, on account of *Chronic Diarrhœa*, and as a result, then followed *Chronic Indigestion* and *Dropsy*, so that for more than twenty-five years I have not gone to sleep on my left side, a thuding sensation in the region of the stomach preventing my doing so. My legs from *knees* to my *feet* swelled, less or more every day, and sometimes I feared the skin would burst. I have medicated all these years with the best physicians I could find, both Homœopathic and Alopathic, and could get but temporary relief. I commenced your treatment in May, 1889, and my indigestion is all gone, I sleep on my left side as sweetly as a babe, and am as clear of dropsical affection as any man living, at eighty-two years of age. Yours truly, H. Z. Adams."

Rev. J. B. Denton, Baby Head, Texas, writes April 8th:

"* * * I wish to tell you that I am profoundly impressed with the value of your treatment. Two weeks ago I was in an extremely low state, in fact as I considered almost at death's door, having suffered from 'La Grippe' since last Christmas, in connection with a liver trouble of long standing. From the first application of the remedy I improved as if by magic, till now I am in better health than I have been for eight years.

"Yours gratefully, J. B. Denton."

James Clarke, Hartford, Conn., writes April 12th:

"Dr. Hall,—I have your pamphlet, and have used the treatment for sick headache, which has troubled me greatly. I regard it as the only sure cure for that disease, and so much do I appreciate your remedy I would not be without it for $500. * * * You can use this testimonial any way you wish. Sincerely yours,

"James Clarke."

N. D. Hart, Druggist, Mexico, N. Y., writes April 21st.:

"* * * I have used your treatment since last September, with such grand results I would not be without it for fifty dollars. I want my family physician to have it, as I see by March MICROCOSM you have liberally offered to make it a present to regular physicians. I enclose postage for the same. You have done a grand thing for suffering humanity. I used your treatment for muscular rheumatism, and took it out in three applications. Yours very truly, Norval D. Hart."

[Here is a man whose sense of honor forces him to tell the truth in the interest of humanity, even when opposed by his own business interests.]

Rev. A. P. McDonald, Mt. Pleasant, Mich., writes April 4th:

"Dr. Hall, Dear Sir,—I received your pamphlet on Health and Longevity, and have made two applications of the treatment to myself, and I must say it has proved a godsend to me. I have not felt as well for five years as I do now. I certainly feel like a new man. A soreness I have had in the stomach for the last eight years entirely passed away with the second treatment. During all these years I could not bear to touch myself in the pit of the stomach with the tip of my finger. To-day I can thump myself with my knuckles in the same spot without hurting me. I rejoice and thank God that I ever heard of you. Your grateful friend,

"A. P. McDonald, Gen. Missionary."

A. H. Fuson, Esq., Nebo, Mo., writes April 20:

"Dear Dr. Hall,—For more than five years I have suffered with nervous prostration. During that time I have spent more than $500 for doctor's bills and search for health, besides loss of time. Finally, your Health-Pamphlet fell into my hands. It seemed only a straw, but as a drowning man I grasped it, and now I have no words in which to express my appreciation of its merits. Four weeks ago, when commencing the treatment, I had not been up for all day in nearly four months, and I suffered constantly from cold feet, loss of appetite, etc. Since then my weight has increased nine pounds, my appetite is excellent, my feet are warm, and I am beginning to do light work. I expect to be a well man in the near future. By the publication of this discovery you have merited the lasting gratitude of mankind. * * * *

"Very gratefully yours, A. H. Fuson."

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
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A REVIEW OF THE MOTION THEORIES OF SCIENCE. THE CRISIS APPROACHING.

BY THE EDITOR.

It is a cause of profound surprise to the philosophical mind in the light of Substantialism, that since the dawn of scientific investigation the nature and character of force have been so entirely misapprehended by all the great thinkers of the world.

That any sensible effect in the realm of physical or metaphysical observation should be supposed to occur without the operation and concurrence of a real substantial entity as its moving cause, is the marvel of marvels viewed in the light of the present self-evident principles of the Substantial Philosophy. Yet strange and impossible as such a view seems to a mind once imbued with the revolutionary principles advocated in this journal, it is even now taught as sound physical philosophy in all our great colleges that the *motion* of matter in many observed phenomena is the actual force which causes such motion, thus making it both the cause and the effect.

That a philosophical mind could conceive motion under any possible circumstances to be more than the resultant effect of the application of force to a substantial body is wholly unaccountable. Or that motion should be regarded as any thing except the mere changing of position in space, whatever the substance making this change or whatever the nature or character of the agent causing it, is no less an inexplicable enigma. Yet our school-books are full of just such meaningless incongruity.

When Sir William Thomson, than whom no higher authority can be quoted, gravely declared a few years ago in his learned address before the assembled students of the Midland Institute at Birmingham, England, that the magnetic force which lifts a piece of distant iron was "nothing but the rotation of the particles of the magnet," those students almost held their breath at the profound scientific wisdom inculcated in that most lucid and satisfactory solution of the problem of magnetic attraction. Though they had, without doubt, at times vaguely caught a glimpse of the thought that there might possibly be some real objective thing reaching out from the magnet to seize the iron bar and pull it bodily, yet the difficulty of one material substance passing through another, such as impervious sheets of glass, and lifting the distant iron as will magnetism, gave a quietus to such substantial dream of the fancy, since under the received idea of motion, as all there is of force, nothing is left as a real and substantial entity except *matter* in some of its forms. Hence, with what alacrity and mental exuberance did those puzzled and befogged students seize upon the authoritative announcement of that most eminent physicist of Europe as the final determination of the whole question, namely, that the magnetic force which lifts the distant bar is "nothing but the rotation of the particles of the steel magnet."

These students did not stop to ask the distinguished savant in what possible manner the rotary motion of the steel particles of the magnet, confined as they are to their own rigid bar of metal, could make their way out of their confines through the air and the intervening sheets of glass, and mechanically grapple with the distant iron mass and lift it bodily in opposition to gravity. No; such an uncultivated catalogical inquiry, after a display of intellectual profundity so original and remarkable, would have smacked of a scientific sacrilege that would nearly if not quite have profaned the occasion. Hence, as students have been taught to do from time immemorial, they shut their intellectual eyes, bridled their impertinent tongues, clenched their philosophical fists, and with one mechanical gulp bolted the mighty truth that this force of nature which gives the most self-evident proof of its substantial character of all the physical forces, is but the rotary motion of the distant molecules of the steel magnet!

Of course these students were already familiar, and had been during their entire primary course of instruction, with Prof. Tyndall's "Heat as a Mode of Motion," and had become thoroughly imbued with the idea that so far from the heat which fills a room from a blazing fire or from a red-hot stove being a real substantial or objective thing, it is but the vibratory motion of ether, a material substance resembling a jelly which fills all space, surrounds the molecules of bodies and in which these molecules dance in suspension like toy balloons in the branches of a Christmas tree.

Believing as did these Midland students, by their long drill in Tyndall's text-book, that "heat, its essence and quidity, is *motion and nothing else*," they were dead-ripe for Sir William Thomson's clincher, which added magnetism to the already long list of the motion theories of science. Sound was a foregone conclusion, and from the very dawn of scientific investigation had been conceded to be the motion of air particles and nothing else outside of our sensations, while inside of them it was but the motion of our nerves transferred from the

wave-motions of the air to the to-and-fro swings of the tympanic membrane. Clearly with such a view of one of nature's most conspicuous forces universally conceded and accepted, it was not difficult to add light and heat as analogous modes of motion, the only missing link in the chain of necessary facts being a suitable substance for undulation which it did not take Huygens long to invent in the all-pervading and jelly-like ether.

From these three modes of motion thus well established in the colleges of the world, consistency seemed to demand from the great Scotch logician as president of the Royal Society of Great Britain, that other forces of nature should not stand aloof from the rational and harmonious ranks of accepted science. After he had forced electricity into the ranks as another mode of motion among the particles of ether, he attacked as already hinted, the problem of magnetism. But here he made his bad break. Why he did not make the magnet act on the distant bar through the intervening waves of his jelly-ether and thus lift it, he fails to explain and we fail to imagine. Why magnetism should be the "rotation of the steel molecules" of the magnet instead of the vibration of the intervening molecules of ether, when such etheric motion accomplishes all the marvelous effects of heat and light, is a question open for discussion.

But to come down to sober reason and serious common-sense, the motion-theories of science in all their conflicting forms, as both the cause and the effect of force, are without the least foundation in rationality or in the laws of mechanics. Modern physicists assume wildly the motions of ether to be the force which produces observed phenomena, while this force in turn keeps up the motions of the ether particles, as in the case of heat, by which the observed phenomena are produced. In other words, the ether-waves, as the effect of etheric force, which in turn are but motion, are the cause of the force which produces the waves. The force is thus the motion which as the cause of its own effect is without a cause till the motion which is the effect of some active force produces it. A more incoherent jumble of ideas never confused the brain of a lunatic. Yet this teaching, brought down to its last analysis, is a fair specimen of the scientific stuff that our physical text-books are made of.

It was not until the Substantial Philosophy made its advent that the slightest order could be brought out of this confusion. The moment it was announced that every force of nature as a phenomena-producing cause must in the very nature of things be a substantial though immaterial entity, the scientific fog began to lift, and the unobscured sun of true physical philosophy began to shine out in all its brilliancy as if there never had been a cloud to obstruct its light.

The classification which at once followed, by which all the entities in the universe were divided into the two grand departments of material and immaterial substances, helped to dissipate the confusion and scatter the gloom from the minds of all who were sufficiently free from prejudice to receive the new scientific light.

The minor classifications in the material realm distinguishing the gross from the more refined substances, and similar divisions in the immaterial domain for classifying the natural forces into the physical, vital, mental, psychical and spiritual, while making them all substantial entities and as real and objective as the grossest tangible matter, still further aided in making the whole system of nature harmonious and consistent with itself, and in making it possible to construct out of these materials a uniform system of physical, vital, mental and spiritual philosophy of universal application.

To accomplish a desideratum so devoutly to be wished, and thus rescue science from its time-dishonored obscurity, it became absolutely essential to organize an uncompromising attack upon every form of the motion-theories of science, including, of course, those of sound, heat and light.

To leave one of these theories undemolished would have been tacitly and practically to surrender the contest at the very start. Hence, the chief attack, as so often described in these pages, had to be made upon the most formidable, ancient, universally conceded and apparently self-evident of all the motion-theories of modern science, namely, that of the wave-theory of sound. Should that theory prove impregnable, then our labor would be in vain; but should the wave-theory of sound be forced to succumb under the blows to be struck by Substantialism, the conclusion was foregone and irresistible that force *per se*, and in all its complex forms and operations, must be accepted as a substantial entity.

With sound demonstrated as a substantial force, no one would question heat or light, much less doubt the substantial nature of magnetism, electricity, gravity, cohesion, etc. And with these physical forms of force all demonstrated as real objective things, who for a moment would call in question the substantial nature of life, soul, mind and spirit—the forces by which men and animals live, move and have their being? Thus alone, by the demolition of the wave-theory of sound and the establishment of sound-force as a substantial entity, was a broad highway cut through the wilderness, and a mighty analogical weapon placed in the hands of every advocate of the immortality of man or defender of the soul as a conscious, personal, intelligent, substantial and enduring force.

Up to that time not one man on this whole earth had been able to make any sort of reply to Dr. Hæckel's defiant assumption that the soul and life, like sound and heat, were but modes of molecular motion. He had mercilessly cut down every theological foe in Europe who had dared to assail his atheistic materialism or to defend scientificially the immortality of the soul, and before this same two-edged cutlass of "soul as a mode of motion" and the certainty that death ends all, in correspondence with the admitted principles of science, the invincible Joseph Cook, of Boston, had just fallen prostrate in Fanueil Hall with the words still trembling upon his lips: "I believe in the wave-theory of sound and that heat is but a mode of motion!" In the midst of this galling triumph of the distinguished naturalist of the University of Jena, and while he was putting the finishing touches upon his two great volumes—"The Evolution of Man,"—he heard of the "Problem of Human Life," and learned with consternation that the motion-theories of science had been successfully assailed, and that all his claimed natural analogy had been logically coerced into the service of nature's God

and in favor of a future life for humanity. It was, then, for the first in the history of defiant German materialism that Prof. Hæckel trembled.

All this legitimately grew out of the uncompromising attack which Substantialism had made upon the motion-theories of science in general, the wave-theory of sound in particular, and as a reflex crusade against Hæckle's doctrine of the soul as a mode of motion predicated upon the teachings of the colleges that force, *per se*, is motion and nothing else.

On this general line of warfare the battle has since raged, and though there have been occasional lulls in the roar of the substantial artillery, never for a single month has the smoke of the camp fires of the army of occupation ceased to be visible all along the enemy's front. And in this way do we expect the war to continue till the end, which we believe, from the present signs of the times, not to be far distant.

NATURE AS AN EXPOSITION OF A CREATIVE SOURCE AND POWER.

BY ISAAC HOFFER.

Everything in Nature, as far as the researches of man have extended, shows the unmistakable evidence of change. The earth, by its well-marked steps of growth in the addition of formation upon formation, by the great work of aqueous and igneous actions, by the combination and formation of minerals and crystals, by the vast accumulations of the remains of Life, and by the continuous renewal of plant and animal organisms, exhibits an endless series of changes and transformations, and clearly shows that this world is a creation.

This fact is generally conceded, but how, through what agencies, and by what power has it been created, are the important questions?

Are the expositions in Nature such that man can discover rational and logical answers to these questions? Is the human mind capable of learning and comprehending something of the nature and work of creation, and of a creative power, from the things created?

The solution of these questions, not by the assumption of any hypothesis, nor by any particular theory, but through rational and logical deductions from known facts in Nature, is the purpose of this article.

Nature as we see it consists of matter and forces, and of the effects and results of their interaction. Matter is a passive substance with unlimited susceptibilities in change of state, combination and transformation. Its elementary constituents, although the substance of all the innumerable variety of forms and characteristics in the material world, are in their essence unchangeable. The carbon in the diamond, in coal and in limestone, is in essence the same as the carbon in oil, in gas and in plants; and that which is unchangeable must always have been the same, can have had no beginning in time, and can never come to an end; for wherever there is a beginning, or an end, there must be a change. Hence material substances in their essence must have always existed in some form, and are the uncreated elements of the created Earth. Elementary substances in their susceptibilities show that they are controlled by a law of infinite variability; while in their essence there is simply eternal existence without variation, and therefore no action and no governing law; for there is no law—no rule of action—where there is no activity. What material substances are in their essence, and the states and forms under which these essences may exist, are as yet hidden mysteries to man; but that they always existed in some state or form, co-eval with creative agencies and power, as elements of creation, out of which the material world and everything as we see it in Nature was created, seems to be the only rational conclusion.* The fact that the unchanging, and therefore eternal, essences of elementary substances constitute the matter of this earth, is the sure evidence that these substances in their essence are the uncreated material out of which the world is created. Elementary substances being unchangeable in their essence, and therefore without action or any power to act, can only be changed in their states, relations and combinations, by a power not inherent in them, or emanating from them, but by some outside power imparted or applied in such a way as to produce the changes. Ice is converted into a fluid and into steam by imparting heat, and is again retransformed into a fluid and into ice by the withdrawal of heat. In this retransformation some other power must come into play in order to change the steam into a fluid and the fluid into a solid.

These two opposite actions were clearly the cause of all the changes in the forms and states of the water; the one disintegrating, attenuating, and bringing into action, and the other drawing together, uniting, and reducing into quiescence. These two actions are ascribed to two forces known as repulsion and attraction; and these are the cause of all the changes in the states of material substances. They are the universal and all pervading conditioning agencies in the material world, but what they are in their elementary energies is as much a secret as the essence of mateal substances. These forces, like the essence of elementary substances, are unchangeable in their mode of action; but in degree of force, in interacting, and in effect in different substances, they are the agencies of variation in the states and conditions of matter, as illustrated in the change of ice into steam and steam into ice. When one of these forces predominates, the effect of the other is proportionately lessened. In solid bodies of matter attraction seems to have effectually nullified the power of repulsion; and in a gaseous state the effect of attraction seems to be as completely destroyed as the effect of repulsion is in a solid body. Where repulsion would predominate to such an extent as to transform matter into a gaseous, or still more attenuated state, everything in nature, except vital and intellectual energy, would be brought into a state of homogeneity, and into one source, with all the material substances diffused but unchanged in their essence, and with all the forces in nature, except vital and intellectual energy, remaining the

* This view of the origin of material forms, as presented by our old and valued contributor in his very thoughtful paper, is no essential contradiction of the principles of Substantialism, as set forth in these columns during the past several years. By the "*essence*" of matter in its primordial elements, Mr. Hoffer no doubt means substantially what we mean by the force-element of Nature, which in reality is the immaterial substance which constituted the eternal environment of the Deity, and out of which the universal forms of matter were spoken into existence. Mr. Hoffer is one of the soundest and ablest of our contributorial staff.—EDITOR.

same in their elementary energies, as they are in the tangible and visible world. When matter has been traced to its elementary constituents, and to the unchanging essence in those constituents, it has been traced to its source, for the unchanging essence of elementary substances is the source of all matter, and when it has been traced to this source, it has been traced beyond the limits of time, and beyond the reach of a beginning; for that which is unchangeable must always have been the same. The forces of nature have never been known to change in their elementary actions, or to have been absent wherever matter was found, and must therefore have always existed co-eval with matter. Here is a source of creative material, and creative agencies, sufficient for the creation of the earth; but there is evidently something wanting in all this source of supply; some power to commence, carry on, and perfect the creation. There is no originating, exerting, designing, directing and controlling power here, a power absolutely essential in all creations. The passive material and the creative agencies are here, but the creative power—the creator—is wanting. What evidence does nature furnish of a creative power that could utilize the formless elements of matter, and employ the actions of forces as agencies for the creation of definite forms? All the objects in nature that show a systematic operation in their construction, and all the activities that regularly produce certain definite effects and results, are evidences of a directing and controlling power; and the whole creation is one grand volume of such evidences. But there is still more direct and more positive evidence of a creative power presented in nature—a complete representative of such power. In man is both the objective and subjective evidence—the external knowledge and the internal consciousness—of such a power. Man can see the creations of another and follow every step of the development. He can hear these steps detailed and see with his eyes the process of creation to the final completion, or, he can follow in his own mind the process of his own mental creations, and by materializing the same demonstrate the reality of these creations to his entire satisfaction. He will find that the first step in his creation will be the conception of the plan, the next the securing of the necessary material and power, and the third the directing and controlling of the agencies employed in carrying out the plan to completion. This is man's process of creation, and there is no other process indicated in nature, and none conceivable by man. Whether a mental creation—the perfected plan in the mind—is more or less a reality, than a material representation of the same, depends upon what is understood by a reality. One thing, however, is certain, that man can not produce or create anything, unless it has first been conceived and perfected in the mind, and when it is thus conceived and perfected, intellectual energy must bring into action, and direct and control the agencies necessary to produce the material representation. It should be remembered that intellectual energy never is a tool, a part, or an agency in the making of any material thing, nor does it in any way become a tangible part of the thing created. So is an originating, exerting, designing, directing and controlling power; not an agency, or an effect, not a machine with its powers and actions fixed for the production of certain effects and results. It is a positive self-exerting energy, the cause and source of all man's actions.

Nature therefore does furnish abundantly and in the most positive manner, not alone the evidence, but the manifest fact of a creative power. It shows that the intellectual energy of man possesses all the attributes and requisites of such a power; and man unquestionably is a part, and a very important part of nature, both in substance and in energy; and man's process of creation, is simply the process in nature manifested through man. This positive creative power developed in nature, and constituting part of nature, is in itself amply sufficient to establish beyond a doubt that intelligence must have existed at the source of creation, or else it could not have become a developed part of nature. It is not conceivable, and, if the immutable laws of nature can be relied on, not possible, that the intellectual energy of man should have come into existence without a cause, or from no source of intelligence; or that it should have been developed out of something, or imparted by a power, that had no intelligence; for there can be no effect and no result without a cause, and no power can impart that which it does not possess.

On the other side, the reverse conclusion, that the intellectual energy of man was obtained from a source and imparted by a power that possessed intelligence, would not only be conceivable but would be perfectly consistent with reason, with the laws of nature, and with axiomatic truths. If there is no intelligent creative power at the other end of creation, what a lucky circumstance that matter, and lifeless and senseless forces, through their interaction accidently produced life and sensation, and finally developed the same into a perceiving, thinking, reasoning being, capable of discovering itself, and apprehending that there is an existence at this end of creation. But for this fortunate accident, which brought into existence an intelligent comprehending and appreciative power, man would never have discovered his existence, and the Heavens and the Earth would for ever have remained unknown, unappreciated, and virtually non-existent.

The difficulty in proving or demonstrating the existence of an intelligent creative power from expositions in nature, outside of the mind of man, is not in the want of clear and positive evidence, but in the profusion, in the absence of any effect or result which does not bear the evidence of controlled action. This universal evidence of controlled action—the reign of law—in all the changing activities in nature, and in all the works of man, makes illustrations by contrast impossible. Man can not see the atmosphere, although it surrounds him on every side, and is the medium through which all things are made visible. Whatever active agencies, whether chemical, vital, or other forces, may have been at work in any production in nature, there is always clear evidence to show the reign of law—of enforced and controlled action for the attainment of definite results; and action that regularly works out definite results must be intelligently controlled action. The only criterion by which the fact of intelligent action or control in any effect or result can be determined, from that effect or result, is the evidence of system and order in the modes of action, and system-

atic construction in the results produced. This is the evidence of the reign of law. There is no system, no order, and no law in chance occurrences.

The laws of affinity and crystalization, of chemical and vital action, are as positive, as clearly defined, and as absolute as any laws could be. Vital action, with which all are familiar, is a marvel of system and order, of accuracy and perfection, in all its operations; nothing could be more positively and more completely under the reign of law. From the simpliest forms of plants and minutest animalcules, to the largest and grandest specimens of vegetable productions, and the most complex and perfect animal organisms, there is a system of germination, of development, of growth, and of reproduction in all; and every form of vital energy has its fixed and distinct characteristics, and is subject to immutable laws, so that like a machine made to produce a certain class of goods, each form of vital energy produces and reproduces the material organisms for which its action and characteristics are prepared and fitted. It is a definitely fixed agency of creation for the production of a certain class of creatures, and all must admit that these forms of life are wonderfully adapted for the positions which they fill, and that they show the "Master-hand" of an intelligent inventor and a perfect mechanic. The progressive development of life from almost featureless forms to the most complete organisms, and the same development of mind, from simple sensation in the lower forms of animal life, to the highest power of a thinking, reasoning intelligence in man, shows the wonderful work of a great power, developing gradually and continuously, step by step, from a lower to a higher order, both organic life and intellectual energy, until this great advancing movement came to a stand in the production of man; and no new and no higher organisms have come into existence since that time. Up to that time the history of the earth, as preserved in the rocks, is filled with the records of the mighty work which this power had performed during these advancing steps; but at this point the record of advance in organic life ends, and reproduction of the same orders of life is all that appears.

This long continued system of progress, that had made the crust of the earth a monument of its productions, did not come to an end in the perfection of organic development, but culminated in the production of a fully developed intellectual energy in man, possessing all the faculties and requisites of a creative power; and therefore a fair representative and efficient agency for continuing the great system of progress and development. We need only look at the achievements of man, and the development of his intellectual energy, to see the prototype in the power that ceased its advancing action at his coming into being. The human mind is a self-developing, self-exerting energy, the moving, directing, and controlling force in all man's actions, supplied with all the attributes of a creative power, and is clearly a creative agency with a continuously increasing power. Man's work, in changing the surface appearance of the earth, and in the creation of the many and wonderful material productions, is an immense achievement; but the progress of development in intellectual energy, in the growth of knowledge and power, and in the capabilities to control and utilize the elements and forces of nature, and make them subservient agencies; and the advance made in science, art, literature and in every branch of intellectual work, are immeasurably greater than those made in material development. This shows that there is a progressive and developing power of no low proportions in man, similar to the power through which vital organisms and mental energy had been developed, and demonstrates that the mind of man is a fair representative, and not a wholly unworthy successor of that power. The culmination of organic development in the production of man, and the commencement of a self-exerting, self-developing energy in the human mind—the ending of advancing steps in one direction, and the commencement of similar steps in another direction, clearly show the continuance of a vast and far-reaching system of progress, and that the progressive power in the past system of life is continued in the mental energy of man. This transmission of creative power to man is perhaps the only link, clearly evident in nature, which shows a direct connection of man's creative power with a similar power that manifested itself in the development of life and mind during a long period before man was created; and is direct evidence that the intellectual energy of man is the true representative of the power through which he was created, and the agency for continuing the great system of progress of which this energy was the culminating product. Among the most significant features in the development and perpetuation of life and mind are the facts, first, that this development continued during long geological ages before organic perfection and a fully developed intellectual energy was attained in the production of man; and second, that life and mind never become inherent forces in matter like other forces of nature, but must be perpetuated by reproduction and a continuous renewal. In these facts is the evidence that life and mind are a power not potential in, or emanating from, matter, and that they are in an unstable, and apparently, abnormal condition in a material body. With all these facts before us, that this world is a creation, which is itself an irrepressible evidence of a creative source and a creative power, that matter is indestructible, and material substances with all their susceptibility of change in states, combinations, and transformations, are in their essence unchangeable, and that the unchangeable always has been, and must forever remain the same; that forces are persistent and continuous, and in their elementary energies unchangeable; and that therefore elementary substances in their essence, and forces in their elementary energies, constitute the source of material, and of active agencies, employed in the creation of the earth. That all the activities and productions in nature testify to the universal reign of law, and that the reign of law is impressive evidence of a law-giving and a law-enforcing power. That man with all his faculties and attributes is a part of nature, and that his intellectual faculty is as much a part of nature as his material body; that the evolving of mind out of matter, is just as irrational and inconceivable as the evolving of matter out of mind, and that the transmission of the intellectual energy of man from, and through intellectual power, is just as rational and as logical a conclusion, as that the material body was evolved out of material substances.

That man stands at the head of creation, is the only being capable of an intelligent survey of nature, of comprehending her laws, and of bringing her forces into his service; that his intellectual energy is a self-conscious, self-exerting, and self-developing energy with all the faculties and attributes of a creative power; that he is, as expressed by Professor Dana, "the first being that was not finished on reaching adult growth, but was provided with powers of indefinite expansion, a will for a life work and boundless aspirations to lead to endless improvement." That he is the first link in the chain of progress in the opening future, and the last link, in a past system of progressive development, the last and final product of a great progressive system of life; that in his physical composition he is the seed of the past, and in his intellectual capabilities the germ of the future; and that the progressive power in the past system of life, which ceased its advancing steps at the creation of man, has its true representative in the progressive energy of the human mind. That the creative process of the mind of man is the only conceivable process of creation, that this process, is the process in nature carried out through man, and that all the productions in nature bear the unmistakable evidence of a similar process in their creation. This summarized statement based upon known and admitted expositions in nature, as presented in the body of this article, forms a chain of evidence which clearly shows that elementary substances in their essence are the source and foundation of the matter of this earth; that the forces of nature in their elementary energies are the source and power of the operating agencies employed in creation; and that the universal reign of law, and the creation of a fully developed intellectual capacity in man, at the close of progressive development in the great system of life, is the evidence of an intelligent source and power, and that the intellectual energy of man is the finite representative of an infinite creative power.

Lebanon, Pa.

THE BATTLE IN BRITAIN.

BY J. I. SWANDER, D.D.

Three quarters of a century have past since the star of Napoleon went down at Waterloo. Not many hundred miles from that historic field there is now another engagement being fought. The conflict is of a different character, but the result thereof will tell no less powerfully upon the future of the world's great history. Not empires and dynasties, but fundamental principles of science are involved in the mighty struggle. The outcome is not a question of doubt. The bird of victory will ultimately perch upon the banner of God's everlasting truth. Wellington is holding his impregnable position against the assaults of a well-drilled counterforce, in the face of a reckless discharge of mathematics and mud. Indeed, there is already some visible evidence that the tide of battle is turning to the right as Blücher deploys his substantial forces upon the unsanguinary field.

Mr. George Ashdown Audsley, F.R.I.B.A., a man of rising reputation in English art and science, is the Wellington of the campaign, and is destined to be the hero of the day. He provoked the conflict by a bold introduction of the Substantial Philosophy in the land of Tyndall, Huxley, and those self-esteemed and infallible mathematicians whose scalps are now dangling from the belt of Wilford Hall as the Curfew tolls the knell of their imaginary greatness, and as the solemn signal dies away according to the law of squared distance inverse as applied to other spherical shells.

Yes, Mr. Audsley is the man who will be held responsible for disturbing the scientific tranquility of Her Majesty's realm. He it is who twisted the British lion in the most sensitive section of his vertebral elongation. And oh, what a roar of rage is now heard from the classic halls of Oxford and Cambridge, as the circles of his sonorous howl are expanding themselves to the uttermost parts of the Empire.

Under the modern utilitarian view of things, it seems somewhat strange that Mr. Audsley would allow himself to antagonize, and attempt to revolutionize a system of thought in the department of physical science whose threads had been interwoven with the very warp of English history. Indeed, he seems to have acted upon the assumption that truth is of more importance than popular opinion, and that a few fundamental facts of science are to be esteemed as of greater riches than many of the theories of modern scholasticism. Such a course would have been approved in the age of martyrs, but it can command no premium in this day of servile submission to the cut and dried opinions of others. It will do only for men who are not willing to be called the sons of Pharaoh's daughter, and who are willing to suffer affliction with the advocates of paradoxical truth, rather than to enjoy the preferments and pleasures of popular nonsense for a season. And just such a man Mr. Audsley seems to be. Perfectly heedless of popular sentiment in matters of science, he armed himself with the invincible armor of truth, and tossed his token of defiance into the arena of scientific combat.

Mr. Audsley began the discussion by publishing, in the *English Mechanic* and *World of Science*, a series of articles against the wave-theory of sound. This was followed by another series in which he advanced the Substantial and true theory as taught by Dr. Hall, and as formulated in the tenth chapter of our book, entitled "The Substantial Philosophy." While his opponents were trying to reply to these tremendous catapultings of truth upon the moss-covered castles of error, Mr. A. was lecturing to crowded houses of intelligent men, showing them by many infallible proofs that the wave-theory of sound has no foundation in the facts and laws of nature. These articles and lectures have suggested and introduced new modes of thought in the minds of many English physicists, and stimulated others to make a more radical and thorough inquiry after the nature of the foundations upon which their theories are built.

The discussion so far has been confined rather within the narrow limits of acoustics. The manufacturers, handlers and operators of musical instruments have also caught the substantial itch to some extent, and are now scratching themselves into a felicitous sensation never previously enjoyed under the undulatory order of things. We have before us several musical journals published in London. In one of these, entitled the *Musical Opinion*, Mr. Herman Smith has an extended series of labored articles on "The Making of Sound in

the Organ and in the Orchestra." These articles are quite musical also in our unmusical opinion. They indicate that he has heard something drop. Though he still adheres to the old theory that sound consists in wave-motions of the air, or as he puts it, in "*suction by velocity*," he uses phraseology that indicates the possession of a good sized ear unconsciously tuned for the coming oratario of Substantialism. He says "Your text-books of science will tell you that the column of air in the pipe is the source of sound, and with that oracular phrase students are mystified. As well say that the river is the source of water." He writes about an "unseen agent," a "stream reed," an "aëroplastic reed," an "ideal reed," which he says is an abstracting force, and which "makes sound in the organ and in the orchestra."

While the foregoing from one of England's pioneers of acoustical and musical thought indicates that the leaven of Substantialism is already at work, the peculiar phenomena of its working leads one to suppose that the meal is not yet in the best condition for a ready assimilation of the whole lump. Some of his language is laughable. The idea of his "ideal reed" acting as an "abstracting force" in "making sound" renders his contributions exceedingly funny. Englishmen may by such methods make a considerable of "ideal" or "abstract" noise about something concerning which they are very ignorant, but they will not in that manner be able to make very much substantial sound. When will learned gentlemen put on their thinking caps, and grasp the basic truth which underlies all that is true in acoustics? When will they learn to know and acknowledge that sound is not made at all, but that it *is* in the very constitution of nature, and that it is the mission of the vibrating reed to liberate and permit it to assume that peculiar form of physical force by which the sense of hearing in men and animals is addressed and affected?

We promise to keep the readers of the MICROCOSM posted concerning the progress of the battle in Britain. This we think we shall be able to do notwithstanding our frequent fits of laughter at the feats and defeats of English "suctional velocity" and "ideal reeds." In the meantime let our American substantialists be of good cheer. Our cause in England is in good hands. Mr. Audsley and his coadjutants are able generals, and they have enlisted for the war. Their faith in the immaterial and invisible elements of being is the victory which will overcome the world of materialism, and fill its face with the lineaments of shame.

Fremont, Ohio.

WAS SWEDENBORG A SUBSTANTIALIST?

Swedenborg's Position on the Relation Existing Between Substance and Spirit.

BY E. M. M. MARSHALL.

Editor MICROCOSM:—In your otherwise excellent article entitled, "Force, motion, substance, etc.," which appears in the April number of "The MICROCOSM," you make this statement: "The classification so often observed in the writings of the adherents of Emanuel Swedenborg, by which *spirit* and *substance* are placed in antithesis, shows a manifest want of a true philosophical discrimination" I do not know where you get your authority for a statement so diametrically opposed to the whole genius and spirit of Swedenborg's philosophy, but presume the error arises in the failure of these "writers" to use language which would clearly convey their meaning. In the use of the word substance, in the connection to which you refer, *material* substance is undoubtedly meant. Any other interpretation is as irreconcilable with Swedenborg's philosophy as with your own. If there is one truth that Swedenborg definitely teaches, and emphasizes by many reiterations, it is that there is such an entity as spiritual substance, out of which the heavens and the spiritual bodies of men and angels are formed. He teaches that spiritual entities are far more substantial than are material things, because the former are enduring, while the latter are subject to constant mutation and decay.

I will adduce a few passages from Swedenborg in order to show what his teaching is on this subject. In his work entitled "Divine Love and Wisdom," Nos. 40, 41, 42 and 43, he shows that God is Divine Love itself and Divine Wisdom itself; that the Divine Love and the Divine Wisdom are *Substance* and Form in Itself, thus Very Reality. He definitely teaches in these paragraphs, that there is such a thing as spiritual substance, of which form and other qualities of substance are predicable.

In his work on Heaven and Hell, No. 434, he says: "Man can not think and will unless there be a subject, *which is a substance, from which and in which* he may think and will; whatever is supposed to exist without a substantial subject is nothing. This may be known from the fact that man can not see without an organ which is the subject of his sight. * * * So also with thought, which is internal sight, and perception which is internal hearing; unless they were in and from substances that are organic forms and are subjects of the faculties, they would not exist at all. From these things it may be evident that the spirit of man is equally in a form, and that it is in the human form, and that it enjoys sensories and senses as well when separated from the body, as when it was in the body, and that all the life of the eye, and all the life of the ear, in a word, all the life of sense which man has, is not of his body but of his spirit in these organs, and in their minutest particulars. Since every thing, say he, which lives in the body, and from life acts and feels, is solely of the spirit and nothing of the body, it follows that the spirit is the man himself." And so I might quote almost *ad infinitum*, from his voluminous writings, to prove that all things in the spritual realm of the universe are most really and truly substantial, and that God is very Person itself, Substance itself, and Form itself.

The rational and consistent Philosophy of which you are the founder and exponent, is in such beautiful agreement with the spiritual philosophy of the "illumined Seer," that I had concluded that you were conversant with his writings, but your criticism, part of which I quoted in the beginning of this article, betrays such a total misapprehension of his principles, as to lead me to infer that you have given them but little attention.

I like the MICROCOSM. It does, indeed, introduce its readers into a little world of its own, and one which is entirely new to most of them. Its brave, positive tone will stir up enemies, but, on the other hand, it is making for it fast

and admiring friends. May its sword ever remain unsheathed until the cause of the eternal truth shall triumph.

Garnett, Kansas.

REMARKS BY THE EDITOR.

There surely ought to be very little controversy between Mr. Marshall and ourself on the real facts of the case as he wishes them understood and as taught by Swedenborg. We never intimated that the Swedish Seer was not correct in his view of spirit as a substantial entity, nor have we criticised modern New-Church writers for not holding similar views on the substantial nature of the spirit both human and divine. What we do criticise, especially in modern Swedenborgian writers, is their slipshod use of the English language in speaking of "spirit *and* substance," without any qualification of the term *substance*, thus leaving the inference that spirit is not substance but something else or something not substantial.

If they believe spirit to be substance why do they not speak of matter and spirit, or material substance and spiritual substance, instead of employing the antithetical contrast of spirit *and* substance as these writers are constantly in the habit of doing, thus misleading all their readers who think according to the modern rules of our language.

We have an article now before us from Mr. Washburn, an able New-Church writer, in which this same contrast is kept up from beginning to end; and even Mr. Marshall, in the very heading of his article which was to combat our criticism in the April MICROCOSM, indulges in the same want of proper discrimination by speaking of "Swedenborg's position on the relation existing between *substance and spirit*," the very form of antithesis which his argument repudiates!

If spirit is substance, it is an outrage on our grand old vernacular ever to use such an expression as that in the heading of his article—"Substance and spirit."

The truth is, while Swedenborg was excusable for imperfection in making these distinctions, as he wrote in Latin, Mr. Marshall and his modern brethren have no excuse for constrasting substance and spirit when correctly insisting, as they do, that spirit is substance—even more real than matter itself.

Why not carefully study Substantialism and learn the proper classification of all the entities of the universe, dividing them first into the two general classes of material and immaterial substances—the first embracing all ponderable entities, and the latter all imponderable or immaterial entities? Then let them continue on in the substantial line of sub-classifications, in which material substance is divisible into solids, liquids and gases, then into metals, minerals, oraganisms (vegetable and animal), etc., etc. Then let them make the necessary sub-classifications of immaterial substance, first into the physical forces (where neither vitality, mentality, consciousness nor spirituality are involved), such as heat, light, sound, magnetism, cohesion, electricity and gravitation, after which they may take a step higher and subclassify the immaterial substances of life, mind, soul, ending with spirit, the crowning entity of the universe. How satisfying to a philosophical mind are these fine, correct and logical discriminations which, when carried out, will keep up all the nice distinctions that can possibly be encountered in our analytical researches within the universal realm of substance!

The truth should always stare us in the face that nothing exists as an entity except substance in some form. Swedenborg, as we have more than once taken occasion to point out, was anything but clear on this whole subject at the time he wrote. Indeed, he had no precise conception of such a generalization as a realm of immaterial substance in which spirit was but a class of entitative existence, but, on the contrary, he wrote as if all that was not matter must be spiritual substance. He had no place in his philosophy for the physical forces, just named, as real substantial entities, for the reason that neither matter nor spirit could include them.

The simple naked truth is, Swedenborg had a most obscure idea of the physical forces, regarding all of them, probably, as he did sound and light, as but modes of motion of material particles, instead of substantial entities. In several places in his writings he speaks of sound as consisting of air-waves, or words to that effect. However clear he may have been upon the soul of man as a veritable spiritual body, he failed utterly to carry his substantial ideas into the physical realm, thus to perfect and round out a philosophy that would bear the scrutiny of scientific investigation. And for this very reason his followers, clinging to his limited conception and want of distinction of the substantial entities of nature, have been struggling for more than a century for recognition among scientific thinkers without having made more than a trifling degree of progress or more than a handful of converts to his views.

It took the advent of Substantialism, with its broad and proper definitions of motion and force, and its adequate classifications of all the substantial entities of the universe, to brush away the scientific fog of ages, and instead of admitting any phenomena-producing cause in nature to be a mode of motion, as did Swedenborg, it boldly and defiantly repudiated every motion-theory of science, even placing sound itself among the substantial entities of nature.

When the adherents of the noble Seer, who was really in advance of his age, shall conclude to step up higher and accept the Substantial Philosophy as the rounding out of their leader's spiritual-substance ideas, then and not till then may they hope for any signal progress among thinking scientific men.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 5.

Starting with the fundamental assurance that all worlds are made alike, we have found our earth, from archaic time to the close of the carboniferous era, characterized by a succession of ages. When we look about us for an adequate cause to account for these tremendous transitions, we fail to find anything within the pale of natural law, if we refuse to recognize annular potency and universality, in the grand stages of planetary evolution. We have found that the oceanic waters have changed every time we step upon the threshold of a new age; and that each change was comparatively sudden. A change in oceanic waters means an addition from some exotic source; and it seems to me no such source

can be found beyond the watery rings that once encircled the earth. Now, as every drop of the waters on this planet was once in its fiery envelope, and necessarily whirled into concentric rings—great world-rings—over the equator, it follows that during the geologic ages deluges vast beyond our comprehension have swept the earth again and again. If the earth had seven rings there were simply seven mighty world-baptisms, and necessarily seven geologic ages and seven grand platforms of evolving life. Now there happens to be some very positive evidence upon this point. On the great planes of organic evolution there are as many breaks in the chain, called "missing links," as there are successive stages. As the earth's annular system was the seed-bed of organisms, and as each ring of world-dust and vapors was an environment for its own implanted germs, there could be no link between one ring and the next higher, but each ring would have its own life-germs, and each ring in its fall upon the earth would destroy the old environment, and crush out many pre-existing forms, and plant new germs in their place. This is a marked and well-known feature throughout the roll of ages. Thus the "missing link" exists nowhere and will never be found.

Each succeeding age shows a rising step in the scale of life, complete in itself. What made this chasm between two ages? Why does each geologic plane, so to speak, exhibit organisms a step higher in the scale of life? The moment I search for the cause outside of the annular system I come to a boundary over which imagination even can not climb. It is more philosophic to conclude that the great world of alternated rings, so situated as to receive the whole force of the electrifying and vivifying force of solar light and heat, would be the natural seed-bed, than that the earth, within the vast envelope, just emerging from the reign of fire, should be that seed-bed. On this base organic evolution must stand, for it is the unimpeachable story of the rocks today, and a proposition that no man can refute.

Again suppose the ocean should be at this age increased in depth, say fifty feet, by the declination of annular waters. The tremendous mechanical pressure of that mass of water on the bed of the ocean would be necessarily conserved in mechanical heat. That pressure, it may be readily shown, would be equal to one degree of heat (Centigrade). That is, the rock-bed of thousands of feet in thickness, miles below the bottom of the sea, would be warmer than they were before the ring-fall. The result is readily calculated. Heat means expansion. If a mass of rock is one degree hotter than before, it is larger than before. If a rock one foot square expands by this heat one hundredth of an inch, one a hundred feet square would expand an inch, and one a hundred times that large would be increased a hundred inches in dimensions. What then would be the result of an increase in the dimension of the rock-bed of the ocean of more than a million million cubic miles? There is nothing able to resist this rock-expansion. Let it be remembered that this expansion is confined to the sea-bed rocks. The continental beds are as before. The result is apparent, The sea-bed rocks force themselves into the continental beds around the margin of the ocean, and this intrusion simply lifts the continents higher and throws them into great mountain folds, generally in line parallel with the coast. Thus a ring can not fall upon a planet without conserving every pound of its weight and its impact force in mountain upheaval. Now there is enough water in the ocean to make fifteen deluges, each of which would raise the level of the ocean *one thousand feet.* Such a fall of water would wreck the world from pole to pole, and fold and plicate every part of its rocky frame.

But as we look back over the mile-posts of ages, the most conspicuous feature of these mighty revolutions is the great *crust-folding* of the earth *at the very time the ocean's waters were changed,* at the very time old organisms were annihilated, and new forms came upon the scene, and what is more, at the very time an old age closes up and a new one comes into view. There is not one geological age that is not conspicuously marked by this great crust disturbance. I have shown this so clearly in the "Story of the Rocks" that I need not dwell longer on it here.

If geologists will but consent to tear down the crumbling structure they have built, and relay it upon this foundation, they will be able to explain every unsolved mystery in the process of world-building. So much as a review.

As we pass from the carboniferous age such a vast fund of annular evidence bursts upon my sight that I am pressed to linger longer in this fascinating field. The grand succession of tropical climes and arctic scenes all over the earth, so that again and again the very poles were clad in Edenic verdure, and then chained in relentless winter, so that the position I assumed many years ago in my boyhood's pamphlet ("The Deluge and Its Cause")—that a ring as it declines into the atmosphere must become a belt, then a canopy, and fall largely at the poles, is confirmed by every step in my investigations.. An annular canopy becomes a vast *green-house roof,* through which the sun's light penetrates as it would through a canopy of glass. These canopies, lingering for ages in the firmament, have made the old world a veritable green-house repeatedly, and then falling in the polar world, beyond the more direct influence of the sun, as mighty down rushes of snow, have buried the world of luxuriant vegetation many times. The geologic records are ample and prove that this is the source of all the Glacial epochs that ever were. Thus the same canopy that formed a green-house world converted the same into a mighty sepulcher by its ultimate fall, in higher latitudes, as snow. Falling in medial latitudes as rain, it produced all the deluges the earth ever witnessed. Of this more hereafter.

The whole carboniferous pile is literally full of records that point with certainty to annular changes, and when we leave it we simply pass higher in the temple of life over the ruins of an Eden world. It is very plain that the ocean that rolled over the carboniferous border into Permian time was a cold one. It is equally plain that that wave grew warm, and raised Permian life to a higher level. Scarcely had the waters quieted in their new quarters than crust-rupture again occurred, and new coasts and new ocean boundaries were formed. In many places, in fact in almost all lands, the vast columns of carboniferous rocks were lifted and folded in every direction.

Again the Permian was evidently closed by a change of waters, life extermination and

upheaval. On a platform of moderately luxuriant vegetation the ice-plow traced unmistakable lines of death and desolation.

Gradually in Mesozoic time the scene changed. Reptiles that had been pioneering began to gather strength and numbers, and marshaling on the shores and muddy flats of the world, the Triassic and Jurassio periods presented a scene that neither pen nor pencil can portray. It was an age of reptilian monsters. The ocean and lakes were their bloody battle-grounds, and all through these rocky piles are the recorded scenes of violence and death. What physical cause had so completely changed the condition of the world?

We pass from the Jurassic into the Cetaceous period, but as usual, our path is over the remains of fallen and falling dynasties.

Elsinore, Cal.

A PISCATORIAL MYSTERY.

BY THE EDITOR.

Among the wonders of the finny tribes is that of the family known as flat-fish. Included in this family are the sloe, flounder, carp, plaice, halibut and some other species.

What is most peculiar about these species is the transformation which takes place a few weeks after the young emerge from the egg. At first the flounder, for example, swims upright the same as the young sunfish or perch, and is symmetrical in form and color, with one eye on each side of the head, and with its intestines below the ventral fin like those of other symmetrical species.

In a short time, however, it begins to incline to swim on one side, either from the inconvenience of remaining upright on account of its broad and flattened form, or more likely because the transformation about to be considered was a part of the original design of its peculiar structure.

As soon as this new habit of swimming is established, a most wonderful metamorphosis takes place. The lower eye seems either to pass around the head or directly through the skull, and take its place by the side of the upper eye, each of the two eyes becoming equally efficient in the economy of the animal's life.

In addition to this marvelous transformation, it is the observation of naturalists that the intestinal viscera change location from the edge near the ventral fin to the middle of the lower side, while this entire side becomes white and smooth, very much unlike the other.

The facts here stated were seized upon by Mr. Darwin as collateral proof in favor of his theory of evolution, namely, that all the various and remarkable forms of animal life have been the result of environment, modes of living, natural selection and survival of the fittest; and that the flounder, if it were not for its great width from ventral to dorsal fin in proportion to its thickness, would most probably continue to swim in an upright position, as it does when first hatched.

Now, we have a strong curiosity to see this matter tested by some patient naturalist in order to determine whether this family of fishes were originally designed by an intelligent creative power, for the strange transformations to take place, as just described, or whether they are thus metamorphosed by environment, circumstances, natural adaptation, etc., as Darwin insists!

To this end we suggest that an aquarium be constructed of wire-gauze partitions placed upright and so near together that the young flounders immediately after hatching and being placed therein shall have room to grow and feed but not to flop over on one side; and as they become thicker that the partitions shall be separated accordingly to accommodate their growth. If it shall so transpire that these little flounders will grow up of symmetrical form, color and structure, maintaining one eye on each side of the head, with their intestines and swim-bladders in the usual positions of other species of fishes of somewhat similar breadth, then it will certainly be a point gained by Darwinian evolutionists, that some of the most singular transformations of animal structure are the result of environment and circumstances, and not specifically designed creations by an intelligent architect.

But if, on the contrary, these flat species shall go through the same transformations precisely, while swimming in a compulsory upright position, it will give a marked fishy look to the whole argument of Darwin based on the circumstantial environment which had wrought such startling changes in the flounder's organization.

Then we would further suggest that the evolutionary naturalist, if there are any such remaining, try a similar experiment with some symmetrical but broad and flat species, such as the sun-fish, only placing the wire-gauze partitions of the acquarium horizontally but so close together as to compel the young fishes to swim on one side immediately after hatching and until fully grown.

If it so turns out that such compulsory habit of swimming on one side shall have a tendency to place both eyes on the upper side of the head, or of reconstructing the intestinal viscera, it will likewise be a point gained for Darwinism. But if on the contrary no such transforming effect should show itself after careful tests, it will hardly strike a thoughtful naturalist as probable that any accidental environment or circumstance could so methodically have manipulated a sun-fish or any other flat symmetrical species as to change it permanently into a flounder. Would not, on the contrary, such failure to flounderize a sun-fish,

by altogether more favorable environment for such a change than would ever be likely to occur in nature, be somewhat conclusive proof that the remarkable changes observed in this family of fishes were the work and design of an intelligent creative will?

Numerous similar transformations in the animal kingdom might be referred to as proof of intelligent design in creation, such as the changing of the tadpole into the frog, the construction of the butterfly out of a disgusting grub, or the remarkable transformations which the acidian passes through from its lively birth to its fatty degeneration into an almost formless and motionless mass; but the case of the flounder is perhaps the most interesting since here we have a chance to test the theoretic working of Darwinian evolution on a practical scale. Who will undertake the experiment?

THE COLLEGE AND SANITARIUM.

Since the suggestion appeared in the April MICROCOSM that it would be a good idea to combine a sanitarium with the College of Substantialism, we have received many letters from different sections of the United States, not only approving of the suggestion, but even urging their own localities as the place for establishing such a combination institution.

Several friends of the cause have generously offered to donate grounds for this purpose, and one man would even add a comfortable building to his bequest if he could thereby secure the college to his own locality. But all the places thus named are too far from this city—the commercial centre and financial emporium of the nation.

Fortunately, an opening has just occurred which is now under negotiation, for securing a most beautiful and commodious building already in shape for the sanitarium, and ample grounds healthily situated, all within about fifty miles of this city.

Upon these grounds, if they shall be secured, the college building will be erected adjoining the Sanitarium in the shortest time possible. In the mean time not a single month will be lost in starting the Sanitarium into full operation, which will be run in the interest of the Substantial College on the general basis of the principles—physiological, pathological, and therapeutical—as set forth in our Pamphlet on Health and Longevity, which has met such hearty approval from the afflicted throughout the world.

A distinguished and learned "M. D.," practically experienced in the latest and most approved sanitary improvements and appliances, has already been consulted upon the subject of the new Sanitarium, its locality, surroundings, etc., and will most likely assume its management at once under the direction of a board of trustees.

We hope to be able to announce the details of this grand enterprise in an early number of the MICROCOSM, probably the next issue. In the mean time let the friends of Substantialism take heart that fortune has favored their cause without being obliged to wait upon the uncertain prospect of donations from reluctant givers. Providence has kindly helped us to the few thousands we possess, and we purpose to show our gratitude by doing all in our power for the physical and intellectual culture of coming generations.

OUR CRUSH OF CARES.

With 2,000 and 3,000 letters a day, week in and week out, it is little wonder that some complaints of delays and disappointments on the part of our friends should reach this office. Still, when any such complaint does reach us, we instantly put it into the hands of a trusty clerk to look up and have adjusted.

But some fault exists on the part of correspondents in not allowing a reasonable time for such an enormous mail to be examined and attended to before they become impatient and commence scolding.

Of course, in sending out so many answers and parcels to agents and correspondents, some failure must naturally be expected in the mails, from the handling of so much matter, but, on an average, we have no reason to complain of the want of efficient service on the part of the Post-Office.

We regret that so much business care has prevented that devotion to the literary and scientific freshness of the MICROCOSM which we could have desired to give; but as this is the harvest of Substantialism, by which to lay the foundation, as we hope, for its future institution of learning, we trust the true friends of this cause will possess their souls in patience and see if they can not manage to work out 50 cents' worth of edification from our little journal till such time as our hands shall be freed for better editorial work.

DR. R. F. STEVENS, OF SYRACUSE, N. Y.

Dr. Stevens was the first medical practitioner to whom we revealed, more than twenty years ago, the new Hygienic Treatment as set forth in our Health-Pamphlet. He gave an unequivocal indorsement of the remedy, and kindly permitted us to use his name in favor of the treatment, which we have done in the MICROCOSM.

This, however, has unavoidably encroached no little on his time, since hundreds of letters have been sent to him requesting advice of various kinds, which he has always carefully answered, both as a courtesy to such correspondents and as a friendship to us, for which he has received no compensation. We deem it but fair and just to remark that those seeking such valuable medical advice from one of the most experienced physicians should at least enclose a *dollar* as a small compensation for the time which a suitable reply would necessarily take from his regular business engagements. The doctor is so generous and good that he would not complain should he be called upon to do any amount of gratuitous work of this kind. Still, no ox, because he is patient and willing to serve in treading out the corn of good health, should be muzzled. If any reader should want information from a reliable source concerning his or her physical condition, the least such applicant can do is to inclose $1.00. This is *our* suggestion as a matter of justice, and entirely without the knowledge of the doctor.

THE SQUARED-DISTANCE CONTROVERSY ONCE MORE.

BY THE ASSOCIATE EDITOR.

By request of Dr. Hall, whose business and other cares engross his entire time, I will as briefly as possible review the present status of the argument.

Since the last number was issued, many dozen elaborate communications have reached this office from mathematicians in different sections of the country, nearly all of them adversely criticising Dr. Hall's position, and a majority of them insisting upon the publication of their arguments complete in the June number of the MICROCOSM. As it would require at least fifteen numbers like this one to contain these papers if everything else were excluded, and as the short letter of Prof. Blake last month contains the kernel of nearly all of them, we refer to that letter as expressing the fractional view of the decrease of sound about as concisely as any.

In summing up the editor's general charge against this fundamental law of the wave-theory, and viewing his arguments in the light of all that has been written on the subject, I am forced to declare my conviction that his main position, as regards the change of intensity that should occur between 999 and 1,000 feet from the bell, accepting the wave-theory as correct, has been completely sustained according to admissions of wave-theorists. Let me state the case once more, so that it can not be misunderstood.

Remember that the doctor's main charge against the application of this law of inverse squares to sound is that it involves the prodigious absurdity, if the ear should be moved one foot nearer the bell from the 1,000th-foot circle, that the sound should instantly become 1,999 times louder, when in fact a movement of fifty feet does not make the slightest perceptible difference to a sensitive ear. How does the doctor attempt to sustain this position? I will state the argument as nearly as may be, in my own language, but in full consultation with him, and thus save his mental and physical energies for other work which no one else but himself can accomplish.

Not one of the critics who have attacked Dr. Hall's views pretends to look at the simple, naked facts involved in this problem according to the essence of the wave-theory, but invariably they approach and discuss the question by fractional ratios, divisions of fractions, etc., when the whole question is virtually one of the simplest possible whole numbers, as will be seen in a moment.

All wave-theorists admit, for example, that a million simple units of air must be gained foot by foot, as we advance from the bell to the 1,000-foot mark, increasing in number as the square of the distance,—4 units at 2 feet, 9 units at 3 feet, 16 units at 4 feet, 100 units at 10 feet, 998,001 units at 999 feet, and 1,000,000 units at 1,000 feet. There is no dispute about this, as this is according to the laws of true science.

Then remember, the wave-theory teaches, that as sound is but the *motion* of the air, and nothing else, the one unit of sound, as it exists at one foot from the bell, must be continually divided and subdivided, decreasing in width of swing or quantity of motion of the air-particles at any one point in exact proportion to the number of units of air accumulated at that foot-circle.

Remember, also, if this law of squared distance is properly applicable to sound, that a given number of parts or portions of the one sound-unit must invariably correspond to a similar number of whole units of air existing in any given shell, and that if a movement toward the bell should be made from the 1,000-foot circle that would reduce the air one single unit, *a corresponding one-millionth part of the sound-intensity would be restored to that shell of air.* And as all wave-theorists admit that 1,999 units of air are lost or withdrawn in moving this one foot toward the bell, it must follow that 1,999 corresponding *parts* of the sound-unit should be restored.

In a word, as 1,000,000 units of air have been gained on reaching the 1,000th foot-shell, and 1,000,000 parts of the unit of sound, save one, have been lost, according to the theory, it is certainly self-evident that in moving back toward the bell *the number of parts of the unit of sound which are restored must exactly correspond, step by step, with the number of whole units of air which are subtracted, thus entirely avoiding fractions, and virtually reducing the problem to one of simple whole numbers.*

Slightly varying this mode of expression, it can be made so simple as to bring the whole problem down to the capacity of a child, while avoiding all fractions and complexities whatsoever. We can thus correctly say that at 1,000 feet there remains one small part of sound out of a million similar parts which have all been lost, save this one, in coming from the bell, and which will all have to be restored in returning to the first foot circle, as all wave-theorists admit.

While this is so, according to the theory, it is scientifically true that a million large parts or units of air have been gained or accumulated at the 1,000th foot shell each of which corresponds with and represents one of these small parts of sound or motion lost.

Now in going back toward the bell it is perfectly manifest that at each foot-step just as many of the million small parts of sound must be restored as there are large parts of air lost in succeeding shells, since, as just stated, the entire million lost parts of sound must be restored, step by step at some rate, while returning the ear to the one-foot circle; and it is absolutely certain that this rate of regaining the lost parts of the sound-unit must correspond precisely with the loss or reduction of the parts of air—so many at each return step—leaving the entire million small parts of sound concentrated into one unit at the first foot, and also leaving but one unit or part of air remaining in this first foot shell.

Can there be any possible doubt but that this involves the essence and quidity of the wave-theory as laid down in Prof. Tyndall's law,—both the air and the sound increasing or decreasing in going and returning "IN THE SAME PROPORTION?" Surely Tyndall in using this language means what he says.

Then, manifestly, if we know at what rate the million large parts of air become withdrawn step by step in approaching the centre from the 1,000-foot shell, we certainly know at what rate the corresponding million small parts of sound are restored, since "the same proportion" must infallibly prevail at each step; and since there is not a wave-theorist

on earth who will not admit that 1,999 of the 1,000,000 units or large parts of air have to be deducted at this first return step, leaving 998,001 remaining, so it must follow that 1,999 of the 1,000,000 small parts of sound, lost in advancing from the bell, must be restored by this same one-foot step, leaving 998,001 of them to be restored. And as there was but one of these parts of the sound-unit remaining at the 1,000th-foot circle, called in fractional parlance *one-millionth*, with 1,999 of them restored at the first step, *the sound must therefore be increased 1,999-fold, or be 1,999 times louder than it was with one part, just as Dr. Hall has claimed!*

Now, these are simply facts based on the wave-theory, such as can not and must not be ignored on any fractional method of reasoning. Then observe that since the next step from the 1,000-foot circle loses 1,997 parts or units of air, the next 1,995, the next 1,993, the next 1,991, the next 1,989, the next 1,987, etc., etc., decreasing by 2 at each step, according to the differences between squares, as all wave-theorists admit, and since all these differences when added together constitute the 1,000,000 parts, leaving but one unit of air remaining at the first shell, so it follows infallibly certain that lost parts or millionths of the sound unit must be restored at the same rate, and therefore at this second step, or from 999 to 998 feet, 1,997 of these small parts of sound must be regained, to correspond with the 1,997 parts of air lost by the same step, or else Tyndall's law of "proportion" between the air and the sound is a ridiculous sham.

Then further it follows that the restoration of the remaining small parts of the sound-unit must proceed step by step at the same rate, precisely as we have seen to occur in the loss of air-units. Thus, the first two consecutive steps from the 1,000-foot shell must restore 1,999 and 1,997 of these lost parts of sound, which added together make 3,996 parts recovered, thereby making the sound 3,996 times louder at 998 feet than it was at the 1,000-foot shell, *where there was but one of these parts of sound, because at that shell there were 3,996 more units of air to be put into motion.*

So on down towards the centre this restoration of the 1,000,000 lost parts of the sound-unit must continue, *keeping pace exactly with the reduction of air-units*, the sound becoming just as many times louder at each additional step as the air-units have become reduced in number according to the aggregate differences between squares.

This is just as it should be, since coming on down through the 1,000 feet to the start, and adding all these differences of squares and increments of intensity together, just as the aggregate numbers of air-units at successive steps have been reduced, namely, 1,999, 1,997, 1,995, 1,993, 1,991, 1,989, 1,987, 1,985, etc., ending with 11, 9, 7, 5, and 3 at the 1-foot circle, *we get the air 1,000,000 parts less and the sound exactly 1,000,000 times louder than it was at the 1,000-foot shell, if this law of the wave-theory be correct!*

I simply defy the critics of Dr. Hall on any possible fractional basis to name a process or schedule or rate of reduction for the 1,000,000 air-units, or for the restoration of the 1,000,000 lost parts of the sound-unit, in any conceivable "proportion" to each other, by which to make the sound 1,000,000 times louder at the first shell than it was at the 1,000-foot circle! Let them meet this challenge and produce even a ghost of a demonstration, or forever after admit the correctness of Dr. Hall's original charge against the wave-theory, as here sustained to the letter.

Let wave-theorists now remember that whatever may be the fractional relations between $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{16}$, $\frac{1}{998001}$, $\frac{1}{1000000}$, etc., about which Dr. Hall has no controversy whatever, such discussion of fractions, however interpreted and however plausible in appearance, can in no manner invalidate his position that 5 parts of the one unit of sound must be lost or obscured in going from 2 feet to 3 feet, *just as certain as that 5 whole units of air must be added by this 1-foot step, which all wave-theorists admit.* And in going back from 3 feet to 2 feet, it matters not what may be the technical relation of $\frac{1}{4}$ to $\frac{1}{9}$, as to the fractional ratio of the increase of sound, *the primary fact as claimed by Dr. Hall, that 5 unit-volumes of air are gained and lost in going and returning between these two numbers is an absolute demonstration that 5 corresponding parts of the 1 unit of sound must be lost or gained in the same 1-foot movement.*

If we begin, for example, at 4 feet to return toward the bell, the problem becomes one of 16 parts of air and 16 lost parts, save one of the sound-unit to be restored, precisely "in the same proportion" as the 16 air-units, save one, are lost by this return to the 1-foot shell. How is this return-problem to be explained and still keep the loss of air-units and gain in corresponding parts of the sound-unit "in the same proportion?"

One thing is certain, it can never be done by fractions, since there is manifestly a conflict between the loss of 7 whole units of air in moving from 4 feet back to 3 feet, as all wave-theorists admit, and the gain of $\frac{9}{16}$ of sound-intensity, or the $\frac{1}{9}$ of $\frac{1}{16}$, or the $\frac{1}{16}$ of $\frac{1}{9}$, as different critics try to figure it out, only to confuse the result.

The only consistent plan is to say that as 7 parts of air must be lost in going back from 4 feet to 3 feet, leaving 9 parts remaining, so 7 of the lost parts of the sound-unit must be restored to correspond with these 7 parts of air, making the sound at 3 feet 7 times as loud as at 4 feet.

The next step from 3 feet to 2 feet loses 5 parts or whole units of air out of the original 16 at 4 feet, making 12 units of air lost, while 5 corresponding parts of the sound-unit must be restored in this 1-foot step, which added to the 7 in the previous step makes 12 parts gained, thus making the sound at 2 feet 5 times as loud as at 3 feet, or 12 times as loud as at 4 feet.

The final step from 2 feet to 1 foot loses 3 parts of air, which, added to the previous 12, make 15 out of the 16, leaving one part at the first shell; so in like manner and "in the same proportion" this final step restores the 4 original parts of the sound-unit within this limit, which, added to the previous 12 parts, make the entire 16, thus making the sound 4 times as loud at 1 foot as at 2; 9 times as loud at 1 foot as 3; and 16 times as loud at 1 foot as at 4

This, I again assert, is the only conceivable way to account for the restoration of lost parts of the sound-unit in coming back toward the centre, and at the same time to maintain any "proportion" whatever between this gain of sound and this corresponding loss of air. This

demonstrated proportionate and corresponding decrease of air and increase of sound as the differences between squares diminish in returning from the 1,000 foot-circle, is the very absurdity in the application of this law embraced in Dr. Hall's original charge, and I believe his fractional critics will be heartily ashamed of their ridicule when they come to read this only true analysis of the problem.

Should this primary and only possible analysis conflict with the fractional interpretation of the decrease and increase of sound in going and returning as based on the $\frac{1}{4}$ of $\frac{1}{3}$, or the $\frac{1}{9}$ of $\frac{1}{4}$, so much the worse for the interpretation, since the primary and essential fact of the gain and loss of whole units of air, as absolute whole numbers, all the way up to 1,000 feet and return, without any fractions about them, while the loss and gain of corresponding parts of the one sound-unit must be "in the same proportion," renders all other interpretations nugatory and void.

This is Dr. Hall's sheet anchor in this controversy, and it is a most observable fact that in all the quibbling of his critics upon the relations of fractions, about which they so widely differ, not one of them even refers to this essential fact of the controversy that in every step from 2 feet up to 1,000 feet and return, *there must be a corresponding number of parts of the one unit of sound lost and gained for the number of air-units gained and lost in each and every foot-step taken.*

Why do not these confident mathematicians, so verbose in their ridicule, refer just once to the essential fact of these air-units gained and lost at each step in going and returning, each unit representing a corresponding portion of the one sound-unit, if Dr. Hall is so badly mistaken as they insist? The truth is they avoid this manifest proportionate correspondence between air-units and parts of the one sound-unit, as they would avoid a piece of red hot iron, not even touching it with a pair of tongs, notwithstanding the long editorial of the doctor last month in which he staked the whole controversy on that one fact.

Is it at all likely that out of more than one hundred elaborate criticisms received since the last number was circulated, not a single critic should touch this proportionate and essential relation between the gain and loss of air-units at each step in going and returning and the necessary loss and gain of corresponding parts of the sound-unit, except on the presumption that they, one and all, saw the impossibility of effecting any sort of a reconciliation on the fractitional basis? Why not be candid and say so if they can not explain it?

If wave-theorists could only be impressed with the fact that the constantly augmenting difference between squares, by 2 at each step as we advance from the centre, determines necessarily and infallibly the increase of air-units in each successive shell, with the loss of a corresponding number of parts of the one sound-unit according to the theory; and then, if they could see, in returning, a loss of air-units according to this same difference between squares, with the same corresponding restoration of parts of the sound-unit, while leaving the relations of fractions entirely out of the discussion, there would be no difficulty in their grasping the fact that the very largest restoration of sound-intensity, according to the wave-theory, must take place at the first return step from the 1,000-foot circle, instead of the smallest, as mathematicians claim, *because at that step more units of air are gained and lost than at any other step clear back to the bell!* Can any thing be more conclusive?

Prof. Henry D. Robinson, of Racine College, Wis., in a most gentlemanly protest against Dr. Hall's position, raises this very point as the strongest fact in opposition to the doctor's charge against the wave-theory, namely, that according to squared distance inverse "*the difference in intensity between any two consecutive feet distant from the sound source increases as we approach the sounding body;*" or in other words, these differences become less and less as we advance from the centre, tapering out to a point, as it were, at the 1,000-foot mark!

Now this law is no doubt correct, estimating this decrease and increase of sound in going and returning by their ratios on the fractional method, since surely $\frac{1}{4}$ is more than $\frac{1}{3}$, just as $\frac{1}{16}$ is more than $\frac{1}{15}$. But this is deceptive, and only shows the self-contradictory character of the wave-theory interpretation of this law, since in estimating the differences between intensities according to the rate of accumulation of air-units and as virtual whole numbers,—the only true and consistent method, by the way, of doing it,—we find that the difference between intensities for consecutive steps, as we advance from the bell, *actually increases precisely as the differences between the number of air units in succeeding shells augment, or exactly as the differences between squares vary.*

Surely the *difference* between 4 air-units and 9 air-units in the second and third shells (5) is not so great as the *difference* between the 9 air-units and 16 air-units in the third and fourth shells, which is 7! Thus the *difference* between the number of air-units in each succeeding shell and the shell preceding it, as we advance from the sounding body, constantly increases by 2.

Why, therefore, should not the same increase of *difference* occur in succeeding stages of sound-decrease as we advance? Why, in other words, should fractional formulas and ratios be lugged in to spoil this harmonious uniformity between the increase of air and decrease of sound according to Tyndall's law, when, as I will instantly show, there is no necessity for it?

When we know that the air-units in succeeding shells augment in number *exactly as the differences between the advancing squares increase*, is there any reason why the successive steps of sound decrease in advancing from the bell should not proceed by the same schedule of differences between squares, since the decrease of sound must correspond to the admitted augmentation of the number of air-units at every step. Positively and unequivocally, the largest number of air-units gained at any step in advancing from the bell up to 1,000 feet must be the step where the largest amount of sound-decrease occurs, since "the intensity or loudness of sound diminishes *in the same proportion.*" (See Tyndall's law, last month, page 90.) And as the largest increase in the number of air-units (1,999) occurs at the last step in the 1,000 feet, it follows that the largest decrease of sound intensity takes place at that same step, instead of the step nearest to the bell, as Prof. Robinson assumes.

So in returning toward the bell that one step, from 1,000 to 999 feet while it loses 1,999 units of

air, restores 1,999 parts of the sound-unit; and, as previously shown, this same number of parts diminishes by 2 at each successive step toward the bell, all of which restorations added together make up the complete 1,000,000 parts of the sound-unit which were absent at 1,000 feet! Again we challenge the ingenuity of man to invent any schedule or mathematical process by which these million parts of sound can be restored on the basis of fractions, and in "proportion" to the augmentation of air-units as required by Prof. Tyndall, So far from the fractional method giving the correct and essential doctrine of the wave-theory, it is a notable fact that Prof. Tyndall in setting forth this fundamental law never so much as intimates that the sound-decrease should be calculated by fractions, such as $\frac{1}{4}$, $\frac{1}{9}$, $\frac{1}{16}$, etc.; but after stating the number of air-units gained at each foot-step, simply adds: "The intensity or loudness of the sound *diminishes in the same proportion.*"

The truth is, the fractional method has been added to the law by wave-theorists without warrant—a misadventure by the way that has rendered the theory hopelessly inconsistent with itself, since a correct interpretation of it by the fractional method, as worked out by Prof. Blake in his letter quoted last month, makes the increase of sound in moving from 1,000 back to 999 feet but the "$\frac{1}{999000000}$ of the intensity it had at the first foot," *while there are actually, as he will admit, 1,999 full units of air from the 1,000th shell withdrawn!*

In the name of reason and all true science, do not these 1,999 units of air lost in going back this one foot represent the corresponding increase of sound belonging to that foot? Does any sane man deny that this loss of 1,999 units of air should as much represent 1,999 corresponding parts of the sound-unit as the loss of three air-units in moving from two feet back to one foot represents three corresponding parts of the sound-unit? Is there one place in the entire series, from the first foot up to 1,000 feet, where the units of air do not represent a corresponding number of parts of the one unit of sound? Yet Prof. Blake, so far from making these 1,999 lost air-units represent a corresponding number of restored parts or millionths of the sound-unit actually makes the restoration of sound 499-times less than the proportionate value of a single unit of air!

If the whole truth were known, I doubt if Prof. Blake so much as thought of the air-units at all; and I suspect strongly that their inseparable proportionate relation to the intrinsic decrease and increase of sound never once entered his mind, or he surely would have shown a little respect to Prof. Tyndall's law that the one must decrease "in the same proportion" as the other increases. Plainly, had the question of air-units occurred to his mind, he would probably have suggested only moving the head far enough back toward the bell to wipe out about "$\frac{1}{999000000}$" of *one unit of air*, instead of 1,999 whole units, and then his "proportion" of sound increase would have been according to Tyndall's law!

It is simply astonishing that this distinguished mathematician should so utterly have failed to recognize the fact that the number of air-units gained or lost has the slightest bearing upon the question of sound increase or decrease according to the wave-theory.

Query: Suppose the sound only gains "$\frac{1}{999000000}$" of the one intensity in passing the ear back through this one foot of distance, as Prof. Blake has proved by fractions, how far would the ear have to travel to gain back the whole first unit supposing the remaining feet in the distance should yield no more returns of intensity than the one foot which Prof. Blake has worked out? Answer: 499,000,000 feet, or more than 9,000 miles!

But it is a fact that each foot, in going back toward the bell, as I have just shown, yields less and less proportion of the one intensity "*in the same proportion*" as the number of air-units in the different shells becomes less and less, and as the differences between the squares diminish, and hence it follows that the "$\frac{1}{999000000}$" of intensity, gained by Professor Blake in that one step, would have to be decreased in value in going through the remainder of the 1,000 feet about a million-fold, thus making the distance the ear would have to travel, in gathering up the whole of the one intensity, *some nine-thousand-million miles!* And as it requires the loss of 1,999 air-units to restore "$\frac{1}{999000000}$" of the one unit of sound, according to this fractional method of "proportion," then it would require the loss of no less than 997,000,000,000 air-units to restore the one unit of sound; or it would require, in other words, the withdrawal of 997,000 times more air-units than were accumulated by the square of the distance in advancing the entire 1,000 feet from the bell! Such are some of the results of the highly scientific fractional method

Mr. Audsley, of England, in a very friendly letter, asks: Since the sound is reduced to $\frac{1}{100}$ of its intensity at about 23 feet from the bell, how is it possible for about the same proportion of the one intensity to be restored in coming back from 1,000 to 999 feet as maintained by Dr. Hall?

I answer that it is the business of those who calculate by such fractional ratios as Prof. Blake employs, to reconcile these contradictory results themselves. It is enough for Dr. Hall to know positively that 1,999 units, or *millionths* of the air are accumulated and withdrawn in advancing and returning through that one foot of distance, and then to quote the words of Prof. Tyndall that "the intensity or loudness of sound diminishes *in the same proportion*," leaving advocates of the fractional method to reconcile their own self-contradictions such as just shown in the highly mathematical results reached by Prof. Blake!

I could just as pertinently ask Mr. Audsley to explain by Tyndall's law of "proportion" how it were possible for sound to increase only "$\frac{1}{999000000}$" of one intensity in moving one foot back toward the bell from the 1,000th foot circle, as Dr. Blake no doubt correctly proves by fractions, when, as every wave-theorist admits, 1,999 full units of air have been deducted? Yet this glaring and preposterous self-contradiction in the use of the fractional method has to be accepted by Dr. Hall's critics with the law as laid down by Prof. Tyndall staring them in the face, that "the intensity or loudness of sound diminishes *in the same proportion!*"

As a common-sense scientific thinker, and one of the brightest I have ever studied, I now ask Mr. Audsley if there is any other way possible of restoring the 1,000,000 lost parts of the sound-unit, according to the wave-theory law of inverse squares, in returning from the 1,000-foot circle to the bell, in such manner as

to maintain Prof. Tyndall's law of "proportion," except the plan proposed by Dr. Hall of restoring step by step just as many parts or *millionths* of the sound-unit as there are whole units or *millionths* deducted from the various shells of air? I ask this question at Dr. Hall's suggestion and in all kindness; and I can only add that I am willing in this controversy to take my chances with the editor for better or for worse, and to stake whatever reputation I ever expect to achieve for scientific acumen on this basis, rather than accept the results of fractional ratios which make such a contradictory showing as worked out by Prof. Blake and other critics of the doctor.

Prof. Peter Hunter, one of the most careful mathematicians in the State of Pennsylvania, proceeds altogether in a different way to sustain the law of inverse squares as applied to sound decrease, though he still does it by the fractional method. He says the true way is to suppose 1,000,000 bells at the centre, and then to reduce them by the fractional process, losing ¾ or 750,000 of them at the very first step, while only gaining three units of air! Is this "*in the same proportion*" as required by Prof. Tyndall's law? The truth is, this profound mathematician misled by the confused method of fractional ratios, forgot that if he started with 1,000.000 bells sounding at the centre, he should also have begun with 1,000,000 units of air in the first shell. He would thus have gained 3,000,000 new air-units while losing 750,000 parts of the sound-units—a result precisely such as Dr. Hall claims and the same as if he had begun with one bell and with one unit of air!!!

A profound mathematician at Los Angeles, Cal., writes: "If Dr. Hall shall be able to sustain himself against the whole scientific world, in the midst of all their contumely and ridicule, and demonstrate the correctness of his discovery of such a stupendous absurdity in a universally accepted theory as that it involves the increase of sound 1,999-fold in moving the ear through a single foot, he will surely have earned an immortality such as no previous investigator has ever achieved."

I submit to the candid and unprejudiced reader to judge whether the doctor has not fairly earned the immortality here foreshadowed.

DR. AUDSLEY'S CRUSADE.

We have a long and very interesting letter from Dr. Audsley, in which he gives a most fascinating account of the lectures he and Dr. Pearce of Cambridge University are delivering in London against the wave-theory and in defense of the substantial theory of sound. We would gladly copy this letter, but it is so interspersed with personal matters in reply to letters and suggestions from us, that it would be difficult to make a proper sifting.

From this long letter we gather unequivocally that the cause is moving forward gloriously at the very doors of Tyndall and Helmholtz. Numerous distinguished acousticians have already given in their adherence to the substantial theory as opposed to the mode-of-motion doctrine of acoustics, while Dr. Audsley and Dr. Pearce are overwhelmed with invitations for lectures on the subject not only in various parts of London but throughout England. We expect specially prepared reports of these lectures from Dr. Audsley himself for the pages of the MICROCOSM, as soon as he can get a little time to prepare them.

In Dr. Pearce's lectures Dr. Audsley does the experimentation for illustrating the various matters to be demonstrated. One of these experiments, described in the letter before us, is entirely new to the scientific world, and is certainly very creditable to the genius of Dr. Audsley for invention.

To prove that air-waves, dashing against the prongs of a tuning-fork, could not be the cause of the sympathetic vibration which awakens sound in another and distant fork, the doctor conceived the idea of placing the two unison forks three rooms apart, with one vacant room, two brick walls, and two heavy doors shut between them.

Thus arranged he bowed one fork and after letting it sound a few seconds, damped its prongs, then opened one door, passed through the vacant room, opened the other door, and going up to the fork found it audibly sounding! He asked his audience to explain how air-waves sent off from the first fork vibrating only the sixteenth of an inch, could find their way through two walls and two shut doors and still possess sufficient mechanical identity to impinge against the second fork and overcome its inertia? He laconically remarks: "the shut doors completely shut their mouths."

The only drawback to the immediate and overwhelming triumph of the substantial theory in England seems to be, judging from the closing paragraphs of Dr. Audsley's letter, our own unprecedented assault upon the law of squared distance inverse as applied to sound, and as printed in the *English Mechanic*. This, the doctor thinks, has given the wave-theory a lease of life over there, by furnishing its advocates with grounds for any amount of ridicule But if the fore-and-aft raking they have received on this fundamental law from the pen of the associate editor in this number does not hurl consternation into their ranks, then we totally miss our guess.

OUR HEALTH-PAMPHLET.

As there have been more than one thousand voluntary testimonials, of the most enthusiastic character ever written or read, received at this office since the last number was issued, it seems almost invidious to quote a dozen, leaving all the rest unpublished. We are simply astonished at these files of indorsements of the new treatment, and marvel at the results in the shapes of cures narrated therein. As we have issued an extra copy of the MICROCOSM, filled with the philosophy of the treatment and its physiological effects, and also a Supplement containing, both together, nearly 150 of these indorsements, we suggest that those who are not regular subscribers would do well to send for these two additional numbers, which will be sent free.

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THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
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THE MOTION-THEORIES OF SCIENCE.—No. 2.
Why Substantialism is a Necessity.

BY THE EDITOR.

Last month we discussed the physical and mechanical impossibility of regarding the natural forces as anything less than real substantial entities, since it is impossibe for the human mind to conceive of a mechanical, chemical or sensuous result except as the effect of a substantial and objective cause.

That our sense-organs, such as those of hearing, seeing, smelling, tasting and taction, could be so impressed as to act on our consciousness and convey ideas to our mind, without the contact of a real objective cause, is too great an absurdity for a philosophical mind to entertain for a single moment. Or to claim that sensation is caused by the *motion* of our sense-nerves which, both as cause and effect, is conveyed as *motion* along these nerves to the brain and there translated into sound, that is into *motion*, as Prof. Tyndall teaches, is to beg and befog the whole question by mixing cause and effect in an unintelligible mass of confusion.

Motion, as we have repeatedly shown, is not and never was a cause of any effect, being itself an effect caused by the application of a real substantial force of some kind to some substantial thing capable of being moved. Yet *motion*, as the mere change of position in space of some substantial body, is itself *nothing* except in the necessities of our language, and is no more an entity, or a cause for the production of any mechanical effect, than is a shadow which is caused by a varying application of the substantial force of light.

It seems marvellous that any philosophical investigator should witness the effects produced by magnetic force, for example, in lifting a piece of iron at a distance, even through intervening sheets of glass, and still not be able to catch a glimpse of that invisible world of substantial but immaterial entities in the shape of the natural forces with which we are constantly surrounded! Yet, as we showed last month, even as renowned a physicist as Sir William Thomson, one of the most distinguished investigators living, could see no more in this substantial cause which moved the distant iron than would the most ignorant rustic see in the substantial but immaterial force of gravity which seizes the apple and brings it down into his basket.

Indeed, such a rustic would hardly be so stupid as to attribute this fall of the apple to the "rotation of the particles" of dirt beneath his feet, as did that distinguished philosopher in supposing the magnetic force to be but the particles of the steel magnet in rapid rotation. Better ignore all causes of the falling apple, and give no explanation whatever of the moving bar of iron, than attempt such an unsatisfactory solution as the one gravely set forth by the learned Sir William Thomson.

It was this falling of the apple, as we are told, that started Sir Isaac Newton into his scientific investigations of the force of gravity. Yet it is a most surprising fact that, after all his mental application to this single subject through weary months and years, Newton never once conceived, or at least he never intimated the fundamental idea, so far as his Principia shows, that a real objective but immaterial substance was at work as the cause which pulled the apple to the ground.

When we first became convinced of the incoherent and unsatisfying character of the motion-theories of modern science, we looked in vain through the works of eminent physicists, such as Tyndall, Helmholtz, Thomson, Lord Rayleigh, etc., for even a hint at the underlying principles of Substantialism; but instead of the broad and grand conception therein set forth that all force of whatever character must of necessity be an immaterial substance, we found nothing but the prevailing incongruity of force as motion and motion as force, the two as cause and effect alternately, and these terms so interminably intermingled and confused as to render the consecutive

operations of natural law unintelligible and utterly bewildering.

For a long time, even a dozen years or more before we took a pen to write, we saw that gravity, magnetism, and electricity, as natural forces, must be something that was real and entitative as a substantial cause in order to produce the tangible and palpable effects observed. But of what avail were these steps in the establishment of a Substantial Philosophy so long as *sound*—this impertinent Mordecai of the physical forces—sat menacingly at the king's gate?

Let all other forms of force be conceded to be Substantial entities, with *sound* alone excepted as but the motion of air-waves, and hearing but the effects of a corresponding motion of the tympanic membrane and the inner bones and nerves of the ear, and this single exception to the phenomena-producing causes in nature will and must stand as an everlasting barrier to any symmetrical system of Substantial Philosophy which can be invented as a collateral aid to the doctrine of human immortality based on the idea that the vital, mental and spiritual forces of our being are anything Substantial.

We saw almost from the start of our investigations, that to concede sound as a mode of motion was equivalent to the surrender of everything to the materialists, since it was Hæckel's boast, in defiance of all theological considerations, that if sound force, as universally admitted and taught, is but the vibratory motion of the air and of the molecules of our nerves and brain, "so may life-force and mind-force be but the motion of our brain and nerve molecules placed together in a most complex and varied manner," and consequently when death ends all this motion of our material molecules, it will in like manner end all life, all mind, and all consciousness, just as the cessation of aerial motion puts an end to the force we call sound!

No reply was possible from a teleological standpoint to this blighting and paralyzing argument of the materialist against the immortality of man, and no reply was ever attempted until Substantialism had made its advent. Such conclusive reasoning as that of Prof. Hæckel could only be met and counteracted by the most radical revolution in physical science ever undertaken by man,—a reconstruction involving an utter overturn of the motion theories of the physical forces as taught in all the text-books of the world. To attempt such a task as this, including the repudiation of the universally accepted theory of sound, required a hardihood which we did not possess, nor could we muster for months and even years after seeing its necessity.

At last, after having become fully satisfied that it was either this uncompromising iconoclasm, or a sullen surrender to the reign of materialistic darkness, we began the work in the "Problem of Human Life," first printed some thirteen years ago, and since that time we have carried on the war as best we could and with whatever assistance we could rally to our support.

It was thus that Substantialism took its rise, and the history of its progress up to date may be found recorded in the ten or eleven volumes of our scientific library.

It was manifest that this blow had to be struck, daring and reckless as the effort seemed, against the combined scientific teaching of the world, including that of every religious college in Christendom. To strike this blow effectively the attack had necessarily to be made, as just intimated, upon that original phase of the motion-theories of science about which no controversy had ever existed, and against which not a doubt had ever been entertained, even by the most radical and iconoclastic crank in revolutionary science. If the wave-theory of sound as the mother of all other motion-theories of science, could not be overturned by reason and incontrovertible arguments, then other and minor theories of physical science based on the same principle might as well be let alone and call Substantialism a failure at its very inception.

But, on the other hand, if the wave-theory of sound under fair and critical analysis should break down, and this form of force should be shown to be a substantial entity,—an immaterial substance,—then manifestly there would remain no reasonable or defensible basis for Heat as a mode of motion, the Undulatory theory of light, or any other mode-of-motion theory of modern physics. And manifestly also, to every Christian thinker who had the candor to reason fairly on the subject, if force *per se* in all its forms in the physical realm should thus be proved to be substantial, and if the motion-doctrine of such forms of force necessarily goes by the board under the blows of the Substantial Philosophy, it follows as a matter of course that all the analogical reasoning of Profs. Hæckel and Huxley about soul, life, and spirit as modes of motion, is at once and forever destroyed. Hence the importance of Substantialism at the very threshold of the argument of the Christian philosopher against materialism.

It is worse than self-stultification for a clergyman to stand up at this day in the presence of a bright disciple of Hæckel or Huxley and admit the forces of nature, such as heat, light, sound, magnetism, electricity, etc., or any one of them, to be the vibratory motion of matter

and nothing else, as all science now teaches, and then to deny the rational and analogical plea of his materialistic assailant that life-force, mind-force, and soul-force are corresponding modes of motion of organic matter. The youngest student of a philosophy class, who should happen to be present at the argument on the theological side, would laugh in derision at the helplessness of such a defender of Christianity and such an opposer of materialism.

A Substantialist in Missouri, Prof. Cropper, sends us a report of a little discussion of which he was witness, which appeared to spring up as if by spontaneous combustion between a clergyman and a materialist who happened to be present. The conversation chancing to turn on the teaching of Substantialism as advocated in the MICROCOSM, the clergyman took occasion to remark that he failed to see wherein the Substantial Philosophy was of any practical value to the church or to the minister of the gospel in defending the immortality of the soul against the claims of materialistic science. After some little argument on both sides, the student of Prof. Hæckel, who also appears to have been one of the readers of the MICROCOSM, made the following little speech, which our correspondent sends us and declares to be substantially verbatim:

"You believe," said he, "that heat, light and sound are but different modes of motion of the particles of air, ether, etc., which motion necessarily ceases to exist as soon as the vibrating particles come to rest. All I have to do is simply, by the most natural logic and analogy, to carry out your teaching, as well as that of the entire scientific world on this admitted nature of force, apply it to mental and vital phenomena, and then challenge you or any who repudiate Dr. Hall's substantial view of the physical forces to give one good reason why soul-force, life-force, and mind-force, with all their manifestations, may not simply be the motions of brain-molecules as Prof. Hæckel so reasonably teaches, and then ask you to show that such soul, mind and life, as brain-and-nerve-motions, may not totally cease to exist at death just as sound ceases to exist as soon as the air-particles come to rest.

"Thus I am forced to conclude by your own premises and by your own logic as to the nature of force in the physical realm what the nature of force must be in the organic realm, and by the laws of natural analogy and the teaching of the professors in your own theological class-rooms I am able to prove to you that soul, life, mind and spirit, or whatever name you may give these various motions of the brain-molecules, must cease to exist at the dissolution of our bodies, and consequently that death must end all.

"Let me advise you," continued the disciples of Hæckel, "if you wish to maintain your position as a defender of a possible immortality of the soul, to change your ground and your tactics at once, join the ranks of the substantialists and take the only tenable and consistent ground ever presented, namely, that every force of nature, even including sound, light and heat, must be a substantial entity in the very nature of cause and effect, and then use the arguments set forth in the Substantial Philosophy by which to sustain your position; and I, as a materialist, would certainly have nothing further to say. But I defy you or any other clergyman to answer my arguments in favor of the soul as a mode of motion so long as you are compelled to admit even a single one of nature's forces to be but the motion of material particles. Either give up the pulpit or cease to give away your whole argument for human immortality by advocating the wave-theory of sound or insisting that any other force of nature can be but a mode of motion of material particles."

Prof. Cropper who is now lecturing successfully on Substantialism and kindred subjects throughout the West adds:

"I assure you, Dr. Hall, the time is not far distant when the preacher who reënforces his Christian sermons with the unanswerable principles of the Substantial Philosophy will have the intelligent and appreciative audiences before him, while those ministers who repudiate Substantialism, because they will not study it sufficiently to comprehend its principles, will not be listened to by those who intelligently think and investigate for themselves. I tell every minister I meet, who rejects the Substantial Philosophy, to prove you wrong and he will thereby prove materialism right,—namely, that the soul is but a mode of motion, and consequently that death ends all. With me it is either Substantialism or rank atheistic materialism. There is no half-way ground to occupy."

We agree with Prof. Cropper fully, and we say further that we have not the least doubt, if Substantialism could be presented in all its force and significance to the minds of such logical thinkers as Professors Huxley and Hæckel, but that they would renounce their motion-theories of the soul, abandon materialism, and at once admit the cardinal, central truth of the Christian religion, that the intelligent soul of man is essentially and necessarily immortal, being a real, substantial and conscious entity which in the nature of things is indestructible.

How unwise, then, how short-sighted, for ministers of religion to oppose Substantialism —the only possible system of reasoning known to man by which the materialistic objections to the soul as an entity can be met and overthrown.

This, dear reader, gives you a slight conception of the necessity of the Substantial Philosophy in defending the cause of religion against the assaults of materialistic science, and this brief discussion tells you why there should be an *Organ of the Substantial Philosophy* widely circulated and permanently maintained, to stand as the bulwark of Christianity in its relation to the physical laws. If you know of

one minister or Christian thinker who doubts the value of Substantialism in this advanced age of scientific skepticism, please call his attention to this copy of the MICROCOSM. It will be sent *free*.

EVOLUTIONARY ANTHROPOLOGY.

BY ISAAC HOFFER.

Man is an animal and belongs to the animal kingdom, although composed mostly of mineral substances. He has descended upward from the lower order of life, according to the "Descent of Man," by Darwin, until he reached the monkey and was finally transmuted into man.

The origin of man, from the fact that he had to start in the origin of life, is somewhat obscure; but as force and matter are the sum and substance of nature's work, the potency of life, according to Tyndall, exists in matter, and matter, therefore, must be the source of life. Hence life is the interaction of force and matter; and the first evidence of this interaction was the production of protoplasm—a slimy substance pervaded with germs of vitality. This was produced according to Spencer's great law of evolution in matter, by "an incident force falling on an aggregate containing like and unlike units, segregated the like units and separated the unlike." When the force fell into the mud, the mud got slimy, and the atoms containing the potency of life were separated from the others, and became full-fledged protoplasmic molecules. From that living matter man commenced to descend upwards by evolution, until every living and creeping thing upon the face of the earth became his ancestor.

Man being a descendant of every grade of life, he is justly entitled to the dominion over every living thing, for it is his heritage by virtue of his direct lineage. When the origin of life had been established in living matter, the common earth-worm was the first that was evolved out of it, as a living being; and this was done in accordance with Spencer's great law of evolution in life, by "a change from an indefinite incoherent homogenity to a definite coherent heterogenity, through continuous differentations and integrations." (Spencer.)

These earth-worms immediately commenced to masticate the hard barren crust of the earth, and put it through a process of digestion which transformed it into arable and fertile soil. If it had not been for these worms, as Darwin tells us, we would never have had any soil to grow vegetables, and would have been obliged to live on fishes.

Fortunately nature had provided for just such a contingency by an abundant supply of worms for bait. It was, however, a fortunate circumstance for the vegetable kingdom that evolution differentiated the homogeneous matter into earth-worms.

Darwin's law of heredity, applied to the earth-worm, almost upsets his law of variability; for the earth-worm is still masticating and re-masticating the crust of the earth, and making more and richer soil the same as he did when he first laid the foundation of the vegetable world; but Spencer's law of evolution explains the difficulty to the satisfaction of the philosophical world, by showing that when the earth-worm had masticated and digested the hard crust of the earth into a soil of fertility, the differentiations and integrations could evolve living plants out of the indefinite, incoherent, homogeneous soil, and thus continue the definite coherent heterogenity.

When the homogeneous soil was heterogenized, the first plant evolved was a species of thistle, with an extremely light and feathery seed, that the slightest breeze would scatter over wide areas of land. After the earth had been filled with these plants, the "Struggle for the survival of the fittest" commenced in accordance with Darwin's well-known law on that subject. Never in the history of evolution before or since was there such a fierce and long struggle. Finally, however, some more fit than others, having been dwarfed in their upward descent, swelled at their roots and evolved into a species of carrot, and by their stronger roots starved out the thistles. In the upward direction the highest thistles were transmuted into sun-flowers, which by their shade and greater strength choked the smaller thistles to death. From thence forward the progress of evolution has been going on without any serious intermission.

Before the survival of the fittest had transmuted the thistle into a wild carrot, and some think even before the earth-worm had laid the foundation for the vegetable kingdom, the aggregated plastic mud at the edge of a green covered pond under the hot sun of the tropics, was struck by an incident force which segregated the like units and separated the unlike in accordance with Spencer's great law of evolution in matter, and then in conformity with the law of evolution in life, by differentiations and integrations evolved a species of tadpole, which in form had nothing but a mouth, belly and tail. When the pond got full of these primitive animals, some were forced into the shallow water and rubbed their bodies on the rough gravel; when at once Spencer's first principles of life, "the continuous adjustment of internal to external relations" were brought into action; and in accordance with the law of "adaptability to the environment," first discovered by Lamark, bones began to grow, and two protuberances made their appearance in the forepart of the belly, which soon developed into feet.

This was the first prophetic indication that man was to be supplied with two arms and two hands. Some philosophers think that the two large side fins of the fish foreshadow the arms and hands of man, but this is evidently a mistake for two reasons: First, because the fins show no sign of a hand, and second, because the fittest tadpoles which remained in the deep water of the ponds were transformed into fish, and became the progenitors of the finny tribes that fill the waters of the earth.

When the tadpoles' feet were fully developed some of them walked out of the water, and the hind part of the belly and tail dragged on the gravel, and hind legs became a "mechanical necessity." These soon in accordance with the principle and law under which the front feet were produced, made their appearance and enabled the tadpole to walk on dry land. While these hind legs were forming another short struggle for the survival of the fittest took place between these legs and the tail, but the tail had to drop, and the legs grew ahead as the fittest; and the evolution of the tadpole into the bull-frog was complete. From thence forward differentiations and integrations

evolved new species of land animals out of the bull-frog, notwithstanding the fact that heredity had fixed the process of transmutation in the tadpole, and land animals multiplied with great rapidity until finally the monkey—the immediate progenitor of man—was evolved. It is a singular feature that the first or original ancestor of man—the tadpole—lost his tail in the first transformation, while the last and immediate ancestor of man had again obtained a long and strong tail by which he can suspend his body from the limb of a tree. Huxley ought to be able to give a scientific explanation of this singular transformation and retransformation; for he has supplied the missing link in the great chain of evolution by his three-told horse, the Hiparean, developed into the Orohippus. Man, therefore, seems to be the ultimate result of the evolution of life; and at his production the law of heredity became the supreme law, suspended the law of progressive evolution, and permanently fixed the grades of life within definite limits, beyond which the law of evolution can not go.

It is a scientific fact, vouched for by some of the most celebrated scientists, that man in his development from the embryonic state to his manhood, still passes through all the formative stages from the living matter protoplasm to the tadpole, from the tadpole to the monkey, and from the monkey to his fully developed physical and intellectual condition.

The most wonderful feature in all the actions and results of evolution is the psychical manifestations of the mineral substances that constitute man. According to Huxley "mind is the functional operation of the molecular composition of the organism;" and if this is true then the minerals that have been evoluted into the organism of man carry on some functional operation which constitutes mind. Hence, when the molecules of matter are of the right kind and properly arranged in the organism, the dynamic action of these molecules differentiate intelligence and thought as a music-box grinds out musical sounds. Wonderful and mysterious as this evolving of mind out of matter appears, Huxley makes it plain that the mineral combinations in the human organism produce the action which we call mind, and that when the action of the mineral substances ceases there will be no longer any mind in the organism. He settles the question as to what mind is and shows that it is a mineral production—the effect and result of molecular action of mineral combinations; but we must go to Spencer for an explanation of the first principles of the faculties of the mind.

Spencer shows that "the mental faculties are the product of the intercourse of the organism with the environment under the operation of heredity." How plain and simple!

This highly philosophical definition had a tangible illustration in my own experience. In my early boyhood I came to an apple orchard, and with the principles of heredity common to boys I was tempted to examine the apples; and in doing so I spied a basket-like thing hanging on the limb of a tree, and obeying this boyish instinct, I got a stick and tried to stir down, this then to me curious object, for inspection. The consequence was that the intercourse of my organism with the surrounding conditions, on that interesting occasion, produced a mental faculty of caution which has survived to this day. More anon.

Lebanon, June 11, 1890.

THE NATURE OF LIGHT.

BY PROF. D. JAMES

Dr. Hall,—As Substantialism is now a foregone conclusion with all who have dispassionately considered its merits, its advocates may advance, without serious molestation, to a more particular discussion of the source and nature of the forces which cause the phenomena around us.

In Genesis the elements of the world, prior to the coming of light, were "formless and void." We may infer that the transformations which occurred after light appeared, were caused by light. The well-known effects of light now, seem to support such an inference. For, if light were removed from the earth, it would inevitably revert to a formless and void condition.

With diffidence, therefore, let it be suggested, that light, which is known to be composite, embodies all the forces which are operating in the earth; and that in some way, light is decomposed, here, into its constituent elements, heat, electricity, etc. These elementary forces, each acting in its peculiar way, produce the various phenomena discussed in the science of physics.

The Sun is the workshop of the chief architect, who there "forms the light," and thence sends it on its mission. *Gravity* may be an independent force whose office is, to re-collect the expended energies at the fountain head, there to be utilized again.

Physical light is symbolical of spiritual light, and its effects are similar. Spiritual light is evidently the embodiment of the forces or virtues excited in the soul; and its symbol, physical light, evidently contains the forces, which its presence always excites into activity.

These thoughts are thrown out, with the view of eliciting investigation on a new line.

BASILAR PRINCIPLES.

BY REV. J. W. ROBERTS, F. S. SC.

There are certain fundamental and foundation principles that underlie all true science and philosophy, a departure from which is certain to lead into error. Some of these are here named.

1. Out of nothing something can not come.

2. Out of something nothing can come that was not already in the something entirely or germinally, for two reasons: First, in just so far as anything essentially new should come, it would be something out of nothing as effectually as in the first place; and, second, the less can not contain the greater.

3. There is and can be no development in pure matter.

4. All development imbues in and is inseparable from the life principle or force.

5. All intelligent development is the outgrowth of a union of intelligent or mind force with the life force.

6. All development is in the line of the inexorable law that "like produces like."

7. Mere physical law has no more intelligence than matter; hence no possibility of improving upon itself or of imparting improvement to anything else in Nature. Like fate, it works and moves in its own groove, and nowhere else.

8. All adaptation of means to an end demands intelligence, which adheres neither in matter nor physical law or force, which are blind and helpless.

9. All development is from the action of the higher upon the lower. Less intelligence can no more impart greater intelligence than less physical force can lift the greater.

10. Matter and physical force never progress, but always remain essentially the same. Hence, when progress is found to exist, its source must be sought elsewhere than in these.

11. As no effect can be produced by nothing, all phenomena must be the product or outgrowth of something. As something is substance, material or immaterial in contradistinction to nothing, so substance must be the equivalent of the something that produces phenomena; otherwise it must be nothing, which is a self-stultifying contradiction.

12. Substance, then, must originate and preside over all things, visible and invisible. As design is manifest everywhere, that substance must be intelligent, and that intelligence must be efficient, for every effect must have an adequate cause.

13. A universe of substance presided over by intelligent substance is, therefore, a self-evident proposition, with the only alternative that nothing did, does and will do these things. The case is clear, the choice is plain and can not be mistaken. It is substance or nothing. "Choose you this day which you will"—substance or nothing.

Oskaloosa, Kansas.

THE "SOUND" PROBLEM.

BY PROF. HENRY A. MOTT, PH. D., LL. D.

The problem as to the decrease and increase of sound intensity when receding from or approaching the source, has created more than usual controversy of late, all arising from incorrectly comprehending the law which governs the problems.

Judging from numerous articles written by Dr. Hall and by his associate editor, it would seem that scientific writers should by this time comprehend the position taken by so clear and lucid a thinker as Dr. Hall. As such, however, is not the case, I propose in this brief article to make the subject so clear that all who have written adversely to Dr. Hall's views will see their error and should have the individuality to admit it.

To correctly consider and experiment with the increase and decrease of sound, according to theory, it will be convenient, to say the least, to establish a station for observation, and this station we will call the "Home Station." Other stations will then be in order, equally distant apart on a direct line with the "Home station," and for convenience we will number the stations 1st station, 2d station, 3d, 4th, 999th, and 1000th station.

At the Home station we will select a standard for comparing the various sounds which arrive, and such standard shall be one bell and the sound from this bell shall be considered of one volume capacity.

We then send our assistant to the 2d station, with instructions to sound one, two, three or four similar bells. The sound from three bells which reaches our Home station falls short in volume to our standard. He is instructed to sound the fourth bell, when the sound, reaching the Home station, compares exactly with our volume or with the sound produced by one bell. The assistant then proceeds to the 3d station and after sounding 1, 2, 3, 4, 5, 6, 7, 8 and 9 bells together, the sound which reaches the Home station is again found exactly of the same volume or intensity as our standard.

After experimenting at other stations, the assistant proceeds to the 999th station and in a similar manner deduces the fact that to produce a sound having the intensity of one volume at the Home station, it is necessary to sound 998,001 bells, and at the 1,000th station 1,000,000 similar bells will have to be sounded according to the accepted theory.

We therefore find it necessary for the production of a sound at the Home station of the intensity of one volume or equal to that produced by one bell that at other stations the following number of bells must be sounded:

Home station.	2d station.	3d station.	4th station.	* * *	999th station.	1000th station.
1	4	9	16		998,001	1,000,000

Which means that to produce a sound at the 2d station, which will have the intensity of one volume at the Home station three extra bells must be sounded; at the 3d station, eight extra bells; at the 999th station, 998,000 extra bells; and at the 1,000th station, just 999,999 extra bells must be sounded.

Now it is clear that as three extra bells are required at the second station (4 in all), and eight at the third station (9 in all) that the difference between the third and the second station must of necessity be five bells (8—3—5) it follows therefore that the difference between the 1,000th station and the 999th station would be 1,999 bells; or in other words, if one bell were sounded at the Home station and a theoretically perfect ear were placed at the 1,000th station, the sound would be just $\frac{1}{1000000}$ the volume or intensity of that at the Home station; and if such ear were moved to the 999th station the volume and intensity of the sound would be increased just 1,999-fold the intensity of that at the 1,000 station, just as it would be increased five-fold by moving such ear from the third station to the second station.

All errors and misinterpretations of this problem have been based upon the "fractional method" which I will now proceed to show to be incorrect. We have deduced above the following:

Home station.	2d station.	3d station.	4th station.	* * *	999th station.	1000th station.
1	4	9	16		998,001	1,000,000
	Necessary to produce a sound of one volume at Home station.					

But according to the fractional method we have, starting with 16 bells at the 4th station:

Home station.	2d station.	3d station.	4th station.
1	$\frac{4}{9}$—1.77 bells.	$\frac{9}{4}$—4 bells.	16 bells.

Starting with 9 bells at 3d station:

Home station.	2d station.	3d station.
1 bell.	$\frac{4}{9}$—2.25 bells.	9 bells.

Starting with 1,000,000 bells at the 1,000th station:

Home station.	2d station.	1,000th station.
1 bell.	$\frac{1000000}{998001}$—1.11 bell—	1,000,000 bells.

Now it is an admitted fact, that four bells must be sounded or four volumes of sound must emanate from the 2d station to produce a sound at the Home station of one volume or corresponding to one bell; therefore as by the fractional method we have at the 2d station in one case only 2.25 volumes or bells, in the next only 1.77 volumes or bells and in the next only 1.11 volumes or bells, it is evident that if such were the case, the sound

arriving at the Home station would fall far short in each case cited of being of one volume intensity or equal to the sound produced by one bell.

Hence it is clear that the elucidation of this problem by Dr. Hall is correct, and the "fractional method" proved inapplicable and incorrect.

REMARKS BY THE EDITOR.

At last it is refreshing to find one thinker and investigator of reputation in the scientific world capable of taking a common-sense view of this squared-distance controversy.

It is but just to Dr. Mott to say that, until he had received letters from England urging him to set us right and prevent our further injuring the cause of Substantialism by attempting to defend the error into which we had fallen, he had given no serious attention to the real bearing of our charge of absurdity against the wave-theory based on this law of inverse squares.

On receiving such letters, however, he at once called at the office of the MICROCOSM and began a critical investigation of the question in dispute, at the same time carefully reading our original letter to the *English Mechanic* as printed in the April MICROCOSM, and the later articles from our own pen and that of the associate editor.

At first the doctor assured us both that we were wrong from beginning to end, and that our critics had us fast. He advised us, as the easiest way out of it, to acknowledge our error in the MICROCOSM and back down as gracefully as possible, and thus give up the fight.

But our young associate said *no, never*, until the doctor should be able to show that a rational "proportion" existed between the bells, the air-units, and the fractional rate of decrease and increase of the sound-intensity from station to station in going and returning, as set forth by mathematicians. This persistence of the young editor, with our own most hearty concurrence, soon convinced the doctor that he had taken a large contract, to say the least.

For nearly a week he kept up his investigations of the problem, declaring in the mean time that never before in his life had he tackled a problem involving so much mental labor. He admitted finally that he could work out no possible "proportion," as required by Tyndall's law, in the fractional decrease and increase of sound calculated in the usual way and the addition and subtraction of bells, as well as the regular accumulation and loss of air-units in going and returning from station to station.

At last he came to the office glowing with evident satisfaction and frankly gave it up, declaring that the fractional method was evidently wrong and must be abandoned, at the same time admitting that we were absolutely correct in our original charge, namely, that if the wave-theory application of this law of squared distance is correct it must involve the increase of sound 1,999-fold by moving the ear one foot toward the bell from the 1,000th station, because that single step loses 1,999 units of air and requires the silencing of 1,999 out of the million bells sounding in order to maintain the one constant volume at the home station.

On the other hand he urged, if there were 1,000,000 bells sounding at the center in order to give one volume or unit of sound at the 1,000th station, as all wave-theorists admit, it would be perfectly evident, in moving the ear to the 999th station, that 1,999 of these central bells must be silenced to keep the one unit or volume of sound constant. And if no bells were silenced at the center, then it is plain that this movement of the ear through this one foot must increase the sound 1,999-fold, since there would be but the volume of one bell at the 1,000th station, whereas there would be 1,999 volumes added at the 999th station! This is evidently so, since in going all the way to the home station the entire 1,000,000 volumes must be added as the differences between squares diminish, or just as the units of air are deducted step by step.

And if this is true with a million bells sounding at the center, *it would be equally true of a single bell with its tone divided up into 1,000,000 parts and only one of these parts remaining at the 1,000th station!* How plain and simple!

The doctor further showed, in case a single bell is sounding at the center, that as moving the ear clear back to the home station would be exactly equivalent to striking 1,000,000 bells at the center while retaining the ear at the 1,000th station, thus giving as it does at this station, one volume of sound, so the movement of the ear back one foot to the 999th station *would be, according to the wave-theory, exactly equivalent to the striking of 1,999 bells at the center, with the ear still retained at the 1,000th station!*

And, dear reader, this monstrous absurdity, now demonstrated against the wave-theory, is the identical position we assumed in our first letter on the subject to the *English Mechanic*, which created such a storm of ridicule all over England, and which called out hundreds of contemptuous letters from mathematicians in this country. Retribution has been sure and swift. (See MICROCOSM for April, page 73.)

Dr. Mott, therefore, now admits, as he states in his article, that we were right in our original charge, thus striking the hardest and most destructive blow against the wave-theory ever dealt.

P. S.—As a final word, we submit to the numerous opposers of our views the suggestive fact that whether we are technically right or wrong, as regards the fractional method, they must admit that there is at least something very puzzling to be said on our side of the question when such a profound investigator and veteran fighter as Dr. Mott was obliged to surrender at discretion.

We ask Substantialists, therefore, who still think we are wrong, at least to concede that we have fought a good fight and kept the faith, even if we have not yet finished our course. We pray all such opposing Substantialists not to turn against Substantialism because there happens to be two sides to a complex mathematical problem, but wait and see what may turn up in the future.

A SPECIAL PROPOSITION TO SUBSCRIBERS AND OTHERS.

The MICROCOSM is admittedly a paper needed by tens of thousands of thinking men and women who honestly doubt the conscious existence of the soul beyond the present life, or who want something on the scientific or philosophical plane to round out, strengthen, and confirm their religious hopes.

Thousands of these persons, though they hesitate to express it above their breath, tremble with misgivings on the verge of the hereafter alone for the want of some substantial proofs from the nature and fitness of things that will re-inforce the evidence of a future life for humanity drawn from purely theological sources; and this is the case even with thousands of professed Christians, who, while sitting under the very droppings of the sanctuary are tortured with doubts and fears concerning the dark and gloomy beyond.

To all such persons we say that no other paper now published except the MICROCOSM makes this phase of original scientific research in connection with religio-scientific philosophy a specialty. And we do not hesitate to believe that no person can confer a greater boon of comfort on a friend who is inclined to doubt the certitude of a future conscious existence than to present him or her with a year's subscription to this journal.

Those who ever desire, during their earthly existence, to do any real missionary work, have now an opportunity at a most trifling cost.

Our proposition is to mail the present entire seventh volume of the MICROCOSM, including all back numbers, to any address for twenty-five cents, in the hope that such subscribers will continue on after learning to know and appreciate the substantial little messenger.

Can not the reader think of some distant friend whom he would like to benefit? If so, send us the name and we will mail this copy free of charge with this proposition marked.

NOT A FAMILY NEWSPAPER.

We do not wish this journal to be looked upon or regarded as in any sense a "family newspaper." There is no room in it for matters legitimately pertaining to such a department of journalistic literature. The Rev. Mr. Wadleigh, of Canada, writes us:

"Don't try to make your journal a family newspaper. There are hundreds of good publications in that line already for all who desire family papers. We want the Organ of Substantialism for what it really is, and for what no other publication contains—for its original scientific and philosophical ideas, discoveries and discussions. We want it because in opening its pages anywhere we are made to *think* outside of the ruts of science and philosophy, or the common current of journalistic investigations. We want it on our table and in our study because it is full of new thoughts."

Whenever the MICROCOSM shall cease to contain food for reflection and original ideas outside of the beaten track of journalism, we shall consider its mission ended. But there is no danger of such a result. Every step we take in carrying out the principles of the Substantial Philosophy tends to introduce us and our readers into new fields of research, with new vistas constantly opening up to the view. The single article in this number from the pen of the eminent scientist Dr. Henry A. Mott, in demonstration of the overwhelming truth of our original position on the law of squared distance inverse as applied to the decrease of sound, gives a grand exhibition of the undeveloped possibilities yet to be explored even in our investigations of the exact sciences. Let every thoughtful reader study it.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 6.

As we enter the cretaceous period, we immediately recognize the fact that we have climbed into a higher plane of existence. The faunæ of the seas, and the pioneer saurians of the mud flats of the world, greet us in profusion, and invite us to tell why this wondrous change. It is not a change noticed in a few exposed geologic pages, but a changeso wide in extent that it embraces every continent and land known to the observer. From the Tundras of the far north, to the very Antartic coasts, cretaceous forms that lived in those ancient waters emphatically prove that the Cretaceous ocean extended over the world. This is so well known to geologists that I have but to mention it, to receive their common assent. Some far-sweeping change had come over the waters of the ocean. And now the question is most fitting; what could thus have

changed the ocean's waters, but a vast down-pouring of *new waters?* Geologists, astronomers, physicists, you will for ever look in vain for any other cause! To change the waters of the ocean, waters must be added; and especially so in this case, when a new life environment is so plain that none but a novice can mistake the boundaries of this geological horizon. Another world-ring had floated down from its moorings on high; new life-germs attended it, and in their new environment, lifted the world's life a step higher.

It is very plain that if new waters then fell on the earth that new mineral and metallic solutions accompanied the same, and in the cretaceous waters these must have been precipitated upon the ocean's floor. *Now whence came the chalky deposits of the cretaceous seas?* They did not exist in the previous ocean, or they would have been deposited then. I will not now attempt to prove that the other peculiar mineral deposits of the cretaceous period were not derived from pre-existing beds, for the chalk-deposits are sufficient witness. But there is another witness to interrogate. If the cretaceous ocean was produced by a vast downfall of annular waters, no sooner did the new waves roll to their level, than the fresh mechanical pressure upon the ocean's floor would increase the mechanical heat of those rock-beds, and as an utter necessity they would expand against the continents. The reader must remember that every pound of additional waters was necessarily conserved in mountain upheaval. Not by a direct result, but by increasing the heat and consequently the dimensions of the solid strata. When thus a mass of expanding rock, hundreds of miles in superficial extent, hundreds and perhaps thousands of feet thick, abutt against a continental wall, that wall must yield. No earthly resistance could withstand it. The Pacific coast mountains, under whose shadow I now write, have been pushed off their bases and *moved overland* for unknown distances, for the older beds lie on top of the carboniferous.

Now as I have before shown the lateral motion of beds must take place every time the ocean is augmented by annular additions. So that if the cretaceous ocean was thus formed, it was inevitably followed by crust upheaval and mountain-making. And now all we have to do is to examine the jurassic and other beds and we find them disturbed and displaced before cretaceous beds were formed upon them, showing that immediately after the annular addition of waters and before the other annular matter had been added, the mighty lever in the balance of forces began to move. We find also this movement continued with more or less activity throughout this period, showing that minor additions continued.

Thus we find a dovetailing of testimony which renders this evidence peculiarly strong. But now if the reader would look back over the record he will find this mountain-making and crust up-turning to begin every geologic age, and to end the same. It is plain then that a ring-fall produced both the age and the rock displacement. There is another feature which becomes more manifest as we come down the ages, and that is the evidence of glaceation on the boundary lines of the ages. Many geologists claim that the ages were separated and begun by periods of galcial cold. The annular theory goes further, and shows that all glacial cold was produced by the fall of *annular snows.* In connection with these signs of refrigeration are the tracks of deluges which Dana characterizes as "vast beyond conception," and Dawson referring to the same, is puzzled by the frequent recurrence of these great debacles of water, admitting that it is strange that the continents *have always been deluged as in baptismal plunges just before continental upheaval and crust-folding.*

The annular theory not only explains it, but shows the necessity of such deluges throughout the ages. A ring descending into the outskirts of the atmosphere necessarily becomes a belt; then a canopy, stretching far toward the poles. But a canopy *necessarily* produces a warm or green-house world. *Witness the green-house periods.* That canopy gradually mingling with the atmosphere, finally passes the stage of the atmosphere's buoyant capacity, and it begins a down rush of waters and other annular matter. *Witness the "baptism of continents."* The waters rush to the ocean; witness *"deluges vast beyond conception."* The new waters create a new environment. Witness the extinction of old organism and the birth of new. The new waters press heavily upon the rock beds of the sea. Witness new mountains and growth of land area. Those vapors that fell nearer the polar circles beyond the influence of solar warmth *fell as snows.* Witness the signs of glaciation from the Devonian to the last glacial epoch.

Thus a ring-fall is shown to be competent to produce all the great geologic changes that characterize an age. And it can be readily shown that it is competent to produce the minor changes and consequently all the geologic changes necessary in world growth.

We now come to the tertiary period, the most remarkable of the worm ages, for exuberance in animal life. At the very close of the cretaceous, the great world-empire of reptiles received such a shock, that dynasty after dynasty passed rapidly out of existence for ever. The ocean was no longer a fit abode for them. The germs of organic life incubated in a thoroughly new environment, were new and developed into new forms. For the first time animals that suckled their young came upon the scene. They were large and ponderous, fitted to an atmosphere of great buoyant power, and this argues, that a canopy of vapors weighed down the atmosphere. They were furnished with lungs that required a pure oxygenated air, entirely different from that fitted for a world of reptiles. This shows that the great floods of cretaceous vapors that fell during that period, simply absorbed the carbonic acid, from the air, deposited it in the limy compounds of that period and closed the reptilion age. It is well known that watery vapors are great absorbents of carbonic acid, and I presume that nothing but annular vapors could have cleared the impure air of that time, and when we find it locked up in such vast quantities in the chalk-beds of the earth, we may consider this point settled, and another victory won by the annular theory.

After a few oscillations in geological conditions the tertiary closed, and when we look back over the mighty dead, and the mighty charnel houses that contain them, we are more than ever convinced that nothing short of the most stupendous revulsions could have swept these huge life forms from existence. In many places their skeletons lie in countless numbers, as though in the mighty rush of waters they

had been carried like drift-wood and lodged and packed like fish in a barrel. This age, too, closes with its flood, its oceanic addition, and a crust disturbance the grandest of all time. The greatest mountain ranges of the earth were then lifted from the deep, and we pass from the wreck of a world of life, to one of utter desolation chained in the fetters of inexorable winter,—a winter that almost completed the extinction of land animals, and forced the artic faunæ too near the tropics.

The continents were in great part covered with a vast casement of snows, hundreds of feet thick. This was in fact an ice-mantled earth. But these vast snow fields and ice melted away, and again they returned, upon lands of verdure and animated nature.

The one all-competent source and cause of these snow accumulations is found in the

EARTH'S ANNULAR SYSTEM.

Elsinore, Cal.

ONE MORE GUN FOR ENGLAND.

The following letter, which we have sent to the *English Mechanic*, will speak for itself. We ask every man who believes that the slightest foundation exists for the wave-theory of sound to read this letter and then send us his verdict:

THE WAVE-THEORY AGAINST ITSELF.

To the Editor of the English Mechanic:

I purpose in this letter briefly to show by the fundamental law of the wave-theory of sound, —namely, the claimed decrease of sound as the square of the distance,—that the theory is self-annihilating, and that no argument except a rigid application of this law is needed to break down the theory.

First, that we may not be accused of misrepresenting the theory, here is the law as laid down by Prof. Tyndall:

"You have, I doubt not, a clear mental picture of the propagation of the sound from our exploding balloon through the surrounding air. The *wave of sound expands on all sides*, the motion produced by the explosion being thus diffused over a continually augmenting mass of air. It is perfectly manifest that this can not occur without an *infeeblement of the motion*. Take the case of a shell of air of a certain thickness with a *radius of one foot*, reckoned from the center of explosion. A shell of air of the same thickness, but of *two feet radius*, will contain *four times the quantity of matter*; if its radius be *three feet* it will contain *nine times the quantity of matter*; if *four feet* it will contain *sixteen times the quantity of matter*, and so on. Thus the quantity of matter set in motion augments *as the square of the distance* from the center of the explosion. The *intensity* or *loudness* of sound *diminishes in the same proportion*."—*Lectures on Sound*, p. 10.

From this law, on which the very existence of the wave-theory depends, it is plain that the intensity or loudness of sound, which consists of the motion of the air-particles and nothing else, must be in exact proportion to the amplitude or width of swing of these air-particles, and this amplitude must be in exact proportion to the quantity of air to be moved, or in other words the "*enfeeblement* of the motion" must keep pace exactly with the augmentation of the number of air-units on which this sound-energy or motion is to expend itself. All wave-theorists admit this.

But here comes the self-destruction of the theory: As taught in every text book, the sound ought to be $\frac{1}{4}$ as loud in the second shell, where there are *four* units of air, as in the first shell where there is but *one* unit of air, whereas, if this law be correct, the intensity of the sound is actually reduced to $\frac{1}{8}$ in the second foot since there are not only the *four* units of air in this second shell to be put into motion, but the one unit also of the first shell which must be added, since all five of these units are kept in motion if this law be true, and consequently the "enfeeblement of the motion" must correspond and be but $\frac{1}{8}$.

At the third foot shell 9 new units of air have been added, and the advocates of the wave-theory superficially tell us that the sound is now reduced to $\frac{1}{9}$ of its intensity, whereas if they exercised the least mechanical judgment they would have seen that the sound should be reduced to $\frac{1}{14}$ of its intensity instead of $\frac{1}{9}$, according to the wave-theory, since there are not only the 9 units of air contained in the third shell to be kept in motion, but the 4 units of the second shell and the one unit of the first shell! Remember that according to theory none of these motions cease so long as the sound continues.

The advocates of this theory, however, in order to carry out the application of the law in harmony with squared distance inverse, are actually compelled to jump over the first and second shells of 5 units, on reaching the third shell, and ignore their motions as if they had no existence thereby limiting the "enfeeblement of the motion" entirely to the third shell in order to obtain the $\frac{1}{9}$ required by the theory! Was ever a greater or apparently more dishonest absurdity formulated into a scientific theory to force it to harmonize with its environment? And is it possible that such an absurdity could be permitted to pass for centuries unobserved and uncorrected except that the theory could not exist without it?

At 4 feet from the center the shell contains 16 new units of air which added to the previous 14 also still kept in motion, must still

further *enfeeble* the sound and reduce it to $\frac{1}{80}$ of the intensity it had at the first shell instead of $\frac{1}{16}$ as the theory requires. Surely all these 30 air units must be kept in motion just as much as the last 16 of them, if there is a grain of truth or consistency in the theory. And if Tyndall's law is correct, the "enfeeblement of the motion," keeping pace with the number of air units to be moved, must, by the very nature of this law, reduce the intensity to $\frac{1}{80}$ at the 4th shell instead of $\frac{1}{16}$ as is every where taught.

Thus, going on up toward the 1,000 foot station and adding to each new shell all the units of air in the preceding shells, which as a matter of course are using up the energy and helping to enfeeble the motion, we will find that wave-theorists have always labored under a monstrous error, and that the intensity of the sound on their own principles must decrease enormously faster than they have ever allowed or even dreamt of.

Look at the following schedule of facts and figures and thereby behold the real absurdity of the theory as taught by every professor of physics in the world: At 5 feet from the center the intensity of the sound is reduced to $\frac{1}{25}$ instead of $\frac{1}{16}$ by adding the "enfeeblement of the motion" caused by the previous 30 units of air. At 6 feet it is reduced to $\frac{1}{37}$ instead of $\frac{1}{36}$ as universally taught. At 7 feet it is reduced to $\frac{1}{140}$; at 8 feet, to $\frac{1}{304}$; at 9 feet, to $\frac{1}{585}$; and at 10 feet it is reduced to $\frac{1}{885}$ of its intensity, instead of $\frac{1}{100}$, since there are 885 full units of air involved in the motion up to this distance from the center, including the 10th shell, instead of 100 as the advocates of the theory teach, thus producing a corresponding "enfeeblement of the motion" if there is any meaning in Prof. Tyndall's law

But this prodigious showing of error in the first 10 feet from the sounding body, is only a bagatelle when compared to the scientific monstrosity exhibited even at 1,000 feet from the center. Instead of a reduction of intensity to $\frac{1}{1000000}$, as the whole scientific world has supposed, the sound is actually reduced in round numbers to $\frac{1}{1000000000}$ according to Prof. Tyndall's law, including of course all the preceding shells and air-units which are necessarily and at the same time using the central energy, enfeebling the motion and diminishing the amplitude of the sound-waves before reach the 1,000th station!

This stupendous oversight of wave-theorists in carrying out this fundamental law, also requires 1,000,000,000, bells at the center, or at the 1,000th station, instead of 1,000,000, to give the one volume of sound at the opposite station, and as a matter of course, it vitiates all they have ever taught or written in connection with that underlying law of their theory. And since the law itself, as thus proved, has been so ridiculously misapprehended, is it not about time for the advocates of the motion-theory of sound to abandon the contest and acknowledge their error?

In the light of this law with its bottom dropped out and the foundation of the wave-theory based upon it swept away as by an acoustical cataclysm, how funny must all the ridicule I have received for opposing that law now appear to those critics? They laugh loudest and longest who laugh last!

I now call upon "Sigma," instead of troubling his head about how doctors of philosophy are manufactured in America, to cork up his demijohns of ridicule and wrath for a time at least, and come down seriously to the work of neutralizing this crushing blow against the basic law of the wave-theory. Unless this argument as here presented against the wave-theory and its foundation law can be met and set aside, then good bye to acoustical science as now taught in all the colleges in the world.

A. WILFORD HALL, Ph. D., LL.D.,
Editor of the MICROCOSM, New York.

TWO CRITICISMS ANSWERED.

BY THE ASSOCIATE EDITOR.

A number of persons who have opposed the views of Dr. Hall in this squared distance controversy have urged that his objections to the application of the law of inverse squares to the physical forces, are as much against the substantial theory as against the wave-theory of sound. This, however, is a misapprehension, for while the wave-motion of air must in the nature of things be in exact proportion to the quantity of air to be moved according to Prof. Tyndall, the substantial forces of sound and light, as Dr. Hall has demonstrated, must to a large extent be *self-augmenting* or *self-expanding* in intensity after leaving their source, thereby causing their rate of decrease to be enormously less than that required by the law of inverse squares; while on the other hand the forces of magnetism and heat diminish enormously faster than this ratio permits. Let me illustrate:

Dr. Hall has shown that the spark of the arc-light, a mere point, no larger than the head of a common pin, and which can be seen 10 miles away with the naked eye, must have diminished if this law be true, to a 100,000,000,000,000th of its intensity in that distance if reckoned by sixteenths of an inch as the unit of measure. (See MICROCOSM, April No., page 89.) Now it is well known that a white object of the same size, not self-luminous, placed against a black ground, the most advantageous view that can be taken, can not be seen by the keenest eye more than 30 feet since the laws of perspective and the angles of vision completely shut out the view. How is it possible, therefore, for such persistent visibility of so small an object to occur except on the principle of the self augmentation of this force? The so-called difference in "intensity" which

is supposed to explain this problem is no explanation at all without it is supplemented as above.

But for this novel and original suggestion of Dr. Hall it would be an inexplicable mystery as to how the arc-light can be seen even a hundred feet away; nor could there be any real explanation of the fact that one light even of the same diameter can be seen many hundred times farther than another—without the aid of this discovery,—this self-augmenting property being thus proved to be somewhat analogous to the varying sonorous property of different sounding bodies.

As the arc-light is visible after it has decreased to 100,000,000,000,000th of its intensity it has been demonstrated by Dr. Hall's reasoning, as now confirmed by Dr. Mott's argument, that in passing through the last foot of the 10 miles, and estimating the rate of decrease by the sixteenth-inch unit, the change of intensity must be 300,000,000 fold, just as certain as that the change of sound in passing the 1,000th foot must be 1,999-fold by the foot unit of measure, as Dr. Mott agrees.

A very critical mathematician, Prof. H. W. Smith, of Belle Springs, Kansas, in a stuning denunciation of Dr. Hall's views, says that he is all wrong in regard to the one unit of sound at the center. He insists that the sound at the first foot consists of 1,000,000 small units, in case 1,000 feet is the distance under discussion, while there are also 1,000,000 full units of air to be considered.

He then urges that at the second station, with 4 units of air, 750,000 of these sound-units are wiped out, leaving $\frac{1}{4}$ or 250,000 remaining. The third step he urges, must wipe out 111,-111$\frac{1}{9}$ of these remaining 250,000 with 9 units of air added; and so on up tapering out to $1_{\frac{1999}{1000000}}$ at the 1,000th station in order to exhaust the million sound-units in "proportion" to the accumulation of the 1,000,000 units of air, etc.

Of course this graded series of fractions will, when added together, make 1,000,000. Who does not know this? But this is not the question. It is this: Is this exhaustion or wiping out of the 1,000,000 sound units as here proposed "in the same proportion" as the accumulation of air units added? In a word, can there be anything more ridiculous than the idea that 750,000 of the 1,000,000 sound-units become exhausted in movimg 4 units of air,—three times as many as it takes to move all the remaining 999,994 air-units out of the 1,000-000? Was there ever a more absurd idea than the one here proposed by Prof. Smith, that while the motion of the 4 air-units at the second station uses up the energy of 750,000 sound-units, the motion of the 1,999 air units gained in going from the 999th to the 1,000th station only uses up $1_{\frac{1999}{1000000}}$ sound units?

Why does not Prof. Smith abandon the impracticable method of fractions and adopt the proportional method of Tyndall's law? At the 2d station he could then deduct 3 units of sound for the 3 new units of air added. At the 3d station where he gains 5 more units of air, making 9, he could wipe out five more units of sound making 9, and this would exactly correspond to the 9 bells at this 3d station required to make the one volume at the first foot. How nice all this "proportion" would work according to the wave-theory.

At the 4th station he could add 7 more units of air, making 16, and wipe out 7 more units of sound, thus allowing 16 bells to be sounded at this station to equal the one volume at the first station. So on up to the 1,000th station, where he would of course add 1,999 new units of air, making 1,000,000, and deduct the remaining 1,999 sound units except one, thus keeping an exact proportion all the way up between the added air-units and the deducted sound-units, requiring of course 1,000,000 bells at the 1,000th station, just as shown by Dr. Mott elsewhere in this number, to make the one volume of sound at the Home station.

Then in coming back toward the center the same proportion would have to be kept up between air-units and sound-units, the first step from the 1,000 station wiping out 1,999 air-units and restoring the corresponding 1,999 sound-units. However false and even ridiculous such a result may be, it is the only ratio of decrease and increase that the wave-theory can adopt to agree with Tyndall's law of "proportion."

What an interesting exhibition Prof. Smith would give in wiping out 750,000 sound-units at the 2d station, and then sounding 750,000 bells two feet from the center *in order to equal the sound of one bell at the one-foot station!* Dr. Hall ought to call for a vote of thanks to Prof. Smith for having suggested the 1,000,000 little sound-units, thus helping him to expose the absurdities of the wave-theory of sound!

THE WILFORD-HALL SANITARIUM.

This Institution, foreshadowed in the June MICROCOSM, is about to be established. The property has been purchased and paid for out of the proceeds of the Health-Pamphlet, subscriptions to the MICROCOSM, and the sales of our Scientific Library of ten volumes.

These commodious and magnificent buildings, with twenty-seven acres of the most available grounds on the banks of the Hudson River from New York to Albany, have cost $62,000, and have been donated and sacredly consecrated by the Editor of this paper to the future College or University of Substantialism.

The buildings and grounds, fifty miles from this city, overlook the Hudson, about five hundred feet above the level of the water, and command a view of fifty miles in different directions, presenting such picturesque and fascinating scenery as is no where else to be witnessed on this continent. This is the verdict of all who have visited the place.

The eminent and learned Dr. Peebles who has for years run a Sanitarium in New Jersey, who recently spent a day and a night at the new location, and who has made two protracted trips around the earth in the interests of science, declares that such a grand and stupendous view never before was spread out before his vision.

A most appreciative literary lady who recently spent a day on these grounds exclaimed almost in a paroxysm of rapture, that it was enough to make a sick person well to roam over these grounds and drink in the surrounding enchantment for a single week.

The buildings were erected a few years ago for the very purposes of a sanitarium on a magnificant scale, having been selected by a doctor who had visited all parts of the country to determine upon the most available site that could be found; but from financial causes the buildings were never occupied nor the fitting-up fully completed. They contain about sixty

commodious rooms that will comfortably accommodate about one hundred guests, and will be enlarged as the business increases.

It is the intention of the Editor and donor to have the new college buildings erected on the same grounds as soon as sufficient funds can be procured for the purpose. In the mean time every dollar of the rents or other revenues received from the sanitarium will be faithfully set apart as a perpetually growing fund for that institution of learning.

A college professor, who has just examined these buildings, declares that they are, with slight alterations, already admirably suited to the purposes of the College, and even suggests postponing the Sanitarium and starting a boarding college at once. We will see. In the mean time let us hear from every friend of the cause as to how many students can be secured in this event. Terms and all details will be sent on application. Address the Editor.

P. S.—Since the foregoing was put into type, we have rented the place to the Hon. E. A. Darragh, who opens it at once as a first class summer and winter hotel. Mr. Darragh has for nine years kept and managed a similar institution at Rockaway, on "Old Long Island's sea-girt shore," and it is said that he knew how to run his hotel successfully, even while a member of the New York legislature at Albany, and while helping to run the empire State government.

Before this notice shall reach the readers of the MICROCOSM the "*Wilford-Hall Park Hotel*,"—as Mr. Darragh decides to name the institution,—will be in successful operation, with accommodations for guests which no man knows better how to furnish than the new proprietor of this beautiful resort.

In the mean time, while the hotel is establishing its reputation, the sanitarium feature of the place will by no means be lost sight of, but will assume form as soon as the suitable force for that purpose can be organized, due notice of which will be given in these pages.

Persons wishing to while away a vacation at a moderate price on

> "The loveliest spot
> That ever was wrought
> By nature and art combined,"

can drop a line to the editor of this paper, when Mr. Darragh's announcement containing full terms and particulars will be sent.

PROF. TYNDALL'S MISTAKE: A STARTLING ERROR HERETOFORE OVERLOOKED.

BY THE EDITOR.

In our letter to the *English Mechanic*, printed elsewhere in this number, we quote Prof. Tyndall's law of inverse squares, which we desire every reader carefully to examine. In this law the professor tells us that spherical shells of air "of a certain *thickness*" increase in the "quantity of matter" they contain "as the *square* of the distance from the center." This, however, is a serious mistake, as we will now show, and one that totally vitiates the wave-theory, based upon this law.

The "quantity of matter" either in spheres or shells of any thickness can not increase as the square of the distance, as every beginner in mathematics should know. It is only the *surfaces* of spheres, or the external superficial areas of shells, which increase as the *square* of the distance from the center, while *spheres* of air or of any other substance increase as the *cube* of the distance in the quantity of matter they contain.

This well-known fact of mechanics proves that shells of air "*of a certain thickness*," as Tyndall expresses it, and increasing in radii by foot steps, can neither increase as the *square* of the distance nor as the *cube* of the distance, but must be a varying increase between the *cube* of the distance and the *square* of the distance, becoming farther and farther from the *cube* and approaching nearer and nearer to the *square* at each foot step from the center.

The absolute proof of this consists in the fact that as the contents of *spheres* or globes increase as the *cube* of the distance, therefore shells "of a given thickness" must vary farther and farther from such cubical increase in the exact ratio as their radii become greater. And as only the external *surfaces* of spherical shells, without any thickness whatever, increase "as the *square* of the distance," it follows that the greater the radii of these "shells of air of a certain *thickness*," the nearer the increase of such shells must approach the *square* of the distance, or pure surface measurement, *because their proportionate quantity of matter bears less and less relation to solid spheres of the same radii.* Surely, this ought to be plain.

Hence it follows that Tyndall's law is a mechanical and mathematical salmagundi, neither the *square* of the distance nor the *cube* of the distance, but a mixture of the two, changing its entire relation to the fractional law of sound-decrease or of squared distance inverse at each foot step—more irregularly than any kaleidoscope ever changed the form of its figures at each turn.

In fact we seriously doubt if there is a mathematician in the world ingenious enough to work out the true ratio of the increase of the quantity of air in such shells and the fractional ratio of a corresponding decrease of sound in proportion to such irregularly varying proportions between shells, spheres, surfaces, contents, etc.

For example, suppose the "certain thickness" of the shells to be *one foot*. It is plain that the first shell or unit of air would be a complete sphere; and the next shell of two feet radius with one foot thickness would be half-way between a sphere and a pure-surface shell without thickness, and consequently its increase would be half-way between the *cube* of the distance (8), and the *square* of the dis-

tance (4), and therefore the sound-decrease, according to the fractional method of stating it, would neither be to the $\frac{1}{4}$ nor to the $\frac{1}{9}$, but somewhere between the two according to the "quantity of matter" to be moved.

The next step, making a shell of 3 feet radius, would muddle the problem still worse, as this third shell of a foot thickness would come still nearer to the square of the distance in proportion to the whole radius, being nearer to pure surface measurement, and proportionally farther from the cube of the distance, etc., etc.

This same proportional departure from the *cube* of the distance, and approach toward the *square* of the distance without ever reaching it, in connection with the counting of all preceding air-units, as being involved in the "enfeeblement of the motion," as we show in our letter to the *E. M.*, must make such a mongrel and hotch-potch ratio of the increase of air and fractional decrease of sound, on reaching the 1,000th shell, as to set any mathematician crazy who attempts to calculate it.

Plainly, Prof. Tyndall must have known these facts, namely, that it was only the *surfaces* of spherical shells of air that increased as the square of the distance, with only imaginary thickness and without any "*quantity of matter*" whatever; and he must have known that shells having any thickness at all must approach just that far toward the *cube* of the distance, and must just that far vitiate and stultify his law of squared distance inverse, as applies to the decrease of sound.

But he knew further that it would not do to speak of *surface* at all, thereby to suggest the true "*square* of the distance," because then it would destroy the entire wave-theory of sound since there would be no "quantity of matter" in these mere surfaces of shells to be thrown into vibration by which the "enfeeblement of the *motion*" could be made the cause of sound-decrease! Hence, he seemed to choose, as the only means of saving the theory, the total falsification of the law by formulating "shells of a certain thickness," "quantity of matter," "square of the distance," "enfeeblement of motion," etc.

If this argument, in connection with the one given in our letter to the *English Mechanic*, does not put a quietus upon the law of inverse squares as well as upon the wave-theory based upon it, we will be glad to have the reader point out the reason why.

THE LOST MANUSCRIPT.

When writing the "Problem of Human Life," some fifteen or more years ago, we were called suddenly away from our room on business, and on returning after a day's absence discovered that two pages of the manuscript were missing, beginning at page 84 of that chapter. No one had been in our room, so far as we could learn, and all the papers, books, etc., seemed to be in their usual place. But these pages—links right from the midst of our chain of thought—were mysteriously missing. We searched for them high and low, and made all inquiry of those who could possibly have access to our room, but to no purpose. We then tried to catch the thread of thought by reading the previous pages of the chapter up to the missing links, as well as those following, but saw plainly that we could not again fall into the same line of inspiration that had previously made the connection between the two parts complete.

Finally we gave it up and wound up the chapter as best we could, always regretting the loss of those pages as containing thoughts which, though vaguely remembered, haunted our mind for years as having an important continuity in the construction of that chapter.

Within the last few days we had occasion to look through an old volume we had been reading at the time of our loss, and to our surprise the missing and familiar pages of MS. looked up smiling at us, having had almost a Rip Van Winkle sleep, and long years after their associate pages, printed and published, had gone forth to the world in more than seventy-five thousand copies of that book. As a mere curiosity, and for the gratification of the thousands of our readers whose libraries contain the "Problem of Human Life," we here copy these two missing pages verbatim, as follows:

In view of the demonstrated unreliability of Prof. Hæckel's four great volumes on the origin of life and the development of species, as evinced by their numberless self-contradictions, misapprehensions of the facts of science, and superficial views of natural phenomena, one is forced to ask in all seriousness, of what value is scientific authority to the world, and of what real use are even our standard textbooks as a certain guide to knowledge?

I do not deny but that important truth is taught in all our standard works on science, but I do assert that these highest authorities will bear close and critical watching in every fact they state, experiment they describe, or inference they draw, and that it is the only safe thing for the student of science to put himself in the place of the authority he is examining, and constantly keep before his mind the questions: Is this so? Can that be true? Is that a fact, or is it mere guess-work? Unless the student becomes himself the investigator of the facts, experiments and phenomena described in the work he is studying, at least so far as is possible in the mental laboratory of his own brain, if he has no experimental facilities at hand, he will be certain to store his mind with false facts, ridiculous experiments and absurd conclusions, at least sufficiently to neutralize and render valueless all the truth he may receive. This is fully confirmed by

the opinion of the great investigator of physical phenomena, Mr. Edison [as quoted in the preface to the revised edition of this book].

In writing the present volume and endeavoring to meet and answer the arguments of the evolutionists, I have been inclined generally to admit the correctness of the facts of natural science as given by these high authorities, and without calling them in question as facts, I have endeavored to explain and set them aside as having no essential bearing upon the subject, or else as being directly opposed to the theory in question, even supposing them to be correctly stated and represented. But I now assert as highly probable, judging from the revelations of the preceding pages of this chapter, that many of the so-called facts of science so positively set down in these great works on modern evolution and so implicitly relied upon and quoted by evolutionists generally, have absolutely no real foundation in truth, and are either obtained by the writers on hearsay evidence or wholly fabricated by what Prof Hæckel calls a "poetical imagination."

As severe as this judgment seems to be, it is nevertheless fully warranted in the light of the bungling, audacious and reckless self-contradictions so easily fastened upon these authorities by a critical analysis of every law they frame or principle of science they announce. Until the existence of the main facts proclaimed by evolution writers, such as those relating to embryology, paleontology, reversions, rudimentary organs, etc., shall be carefully verified by investigators who have not a pet theory to support, it is only safe to challenge, provisionally at least, their accuracy, whatever we may be willing to admit for the sake of the argument, or for the purpose of destroying the theory with its own weapons.

THE "PROBLEM OF HUMAN LIFE."

Numerous inquiries are now reaching this office concerning the above named book, it being our first work touching upon the Substantial Philosophy. Many want it who do not feel able to pay the $2. As we have met with good fortune of late in our publishing ventures, we will now send this work for a short time by mail, post-paid, substantially bound in cloth, at half-price—$1. This is net cost, and those wanting the book should send at once, as life is uncertain. It contains 524 royal octavo pages, with portraits of the six great scientists reviewed in the work, namely, Tyndall, Darwin, Huxley, Helmholtz, Hæckel and Mayer.

REV. DR. J. I. SWANDER A "Ph.D."

We are pleased to learn that the faculty of Bowdon College, Ga., has honored itself by honoring our old co-worker and contributor, Dr. Swander, with the justly earned Title of *Doctor of Philosophy*. We shall look for an article from his pen for the August number that will duly christen this well-merited degree.

OUR PROPOSED COLLEGE BUILDING.

As noticed in another column, the site for the College of Substantialism has been purchased in one of the most eligible and beautiful locations in America. The main building should be commenced at once. A part of these grounds is well adapted to such a building, which should cost not less than $100,000. We have already, besides paying for the grounds and other buildings, a portion of the funds required for the College building proper, but hope that other friends of this cause will be proud to put themselves on record financially as promoters of so grand a work.

Dr. George Ashdown Audsley, F. R. I. B. A., of England, an enthusiastic defender of the Substantial Philosophy and one of the best architects living, has volunteered to contribute a new and original design for this edifice that will be commensurate with the magnificent view it commands. We are looking for Dr. Audsley's early visit to this country to inspect the situation and commence his plans for the building.

Surely this fact ought to rejoice the hearts of ten thousand subscribers to the MICROCOSM who are devotedly attached to the principles of this new philosophy.

A full record of progress will be kept in the monthly issues of this journal for all such as are interested in the work. Truly a very propitious Providence is doing wonders in thus holding up the hands of the editor while the battle is waging both here and abroad.

The temporary use of the present buildings as a hotel under a good rental was deemed expedient as a means of adding to the fund for starting the college, rather than have the buildings to remain unoccupied.

The Sanitarium, at first contemplated, we soon found was too large an undertaking for our time, crowded as it is with so many cares, without the assistance of an already experienced and organized force. Such a force we saw, after a short effort, could not be obtained without too much personal application on our part, as every moment of our time is now occupied in organizing the sinews of war.

But the Sanitarium phase of the work, in combination with the College of Substantialism, is to be a future part and parcel of the great revolution, and let none of our readers forget it. We are more encouraged now than ever before in the whole course of our eventful life. God speed the truth and the right.

OUR CREED SUMMARIZED.

Substantialism teaches: That every force of nature, or phenomena-producing cause, whether in the physical, organic, conscious or spiritual realm,—such as heat, electricity, magnetism, gravitation, light, sound, cohesion, life, instinct, mind, soul or spirit,—instead of being a mode of motion, is a substantial, though immaterial entity, and as really objective as are any of the material objects around us. On this broad and original foundation the Substantial Philosophy has taken its stand, and challenges the education of the philosophical and scientific world.

A. WILFORD HALL.

July 1, 1890.

OUR HEALTH-PAMPHLET.
THE WONDER OF THE AGE.

It is admitted by all who have tried this remedy without medicine, and who know anything about the work it has accomplished, that it is the marvel of the nineteenth century, both as a business success and as a universal panacea. We have already put into the hands of the afflicted almost 200,000 copies of this little book, and have now in our files between eleven and twelve thousand voluntary indorsements, a bare sample of which—the first we take up—are copied on this page. If you have an ailing friend send us the name:

J. M. Battle, Esq., Attorney at law, Searcy, Ark., writes:

"My dear Dr. Hall,—I use this affectionate expression because I feel that you are *dear* to me. It is a notorious fact all over this part of Arkansas that for several years my wife has been almost a bed-ridden invalid, having suffered for fifteen years with female troubles, dizziness, weakness, etc., the results of constipation. Some four weeks ago she commenced using your treatment, and from that time to the present she has not suffered for a single day. The abnormal position of the organs, which for years had given her so much trouble, to our astonishment have been restored by your treatment to their normal position. Previously she could not step her foot on the damp ground without taking cold; now she can work a whole day among her flowers without the least inconvenience. She can now run up a stairway of twenty feet with no more fatigue than when she was sixteen years old. I have also suffered from sick headaches for sixteen years, but I have now the sure remedy. I cured myself of a severe attack last Friday in less than an hour. You can understand why we feel such affection for you. We can not say too much for your wonderful remedy. The inclosed $20 are for pamphlets for my wife to distribute among friends who know about the effect of your treatment upon her.

"Gratefully yours, J. M. Battle."

Hon. D. P. Coulter, Clerk of Graves County Court, Mayfield, Ky., writes, June 3:

"Dr. Hall, my dear friend,—I have been using your treatment for chronic catarrh of long standing. I have waited before writing you to see the result. I am feeling relief by using your remedy, and am now confident that the continuous application of your treatment will greatly relieve if not permanently cure this most disagreeable disease. * * * I had the misfortune to have my pamphlet burned, and must have another. [No charge in such a case.—Editor]. I will let you hear from me as my case progresses. There is a very great inquiry now making here as to your treatment, and you will doubtless receive many applications soon.

"Truly yours, D. P. Coulter."

George Glass (merchant), Barnhart's Mills, Pa., writes:

"Dr. Wilford Hall,—I inclose twenty-five cents for your photograph, as I want to see the man who has used this wonderful treatment forty-one years, and who has done so much good to suffering humanity by giving it to the world. I was a miserable victim of dyspepsia and its attendant ills, of sixteen years standing. I was induced by a friend to try your treatment and began its use the 18th of last March. I set my medicines aside and have not touched them since. I then weighed 131 pounds, and could neither eat nor sleep with any comfort. In two months I weighed 147 pounds, and for three weeks I have not felt the least touch of dyspepsia or any of its accompanying ailments. I now eat whatever I please, sleep soundly, and never felt better in my life. This is a rich county, but I declare to you, Dr. Hall, I would not take the entire county and give up the use of your discovery. This is not alone my experience, but that of others who are using the treatment. I am not satisfied with telling this to my neighbors, but I send it to the MICROCOSM that it may be given to the whole world. Your grateful friend,

"George Glass."

Rev. Miles Grant, the distinguished evangelist and pulpit orator of Boston, Mass., who has repeatedly indorsed the new treatment, writes on his return from Europe, June 20th:

"Dear Dr. Hall,—I returned from Europe this week. I received the twenty-five Health-Pamphlets you sent me in London and inclose pledges I have received from various persons, who have been benefitted by your discovery. I say to my friends that this has been the best year of my life physically which I attribute through the blessing of the Lord to the use of Dr. Hall's 'life preserver.' A correspondent writes me: 'I use the treatment every other day and I regard it as the grandest thing that was ever made known to the world. I am fifty-one to-day and in perfect health.'

"Your brother in Christ, Miles Grant."

Rev. H. S. Smith, of Jamestown, Ohio, writes:

"I am a Baptist minister and the father of Rev. I. L. Smith, who took your remedy with him last year around the Mediterranean as described in the MICROCOSM. I procured your Health-Pamphlet from him, and have now been using it some four months, having been afflicted with kidney trouble and disease of the bladder. I have been greatly relieved by your remedy without medicine, and I have no hesitation in declaring that I regard it as nature's own cure for disease. I want my neighbors to know about it, and if you will send me circulars I will gladly distribute them.

"Yours very truly, H. S. Smith."

L. M. Seitz, Copperas Cove, Texas, writes, June 1:

"Dr. Hall,—I write to express to you my heartfelt gratitude for the blessing you have conferred on me through your priceless hygenic treatment. When I received your Health-Pamphlet I was in a very distressed condition. I had a severe cough like one bordering on consumption. I had no appetite, was rapidly losing flesh, had fever every night, followed by night sweats. But in two weeks after commencing your remedy, my appetite revived, the fever, cough and night sweats left me, and to-day I feel like a new man. Dr. Hall, I owe it all to your pamphlet, for which I will ever be thankful. Your sincere friend,

"L. M. Seitz."

Rev. G. H. Wright, of Cambridge, Vt., writes:

"Dear Friend Dr. Hall,— * * * I will add that I have used your treatment about three months with very marked improvement upon my health. During this time I have performed an amount of labor that would have been entirely impossible before I began your treatment. The debt of gratitude I owe you can never be expressed in words. I regard you as the greatest benefactor of the human race that the nineteenth century has produced. May your declining years be the best and happiest of your whole life, is the prayer of your sincere friend. * * * I inclose the money for a Health-Pamphlet for a friend, and fifty cents for a year's subscription to the MICROCOSM.

"Yours, G. H. Wright, pastor M. E. Church."

Rev. J. Blake, Havana, Kansas, writes:

"I have been using your treatment six weeks, and I can say in truth that I feel more like myself than I have for years past, having suffered so much from stomach derangement, constipation, etc. I tell you, Dr. Hall, money would not buy the knowledge I have gained from reading your Health-Pamphlet, and you might about as well try to offer me cash for my life as for the secret I have thus obtained. * * * There is a general interest aroused among my friends and acquaintances on this subject, seeing as they do, the change that the treatment has wrought in my condition in so short a time. No wonder the demand for the pamphlet is on the increase everywhere.

"Your sincere friend, J. Blake."

Rev. Joel Hopson, of Bainbridge, Ky., writes:

"Dr. Hall,—I received your Health-Pamphlet, and I lost no time in satisfying my longing curiosity as to the revelation I was to receive. Let me say to you that before I had read it through I said to my wife that I would not take $25 for the prospect and return the pamphlet. On completing the reading I began the treatment at once, and I am glad to say I have derived great benefit already. My trouble for years has been with my bowels, and I had come to despair of ever receiving any permanent relief. But to me the pamphlet has been better than a gold-mine, for what is wealth without health to enjoy it?

"Your brother in Christ, Joel Hopson."

☞ Any clergyman who owns the Health-Pamphlet and who has learned to approve of the treatment will please write the Editor, marking his envelope "Personal," and we will reply personally, making a special offer which will be greatly to his advantage and to the benefit of suffering humanity. Please refer to this last paragraph on this last page when writing, as the proposition referred to is only to clergymen.

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

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The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
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MATTER, SUBSTANCE, FORCE, MOTION, Etc.
With Remarks by the Editor.

BY H. H. MOORE.

Some years ago I read with care your work entitled "The Problem of Human Life," and since then I have frequently examined the MICROCOSM, the paper you edit and publish. I fully sympathize with every effort which is put forth by any one to check the tide of materialism and save humanity from its blight; and viewed in this light your efforts are laudable in the highest degree.

But if I understand the ground you occupy, frankness requires me to state that in my judgment you misapprehend the constitution of nature, and your argument is inconclusive. You hold to the reality of an external world against idealism, and in this respect I am with you head and heart. You further hold that force or energy, such as gravitation, attraction, light, heat, electricity, motion, etc., are substances, but deny that they are material substances. So far as your argument bears upon the affirmation of the materialist that there is but one substance—matter—it is conclusive, but I distrust the soundness of its basis, and then, if true, it does not go far enough to cover the case. Materialism can be overthrown only by establishing the fact of the existence of an antithetic vital world. No intelligent materialist is strictly a Monist, for every one holds to *all* the different kinds of matter known to the chemist. Here, to start with, we have nearly seventy different substances, each one possessing a nature exclusively its own.

Now it seems to me that the properties, forces and phenomena of matter, etc., which are inseparably connected with matter, must be regarded as an expression of its only possible mode of existence and hence are effects. But could I see reason to hold that gravitation, etc., were substance in essence, I should still be without proof that they were vital. Sulphur and oxygen, by union, give us a powerful acid, and its energy will continue while the basal cause remains. Separate these elements and the force which resulted from their union disappears—is annihilated. Was it not, therefore, simply a transient effect?

I would, therefore, define a substance to be an ultimate, simple essence, self-centered, existing solely in self, independent, unchangeable, indestructable, and, if you like, eternal. To be *something* and not *nonentity*. Such substance *must* have distinguishing characteristics, and these are its manifested properties, forces and phenomena. Inert, passive, forceless substance, I think, does not exist. Only the non-existent is without properties of some kind; the presence of properties is a manifestation of power; and, as I understand it, they constitute the account the substance gives of itself. Now, as it seems to me, to attach to these properties and forces a substantive character is to reduce the basal substance to nonentity or multiply the substances.

Now of the nature or essence of substance we know nothing. Wherein oxygen and hydrogen, or nitrogen, or silicon, or carbon in essence differ we know nothing—we are simply certain of the facts of their existence by what they do—by their properties and phenomena. Hence, I must affirm that each substance has characteristics or properties of its own, and from these as a *necessity* arise the forces of nature, or if these forces are not *phenomena of substance*, but are themselves substantive in essence, then the originals are without distinguishing characteristics, and hence are chimeras, nonentities. Hence, in the case of electricity, the bicromate of potash, sulphuric acid and zinc are forceless nothings, and the only substance is electricity.

This conclusion may be avoided by taking the position that a material substance may generate another substance that is not material. Could you prove that to be a fact, would not materialists raise a shout of triumph? How is it that substance in exciting or generating force does not in the least exhaust itself? The pressure of an anvil on a block, it matters not how long continued, does not diminish the weight of the anvil. The fact that a magnet, enclosed in a glass bottle, will attract iron filings on the outside and some distance away, is proof to my mind that the magnetic force can not be substance—self-centered and indestructable. The *how* and *why*, we make no attempt to explain.

Prusic acid generates a force which, to animal life, is a deadly poison. This acid is composed of three kinds of matter, carbon, nitrogen and hydrogen, three material substances, and as I understand your philosophy, their union produces a fourth substance of deadly power. What is it? But I break up the compound and this fourth substance disappears—what has become of it? To say that it has ceased to be is to say that it was not substance. My mind is so I can not but regard it as a transient resultant—the effect produced by the union of three kinds of matter, and that it

ceased to exist when the compound was destroyed.

Water is not *a* substance—it is not an elemental part of creation, but it must take its place as an effect—as phenomenon—for the moment the component elements, oxygen and hydrogen, are separated, the *aqueous* material ceases to be. But in water we have not only the forces of oxygen and hydrogen, but we have the elements themselves. In no case can force be separated from its origin and exist apart from it or its equivalent.

In order to meet materialism, as it seems to me, we must concede to matter all that can, with any show of fact or reason, be ascribed to it; and then step out beyond its conceded limits, and unmistakably point out the reality of the existence of a vital world. This, I think, can be done. The vital world we are in quest of is so related and co-ordinated to about seventeen kinds of matter, that the conditions being favorable, it works the matter into organic bodies—plants, animals, men. With this work in hand we are outside the realm of pure matter and all its forces. It is as improper to apply the terms life or death to any kind of matter as it is to apply the terms long or short, red or blue, to an idea. Let the materialist show me an atom, molecule, or lump, or liquid, or gas or *live matter*, and I will acknowledge him victor. The existence of a living God granted it logically follows that in creation he would give existence to a vital world. This vital world, as I think, uses a part of the material world to give us the organic world. I trouble you with my views that you may see the more clearly how far I am from what you regard as the true philosophy.

St. Petersburgh, Pa.

REMARKS BY THE EDITOR.

Our contributor, Mr. Moore, certainly has a happy faculty of confusing ideas and of promiscuously throwing together generalities about matter, substance, properties, phenomena, motion, forces, effects, causes, essence, etc., etc., leaving the mind of the reader slightly clinging to everything he says, as the odds and ends of heterogenous thought, without any definite continuity or relationship existing between them.

A mind that can not distinguish between phenomena and forces, motion and its cause, substance and its properties, would do well to study Substantialism without bias, and begin such study by a proper analysis and classification of the real entities of the universe.

The student who wishes to know all about the nature of things, should not fling together scientific and philosophical terms without first determining in his own mind in the most orderly manner possible their true meaning, as well as the intrinsic relation each of such terms bears to the rest. For example, one who loosely speaks of "gravitation *and attraction* as two things," and then of "light, heat, electricity, *motion*, etc.," as among the forces which Substantialism regards as entities, and thus in a most slipshod manner misrepresents the facts, can hardly be expected to present any clear or consecutive idea of the orderly continuity of nature's system of things.

If Mr. Moore will first impress his mind with the fundamental fact that substance is any objective thing that has an entitative existence, which can either be recognized by our senses, or by our reason and observation, as the cause of any phenomenon or effect in nature, he will be in a fair way of getting a right start. Otherwise his words will only represent confusion in whatever he may thereafter write. No matter whether he may understand or be able to describe the essential nature of any substance under investigation, or whether he may be totally ignorant of its elementary essence, he must admit it, in the laboratory of his own intellect, as a substantial entity if it shall come under the above-named conditions.

Then if he shall wish to have a clear conception of the substantial order of things that confront him in this complex world of ours, he must recognize the grand dual classification of the substances of nature, as material and immaterial entities,—the former as ponderable and tangible, or susceptible of analytical investigation, while the latter as only recognizable on the substantial plane by their observed effects as phenomena-producing causes. Without a knowledge of this distinction between *material* and *immaterial* substances, a writer has no business to touch his pen to paper on any subject relating to physical philosophy.

Then having mastered this phase of the order and harmony of nature, by a careful study of the principles of Substantialism as set forth in the volumes of our scientific library, Mr. Moore should be able at once to see that *motion*, as the effect of some force on some real entity in causing it to change its position in space, is itself *nothing*, having no existence before this substance thus acted upon commenced changing position, and absolutely ceasing to exist as soon as the moving substance comes to rest. Such non-entitative motion, existing only in name, is no more substantial or an objective existence than is a shadow—the mere effect of the varying application of the force of light.

When the physical student has advanced thus far he is prepared to make the proper distinction between the properties, qualities, or attributes of a substance, which are but its peculiar characteristics, and the substance itself. The properties of a substance are no more an entity than is the character of a man an objective thing. Properties, qualities, characteristics, etc., may be annihilated or may cease to exist, but substantial entities or objective things, though changing in form or

character, can never cease to exist or become nonentitative.

Then let this student of Substantialism remember that the *phenomena* of nature are but the *appearances* of things which present themselves to our sensuous observation, and are no more real objective entities than is the *shadow* of a flying bird or the *motion* of a passing cloud. Without these elementary distinctions borne constantly in mind while attempting to investigate the harmonious order of nature, a man might as well attempt to compose an intelligible sentence blindfold by dipping his hand into a box of pied type.

Mr. Moore deprecates materialism and wishes that it might be counteracted in its baleful influence. Yet what remedy does he suggest that tends even in the remotest degree to meet the case? He confuses properties and phenomena, force and motion, matter and substance, and even denies that we really know anything of the intrinsic existence of matter or substance because we can not comprehend the essential nature of its existence.

Because there are many elements of which matter is composed, is no proof that they are not all material elements and that they could not all be reduced to a single element by a chemist of sufficient facilities and of a greater scientific knowledge. Neither does this touch the realm of the immaterial substances of the universe, subdivided as they probably are into as many separate departments and possessing as many distinct properties, attributes, or substantial characteristics as belong to the material, visible and tangible objects around us.

Mr. Moore talks about combinations of substances and about their generating new forces out of matter, and then, when the combination is broken up, of the annihilation of these forces,—proving that they were not substantial, etc. How little he knows of substantialism or of nature's resources! Had he but studied the principles of that philosophy he would have learned that all force, whatever its manifestation or effect when liberated and applied, already exists in its substantial element in the force-fountain of nature, and after it has served its use it subsides back into this same fountain where it is conserved without one particle of it being lost or annihilated.

When Mr. Moore sees an apple fall from a tree is he so much like the untutored savage that he can not behold with his mental eyes the invisible threads of an immaterial substance called *gravity*, like a spraying mist of network pulling at this apple in angles toward every part of the earth's substance and naturally preponderating toward its center? And does he doubt the immaterial character of these gravital threads because his materialistic leanings have caused him to look upon matter and substance as synonymous terms? If so, let him reflect that these really substantial threads of gravity, while pulling a material body, without which it would not fall, are so immaterial in their character and essence that they will pass in their full energy and force through the most impervious intervening bodies and draw the apple as if nothing were interposed, thus defying all material conditions. This gives a slight conception of what substantialism means by an *immaterial* substance.

Yet marvelous to read, Mr. Moore speaks of an anvil pressing on its block and as "*exciting* or *generating* force" and states, almost as a discovery of his own, the remarkable fact that after thus "exciting or generating the force" of gravity, this curious anvil does not become lighter or lose any of its weight, "it matters not how long-continued" such "exciting and generating" process may be kept up!

If a beginner in a philosophy class could not understand that the anvil did not generate the force of gravity by pressing on its block, when it was the force of gravity that caused it to press, he should be unceremoniously sent home.

This discovery, however, is only in harmony with the one announced nearer the close of his paper that "water *is not a substance*—it is not an elemental part of creation, but it must take its place as an *effect*,—as a *phenomenon*!" etc.

After stating previously that "carbon, nitrogen and hydrogen are *three material substances*," he here adds to his discovery, about water not being a substance, that it is composed of the "FORCES of oxygen and hydrogen" which just before were "material substances." It is hard, we confess, to review a writer whose statements hang so badly apart.

The same principle we have been discussing is true of magnetism and the other physical forces. Of what use would Mr. Moore's confused and incoherent presentation of materialistic objections and difficulties be in explaining the lifting of a piece of iron by a magnet at a distance, even through sheets of glass and that, too, from the same distance precisely as if the glass were not interposed? He would stand before his intelligent class of students while attempting to explain this, in the same stupid and vacant confusion exhibited by Sir William Thomson before the students of the Midland Institute at Birmingham, England, when trying to tell them that this force was but the "rotation of the particles of the steel magnet."

Indeed, Mr. Moore confesses to the same irrational conclusion when admitting, as he does, that the magnetism which issues through the sides of the impervious glass bottle will draw iron filings even at a distance. He has the

scientific bravery then to declare that to his mind this "magnetic force can not be *substance!*" What is it then, Mr. Moore, for it does work? Do you agree with Sir William Thomson that this force is "the rotation of the particles of the steel magnet?" Or will you be silently ashamed to tell what it is that does this mechanical work, since it "can not be substance?" This is the predicament of all materialists.

But the substantialist would hold his head erect, and his eyes would sparkle as they met the congratulatory smiles of his intelligent class while he would lay down the laws and principles of the Substantial Philosophy which meet all such difficulties as no other system of science or philosophy on earth can do it. Such teacher could proudly point out to his students that as no substantial effect can be produced without a substantial cause, this lifting-force from the magnet, even though it has to penetrate and pass through these sheets of glass in reaching the piece of iron, must be a real substantial though *immaterial* entity.

Then how easy, after this step has been taken, to lead such students, under such a teacher, right along through the thickest materialistic fog Mr. Moore ever raised or ever saw, without touching a single snag, to the *open sesame* of a probable human immortality based on the scientific proof thus established that force *per se*, including life-force, mind-force, soul-force, etc., in the nature of things must be substantial, and if a substance, it must be indestructible in the very nature of all entities!

When Prof. Hæckel demonstrated that the mind, soul and life of man are but "modes of motion," basing his argument on the established and admitted motion-theories of sound, heat and light as taught by all Christian professors, the religious world stood appalled at such overwhelming evidence that "death ends all," and almost held its breath in waiting for some scientific friend of religion to reply to this terrible materialistic argument.

To the scientific disparagement of the educated clergy of Europe and America be it said that no attempt to meet this blow was ever made until Substantialism unsheathed its sword in its terrific crusade against every motion-theory of science in which it undertook to prove that even the forces of sound, heat and light were substantial entities.

Of course this fatal materialistic argument of Hæckel, as now admitted, can only be met by overturning the natural and scientific analogy on which its logic was based; and this could only be done by destroying the wave-theory of sound and the doctrine of heat and light as modes of motion, for in such overturn and destruction all point and edge must literally be knocked off the plea of Hæckel against life, mind and soul as real substantial entities.

At the announcement of this successful reply to materialism, thousands of thoughtful clergymen all over both continents thanked God and took courage. But a few, like Mr. Moore, neglecting to drink into the essential principles of Substantialism, and failing to recognize the distinctions here pointed out, are still floundering half-way up to their necks in the mode-of-motion doctrines of modern physics, confessing their inability to imagine "of what advantage to the doctrine of the substantial nature of soul and spirit Dr. Hall's crusade can be against the wave-theory of sound." Yet several clergymen of our acquaintance actually claim to be Substantialists with the monstrous absurdities of this theory forming a part of their religio-scientific curriculum —a veritable play of Hamlet with the Prince of Denmark ignored.

Even an able chancellor of an excellent university, who for eight years has publicly and privately declared himself to be a Substantialist, and has even been ready to contribute thousands of dollars toward starting the College of Substantialism, declares, as we learn, that he does not see what the wave-theory of sound has to do with the question! We pray that good and noble man, should these lines meet his eye, to read the July number of the MICROCOSM and there learn the *reason why*.

THE IDEAL WORLD.

BY ISAAC HOFFER.

There is evidently in the minds of many men but a vague and imperfect understanding of what constitutes the ideal world, and the relation it bears to the material world. An idea is generally looked upon as a mere functional operation, although that is nothing in itself and has no reality. We often hear the expression "the ideal and the real" as if an idea had no reality, and was only an impression reflection, or a shadow of something real.

A little examination into the relation between mental and physical operations will show, that instead of thoughts and ideas being non-entities—mere effects of functional operations in the human organism—they are the acting, moving, directing, and controlling power in all man's activities.

There is not a single work of man that was not originated, developed, and perfected in all its parts, and had not its purpose fixed in the ideal world before it could be tangibly presented in the material. Mental energy is the only source and power in man that can originate, create and develop. It is in the ideal world that the mind prepares the models and fixes the purpose of all man's work, perfects the arrangement for manifesting the hidden plan, and superintends the transformation of the ideal work into visible representations.

The mechanic has the purpose and the plan of a building completed in his mind—a perfect

ideal building—before he can make a material representation of it. This is not then a building of stone, mortar and lumber, nor is it a representation of such a building, but it is the conception and comprehension of a building fully prepared and perfected in all its parts ready to be materially represented, thus showing that the ideal world is the real, the elementary and fundamental, and that the material world, so far as man's manipulations go, had its source in the ideal, was brought into being by it, and is clearly only a material representation of it.

It must be evident to every thinking man that mental energy is the elementary, the substantial, the controlling power in all his operations, and man being a part of nature the laws which govern his energies and determine the fundamental mode of his actions are nature's immutable laws, the same that govern the operating agencies in all her works. The works of nature are therefore just as much the result of intellectual operations—the material and tangible representation of an ideal world—as the works of man are the material representations of mental operations.

It is not the height of wisdom to ignore or underestimate the importance of the ideal world, and to despise and ridicule metaphysics; for that which is not physics is metaphysics; and take away what is not purely physical and there is nothing left but dead matter. It is only mental energy that gives matter an apprehended existence, and it is only in the ideal world that the material world is known. Outside of the world of mind there is no knowledge of anything and no power to know; hence if we despise the science of mind, and ignore or underestimate the importance of the ideal world, we forget that positive knowledge is not the object known, but the *fact of knowing;* and that the process of knowing is as much a reality as the thing that can be known; and that an idea of something outside of us is all that we can have of it.

While it is evident that the ideal and material worlds bear a close relation to each other, and while the laws governing the one generally apply to the other, there are exceptions in which the same laws do not apply to both.

In the material world it is a wasting transgression of right for a person to build a house on another's land, but in the ideal world one can build a fair castle upon another's foundation, and claim it as his own without infringing a right or committing a wrong.

Thousands of ideal castles can stand upon the same foundation without the least interference with each other. Millions upon millions live, each in his own enduring building reared upon the simple foundation of Christian faith, and no two are in each other's way. Only when these ideal buildings are dogmatically represented in the material world will the conflict of preference, personal claims and exclusive rights begin; and with those who lose their hold on the ideal, the spiritual and the real, and cling to the form, the material and the representative, will this conflict continue.

It is highly important that we should try to understand the nature and characteristics of our mental resources and capabilities and learn how to cultivate and improve our mental energies, and establish safe guides for their operations, so that the creations and productions of our ideal world may be such that we need not be ashamed of a tangible representation. The cultivation and development of the mind is the improvement and expansion of the source of all the elements of progress in every thing that comes under man's dominion, or tends to promote his permanent welfare. The ideal world is the world of cause—the source of energy and exertion; and the material world is a world of effects—the result of exerted intellectual energy; and both are equal realities.

Lebanon, Pa.

THOUGHT THE PRIMARY FORCE IN NATURE.

BY G. W. CAMPBELL.

It is a conceded fact that man is endowed with but five senses; therefore we can not, in our finite condition, form any conception of the infinite or boundless in nature only by comparison with the known, or what is made manifest to these senses through our material surroundings.

The Substantial Philosophy teaches us, however, that everything in the universe, visible or invisible, of which the mind can form a positive conception, is *substance* or *entity.*

Granting this to be true, we can then form some conception of how *immaterial* forces act upon or through the material substances. We see magnetism, electricity, gravity and many others of these immaterial forces manifesting themselves through, and in apparent defiance of matter; but we can not perceive that these immaterial forces ever act in any other way by which to make themselves manifest to our senses *than through material substances.*

It seems that the material in nature is the *medium* through which the immaterial acts, and without this medium there can be no action so far as our senses are concerned; yet, we can not say that these immaterial forces, with their constitutional affinity for each other, can not and do not act regardless of and independent of material substances; but mind in its finite sense can not be made cognizant of this action only as manifested through a material medium.

Gravity does not manifest its action to our senses only through material bodies, as the earth, the planets and all bodies having what we call weight; life only through organized material bodies, either animal or vegetable; sound only through material resonant bodies; and magnetism only through the material metals, iron, steel, etc.; all of these material mediums being adapted or conditioned to such manifestations.

Having, I think, made these points clear, and granting them to be facts, can we not conceive a little farther into the immaterial realm and recognize the fact that *thought is the primary immaterial force that moves all nature,* and that all other forces and entities, both material and immaterial, are the direct or indirect result of thought? Not that thought really exists in all entities as an intelligent substance, or that matter could become cogitative, but that thought, like all the other immaterial forces has its medium—*mind.* But, mind is also recognized as immaterial substance, and, although it has an abiding place in every material brain, the action of thought upon or through mind is not made manifest to our senses only through this secondary medium

—material brain; by and through which it finds expression and becomes manifest to us.

This kind of reasoning may be objected to, even by some substantialists, with the argument that thought is but an attribute, action or faculty of mind, and therefore can not be an immaterial entity, and that thought, as expressed, or conceived, by human brain, is but the effect of our perceptions, and is often distorted, vague, and even frivolous and otherwise at fault. This action of thought we can not deny. But is the so-called fault really with thought as an immaterial force? Is not the fault with the material medium?

As the immaterial is the *real* in the universe, and the material is but the effect of the real, so, also, is thought, mind, life and soul the real in man; body and brain being material, or only an effect of the real. Then, it is evident that thought, as manifested through human brain, must partake of the material character of the brain as its medium.

Sound might as well be said to be at fault when emanating from an instrument, or medium, that is what we call "out of tune," while, in fact, the fault is not with sound as an immaterial entity, but its effect is distorted through the material medium thus becoming out of harmony to our sense of hearing. Whatever imperfection or derangement there may be in the medium, a corresponding imperfection will be manifested in the action of the forces through it; and thought-action through material brain is always subject to the condition, degree of health, and perfection of the brain, and of the will made up by the action of thought through the brain. We have evidence of this in the action of thought in all cases of derangement of the material brain, such as insanity and kindred mental diseases.

As evidence of the substantial nature of thought, let us try to conceive of a thought ever being annihilated. A thought when once conceived and impressed upon immaterial mind is eternal. It may be, as we express it, forgotten or blotted from memory in a seeming sense, but never destroyed. The thoughts that are constantly flowing into our minds are being rolled up, as it were, upon a scroll and filed away in the archives of memory to be reproduced when occasion and condition requires, like the words spoken to and indented in the tin-foil or wax cylinder of a phonograph are capable of being reproduced; as is evidenced by the many thoughts that recur to mind that were impressed in our childhood days.

Thought, then, as impressed upon immaterial mind, is necessarily *that conscious entity in man that lives eternally—his individuality, his intelligence, his ego—therefore, thought, mind, life and soul constitute that inner-man which is endowed with immortality.*

We must acknowledge the force of thought even as it is manifested through man's material brain and directed by the human will, when we try to conceive of anything of mechanical construction that is not the result of thought, from the most intricately constructed watch to the most ponderable steam-engine, or the grandest achievements in architecture. Do we not see all around us the wonderful inventions of man that are now being utilized for our benefit? Can they not all be traced back to thought-force as the primary cause of their existence?

Then we ought to be able to form some conception of thought in its infinite sense, or of that *Great Infinite Fountain of Thought or Intelligence which we call God*, occupying all the universe and filling all space, who *Thought* into existence not only this world of ours, but all the myriads of suns, worlds and systems of suns and worlds in all their grandeur and sublimity that swim in infinite space. Are not the terms *Thought* and *Word* synonymous?

Thought, then, created all that is, both of the immaterial and the material, and is the upholder of the universe. It is ever being manifested through its medium, mind. Through the Infinite mind, directed by Infinite Will in that great degree of infinite perfection that fixes those immutable laws in all the universe and in all nature; and from infinite to finite mind through the medium of material brain, but in that imperfect degree proportionate to man's imperfection.

Pendleton, Ind.

THE POWER OF MORAL INERTIA.

BY REV. E. O. BENNETT.

D. Aubigne began his history of the reformation by saying: "The world was tottering on its foundation when Christianity appeared," so it may he said, Theology was tottering on its foundation when Substantialism appeared. But this is only true in a limited sense. I do not believe Christianity would have fallen if Substantialism had not appeared, for the Bible is a sure and infallible guide to all who accept and follow its precepts. They do not need philosophy of any kind to uphold their faith. But atheistic materialism has made such rapid advance, both in the church and out of it, as to sound the note of alarm to Christian teachers; and such was the condition of the scientific world and such the teaching of all our colleges that when Profs. Hæckel and Tyndall carried out the reasonable deductions of scholastic philosophy and based on them an argument against the immortality of the soul, leading scientists could only stand and blush.

Thus there was an imperative need of some solid foundation on which the Christian could stand to wage an aggressive warfare against infidelity. Substantialism has given us that position, and the great wonder is that Christian teachers are so slow to accept it, but such has been the accumulation of prejudice and early training, handed down from generation to generation, that it will require a strong resistence to overcome its inertia. That a "drowning man will catch at a straw" does not hold good in this case. While the ship of Substantialism is sailing by and the sailors are throwing down the ropes, the materialistic scientists are floundering among the very billows of atheistic and agnostic destruction refusing deliverence.

The world moves by epochs. Moral force is sometimes slow in permeating the darkness of society, so that the reformer needs patience as well as courage to hold out in the contest.

When astronomy was based on a false standard and the heavens viewed from a wrong standpoint, it was not a wonder that the Greek and Egyptian astronomers should conclude that the sun might be about ten miles from the earth. It was the logical result from their standard of astronomy. The sun must necessarily be very near the earth or it could not make its revolution around it in twenty-four hours.

It is just so now. Natural phenomena must

be forced to suit the standard of the motion theories of science. How long and hard was the struggle of Copernicus and his co-laborers to overcome the moral inertia of the prejudice against the new theory.

It has not been long since the last of the old theory was abolished, though the proof against it was irresistible; and even yet remnants of the old view appear occasionally in the flat-earth doctrine. A boy once returned from school and told his mother what he had learned, namely, that the earth was round and turned over once in twenty-four hours. She replied it was all nonsense, it was flat and rested on a rock. What does the rock rest on, asked he. It rests on another rock. What does that rock rest on, he asked. She replied, "it is *rock all the way down; now, hush up.*"

If a scholar should ask a teacher how it was possible that the human voice which made so little disturbance in the air when spoken in the telephone should make waves that could travel with such rapidity 700 miles and be heard at the other end with nearly the same volume of sound, and a long list of similar questions, the teacher could do but little better than to reply as did the good mother: "Now, hush up."

This false standard of motion in science has doubtless led many into infidelity. It causes such confused ideas in regard to inert matter and active forces that no true conception of science can be formed. A teacher of a school in the East, who was professedly a Christian man, said apologetically to a visitor: "We stick on the term *God;* so we have used the term *creative energy of nature.*" That teacher should have first settled the question: Is there any creative energy in nature. When the seed-germ of a plant has favorable environments it will germinate and produce a large stock, but nothing has been created, only a change of the particles of matter has taken place, for when the life energy has departed the plant returns to its former elements. Set all the forces of nature whirling and gyrating, and keep them thus in motion for millions of years, and it could not create a single pebble much less a living thing, or even a grain of protoplasm.

I believe that all substantialists, as well as nearly all other scientific investigators, concede that life, *either vegetable or animal,* must in every case *come from life.* Even Prof. Tyndall concedes this. We stand on this rock and challenge any one to jostle us one iota from the position.

Thus we can trace the life-element down through all the cycles of ages to the first pair who nhabited the earth. Then the question arises, from whence did they get this life principle? And the best answer to be given is in the declaration: "Let us make man in our own image, after our likeness." Thus we can trace the life germ beyond the realm of nature to an infinite source, and finite minds can reach no farther.

I remember many years ago when we were studying philosophy, our class could not readily accept the wave-theory of sound, and when the question was asked me, what is heat? and I answered, "the essence of heat is motion," I felt all the time as if I was telling a lie, but I could see no way out of it. I was ready to accept Substantialism when it was first made known to me about ten years since in the MICROCOSM. It was just in the line of thought in which my mind had been directed for years, but I had formulated no theory. I was pleased with the solution it presented of some hitherto unexplained phenomena of nature, and I was so delighted with it that I preserved the paper, and have it in my possession yet. I regard it as quite a relic. The title-page was truly a pictorial MICROCOSM. It represented the whole world and nearly all that is done in it. I shall never part with it.

When we turn to the religious world we see, perhaps, more of this moral inertia to be overcome than in science. The Presbyterians are agitating a reform in their creed. This is a good omen of progress. Some of the radicals in that body insist on throwing away the old creed and making one which will contain only the *essential doctrine* of the gospel. If they could carry their point it would be the greatest step towards the millenium that has been taken for many years. But so great is the moral inertia of that vast body, there is but little hope that the church has power enough to move it.

There is but little doubt but that they will amend their creed, but they will only trim off some of the most jagged knots and leave the body for a memorial of its illustrious founder. The churches have set up a false standard. They say every flock of Christians who may differ in the least on some unimportant point of doctrine should be fenced off into a separate pasture. * * * Since I have been laboring and writing on practical *Christian union,* I have felt deeply the power of this moral inertia. While many are lamenting over the divided state of the church, and acknowledging the waste of means in supporting so many feeble and starving congregations, still they resist any *practical* attempt for union. One may advance the wildest theory of Christian union, and say the hardest things against sectarianism, and almost any of our popular periodicals are willing to publish it provided it contains nothing *practical.* I think if Dr. Hall had not been quite so radical in his views, and not pushed his investigations to such a practical issue, he would have met with much less opposition and would have been less liable to be called a crank.

Brighton, Iowa.

A NEW LIFE INSURANCE COMPANY.

Already capitalists have caught the idea that the "Wilford Hall" Health-Pamphlet and treatment will form an excellent basis for a Life Insurance Company, which must, in the nature of profitable risks, outstrip all other systems of insurance.

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In addition to this fact, we have recently been informed of a number of cases where insurance agents, hearing of the dangerous illness of policy-holders, have purchased for them the Health-Pamphlet, and thus have prolonged

their lives, to the financial benefit of their companies. Mr. J. S. Rodney, of Philadelphia, just as we were going to press, also informs us of several cases where insurance agents, unable to pass applicants with a clean bill of Health, owing to the adverse report of the examining doctor, have induced such applicants to send for our Health-Pamphlet and adopt the new treatment, by means of which the renewal of the application in a few weeks after has proved completely successful. Surely facts like these, which can easily be verified, must speak volumes in favor of this new enterprise.

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Full particulars of the progress of this organization will be given from month to month, in the MICROCOSM, which should be taken and read by all persons interested in these subjects. Price 50 cents a year. Sample copies free. Subscriptions begin with first number of current volume. All back numbers supplied.

For subscriptions, books, Health-Pamphlets or agencies,

Address A. WILFORD HALL, *Editor.*
23 Park Row, New York.

EVOLUTION.

BY REV. JOHN CRAWFORD, D. D.

I am writing a work on the "Origin, Nature and Destiny of Man;" which I hope to publish this fall. Of course, when on the first part, viz., the *Origin* of Man I had to grapple with the evolution theory.

Having read all that I could lay my hands upon in its defense, my difficulty has been to find any argument to refute worthy the name. The whole thing is built upon unproved hypotheses, and wild assumptions; so that, instead of being a sound induction from facts, it is a mere scientific castle in the air.

The most plausible argument which I have met with is that founded on embryology; but, when carefully examined, it is no more than plausible. It is no sound induction from facts. I purpose in this article, to examine very briefly this embryonic argument.

Dr. Hall, in his "Problem of Human Life," has sufficiently exposed the hoax about the embryonic human *tail*, which is, in reality, no tail at all, but the lower vertebræ of the spine, before the adjoining parts are added.

He has also exposed the supposed gill-arches, and shown them to be no gills at all, but folds, under the chin, containing materials for the lower portion of the head and jaw. They are not the proper number; and are not in the right place. But, what demonstrates them to be no gill-arches, is the fact that embryonic fish have the same folds, as well as the true gill-arches, in the right place, at the sides of the neck.

Thus neither the imaginary human tail, nor the supposed gill-arches, prove that the progenitors of man were either tailed quadrupeds or fish.

The only argument, based on embryology, which I have seen in favor of evolution, presenting any difficulty is that founded on the fact that fœtal whales have small teeth, which never fully develop, but are absorbed; and that ruminant quadrupeds have also teeth in the front jaw, which are absorbed before birth. By these facts evolutionists would persuade us that both the whale and the ruminant must have descended from progenitors which possessed full sets of teeth.

Now, if there be any force at all in this argument, it proves a back movement, perfectly inconsistent with natural selection, and the

survival of the fittest. How could an animal lose its teeth by the survival of the fittest? Surely an animal with teeth is superior in structure to one without them?

In meeting this argument from fœtal teeth, Dr. Hall has given an answer as a solution of the difficulty; and I shall now furnish another; and, if either be valid, it sets aside the evolution logic on this point.

It appears that in the formation of the animal in the womb, as well as in all his works of providence, God proceeds by the *operation of laws*.

Now it would seem that there is a law in operation which, in the formation of jaw-bones in most animals, teeth appear at a certain stage. We have, therefore, only to suppose this law to be allowed to proceed in its operations, without check, in the construction of the whale's jaw, and that of the ruminant, until the teeth *begin* to appear, when this law is checked by another, which then begins to operate, and which causes the absorption of these supernumerary rudimental teeth, applying their materials to other parts of the mouth, or to strengthen the jaw itself, just as the roots of the first teeth in the child are absorbed to form the second set.

Let me illustrate this process by the method of the potter. Suppose him making a tea-pot. He does not turn it out at first with a hole for the spout; but the place where this hole is to be made is, like the rest, filled with clay. After he has formed it, however, on the wheel, he removes the clay where the hole for the spout is to be, and over this hole he affixes the spout.

Now, in like manner, the whole jaw of the ruminant is first formed with all its rudimental teeth; when, by the operation of another law, those in the front of the upper jaw, being not required, like the clay that at first occupied the place for the spout of the tea-pot, are removed by absorption, their materials being employed to strengthen the jaw itself.

This appears to me to be the most philosophical view of the formation of fœtal teeth; and, if it be correct, it proves that the appearance of these teeth afford no proof whatever that the ancestors, either of whales or ruminants, had full sets of teeth; and, if they had, their loss could not certainly be by natural selection and the survival of the fittest. Why should nature bestow teeth, by the operation of natural selection, and then, reversing the process, abolish them?

Pretty much the same line of argument may be applied to the development of the frog. Its development proceeds, at first, like that of fishes, until the time has arrived when the limbs are developed, to take the place of the tail as a propeller. The tail was suitable only so long as the water was its only element; but, when the time has come that it must also occupy the land, it is provided with limbs, and, when these are developed, the tail being no longer required, is consequently absorbed.

The possession of a tail, as a propeller, until the limbs are fully formed to take its place, is no proof whatever that the frog originally descended from the fish. A tail is given it for locomotion, so long as it resides in the water only; but, when the time arrives for it to leave that element, the tail disappears, as no longer required, and the limbs take its place.

St. Thomas, North Dakota.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 7.

To account for the vast continental glaciers that plowed and crushed the earth's surface during the great "Ice Ages" has taxed the ingenuity of the scientific world; and yet outside of the earth's annular system no competent source of such cold and such vast accumulation of snows can be found. This declaration is readily and amply supported by the fact that if the vapors, which produced the vast ice accumulations, came from water *on the earth*, there must have been *excessive heat* to produce them, and this very heat would prevent the accumulation of snow. On the other hand, if the earth had grown cold enough to insure ice accumulation, that very cold would prevent the formation of vapors by evaporation and hence a cold world could by no means have become encased in ice. But ice ages have *come and gone* again and again, and one of them at least came *suddenly* upon a world of exhuberant life.

Animals were entombed all over the north polar world, while they were feeding in their accustomed pastures, by tremendous down-rushes of snow. The arctic mammoth and the woolly rhinoceros have frequently been found in such situations as to settle this question forever. The food undigested and undecayed in their frozen stomach, nay, undecayed vegetations partially masticated, has been found lodged in their teeth. The history of the discovery of these animals is open to all, and the facts are such as to crush any glacial theory that does not suppose that in *a day* the snows became the winding sheet and grave of polar life. My telescope tells me, that to-day jupiter's and saturn's belts are floating down to their poles, but the inevitable result of such polarian motion is to fall as snow, so that if the earth ever had an annular system the oceans, derived therefrom, came in large part through the melting of annular snows.

When we trace the glacier's track in every continent,—almost in every land, and find also conclusive evidence that when the snow fields had accumulated and winter was in the very summit of power, edenic conditions returned and melted the ice and snows so rapidly as to produce wide sweeping and immeasurable floods, we are forced to face difficulties that have hitherto defied solution.

But now when we contemplate a succession of annular canopies, and remember that each one of them must produce a warm climate while it exists, and a cold climate in its polar fall, we can readily see how, even while the earth was incased in snows, it would again be over-canopied by annular vapors—a green-house roof,—which would dissolve the snows and produce mighty deluges.

From the very beginning of the carboniferous period, this mysterious *over-lapping* of cold and warm climates is plainly visible in the geologic column, and in the last glacial period it is too plain not to be seen even by a novice.

Again, it may be easily shown that annular vapor instead of falling directly at the poles, would in larger part reach the earth *below the polar circles* in the upper regions of the temperate zones. Now it has been satisfactorily ascertained that the radiating centers of glaciation are not at the poles but more in medial

latitudes. That of North America being situated centrally in British America, and that of Asia in Siberia. Thus all the salient features of the glacial ages harmonize with the annular idea; so that I am bold to claim that the rings that once surrounded the earth produced all the glacial periods that ever were.

From the foregoing it will be seen that all the waters of the melted glaciers of annular times having rushed down to the ocean, must have increased the depth of the oceanic waters. And a critical survey of the shores of the world, shows to my mind that the ocean stands fully *thirty fathoms deeper now than before the glacial period.* There are many literal signs of this, which can not be otherwise explained. Why this harmony?

But this oceanic augmentation must as I have heretofore shown, produce crust-folding and mountain upheaval. Look then at the geologic "Record." There is scarcely a shore line that does not fulfill the demand. Nearly the whole coast of Western America shows this disturbance, and some parts as between Alaska and Mexico, in many places, great beds of lava were forced through the crust.

The New England Mountains stand hundreds of feet higher than they did before, so also with the mountains of Southern Europe and Asia. Why this dove-tailing of facts?

The annular theory is supported by a vast array of evidence that I can not touch upon in a few brief papers. But there is not a geologic question it can not explain, and we see the utter necessity of following in the line of uniformitarian law in the evolution of worlds.

This, for the present, will close the geologic papers. I will next show that primeval man *saw a part of the earth's annular system.*

Elsinore, Cal.

CHRISTENING.

BY J. I. SWANDER, PH. D., D.D.

If the reader will take the pains to turn to page 127 of the present volume, he will observe that the venerable editor has virtually promised that this August number would include a christening service in its table of contents. The writer wishes to state that the announcement was made without any consultation in the matter. The editor also accompanied the assignment of the service with a caustic intimation that we are not in the full discharge of our duty in not writing an article for each number of the MICROCOSM. Remembering the saying of Solomon that "the wound of a friend is faithful," we received the lecture in the spirit of a true disciple. While we dissent in part from the conclusion reached we bow in a spirit of obedience to Park Row authority. In this condition of heart and mind we take our quill in hand to tackle the subject thus assigned us. It is not, however, our intention to treat the subject in such way as to make the discussion apply to the case which the beloved apostle of Substantialism saw fit in the kindness of his heart to advertise to the world. And right here we wish to express our thanks for that disciplinary letter which suggested to our mind the train of thought which is now floating in fluid form and gravital force toward the point of our spluttering pen.

We purpose offering a few thoughts upon the term "christen," especially as to its etymological significance. Wide-awake readers of current literature can not fail to notice that the word is used by some of our standard writers in a sense that indicates an entire ignorance of the root from which it has grown, as well as a positive disregard for the sacredness of the idea which the term once enshrined. Indeed the word is frequently so employed and applied as to justify the fear that there is absolute sacrilege, if not positive profanity, in the motive that prompts its abuse. We read about "christening" steam-boats when they are first launched upon the water, of locomotives when they are brought from the shop and placed upon the track for service. We have in mind the case of one man who "christened" his race-horse by ceremonially giving him a certain name, also another case of a dog-fancier who "christened" a favorite setter by calling him Victor.

It may, therefore, not be entirely out of place for us to inquire after the origin of the word, and the sense in which it was formerly and properly used. Webster derives it from Christian, even as Christian is a derivative of Christ. Defining the word as a verb in its primary sense and use, he says it is to give a name and apply water to, as a religious ceremony, in the name of, and according to the precept of Christ; to baptise. As religious ceremonies can never be merely such without hollow mockery, the term "christen" means to Christian or christianize—an act which has to do with the nature, as well as with the name of the person or thing so christened.

We therefore take the position, fully confident of its correctness, that the term should never be employed, except when the person or thing christened is capable of being so affected in its nature, as well as changed in its name, as to bring it into the service of Christ. Was the old serpent's nature changed—was he "christened" when he was denominated the devil? We think not; for had he been, the world would not be cursed as it now is, with a multiformity of atheistic materialism. To speak of christening a locomotive or a race-horse is admissable only by an unjustifiable stretch and travesty of language; and when the sportsman "christens" his setter he only indulges in another form of casting that which is holy unto dogs.

The only life-forms of being that may be christened are humans. Christ took not upon himself the nature of angels, and we have no evidence that the angels can take upon themselves the divine nature as it is in Him. With men it is different. They *may* partake of the divine nature, and *therefore* they may be baptized into him. In other words, they may be christened or christianized in such sense as to give them the new name which no man knoweth save he that receiveth it. Rev. ii. 17.

In a modified sense the term "christen" or "christening" may be applied to things so far as such things allow of their nature being affected by such christening power and themselves brought into subserviency to such higher power. Thus the term may be qualifiedly used in the sense in which it was employed by Dr. Hall in his kind reference to a title conferred, provided that that title be kept at the foot of the throne of Him whose name is not only above every name, but who also gives the only real significance that may be possessed by any honorable title beneath the starry skies.

The term may also be qualifiedly applied in consecrating or denominating any branch of

education which is calculated in its nature to prepare the world for Christ or the soil of the human soul for the seed of the Christian religion. Thus we may speak not only of "Christening" a certain proper mode of thought, but also properly talk of Christian science, Christian ethics, Christian philosophy.

Philosophy to be Christian or become Christian must possess, at least, some of the essential elements of truth, with its face turned toward the personal Truth. Atheistic evolution and materialistic infidelity, however much they may denominate or "christen" themselves philosophy, are only systems of error, subservient to the powers and purposes of anti-Christ. They can never be properly "christened." Such baptism is forbidden by an absolute incompatibility. The truth as it is in nature is not only complemental to, but also a preparation for the truth as it is in Jesus; and the truths of nature can not be regarded as having started upon their course of freedom from all error until they are "christened," or christianized by Him whose mission in the world is "to bear witness to the truth" by casting out the devils of false philosophy which, like strong men armed, have, until recently, kept their palaces and held their shoddied goods in peace.

The Substantial Philosophy does not claim to be entirely free from all error. It is, however, consistent in claiming to be a radically conservative and new system of thought built upon certain truths of nature heretofore unrecognized by the world's leading philosophers. The fibers of this new system are interwoven with those fundamental facts and forces of nature which lie beneath the mere phenomena thereof. Substantialism starts, therefore, in faith, and walks by reasonable faith in things unseen. For this reason it is more constitutionally in harmony with the Christian and "christening" religion than any one of the several systems of thought now so foolishly apotheosized by those whose scholastic zeal seems to exhaust itself in the way of idiotic opposition to the obvious truth of God, because, forsooth, they find themselves confronted and challenged by the claims of a superior system which requires both industry for its investigation and brains for its comprehension.

This philosophy is, therefore, a proper subject for Christian baptism. Indeed it has already been "christened." Neither had it any need to wait for some god-father to present it at the baptismal font. It was born within the chancel in God's great temple of everlasting truth. In its first infant cry it muttered the mighty truth that sound philosophy, like true religion, can endure only as it sees the invisible. In this respect true philosophy and Christianity overlap each other and coalesce in some of their essential elements, while the former is always the armor-bearer of the latter for the suppression of the evil and the promotion of the good and the true. They are distinct and yet inseparable. God has joined them together. In virtue of this union philosophy is "christened," as well in nature as in name. It can not be otherwise indeed. Jesus Christ is both the founder of the true religion and the father of all true philosophy. Christianity is a system sufficiently comprehensive to include all principles of philosophy, as well as the key to the solution of all the questions involved in the intricate problem of human life.

Fremont, O.

The Revolution Advancing in England.

We now have the pleasure of laying before our readers from the London *Musical Opinion*, the first part of one of Dr. Pearce's popular lectures, which he is delivering in London in connection with Dr. Audsley as demonstrator.

Dr. Pearce stands among the first acousticians in Great Britian, being not only a professor of that branch of science in Cambridge University, but a critical instructor of other professors or examiner into their qualifications to be admitted as teachers of the science of acoustics Yet Dr. Pearce had only read two or three of Dr. Audsley's introductory papers on the "New Theory of Sound," in the *English Mechanic*, when he became alarmed at the manifest unreliability of the wave-theory to which his professional life had been devoted. He at once commenced, not only a reconsideration of the whole question, but a correspondence on the subject with Dr. Audsley, receiving in return our principal volumes which discuss the Substantial Philosophy.

The manner in which Dr. Pearce has studied those volumes can be judged by every student of our writings by a careful reading of the first part of the following lecture—the remainder of which will be given in subsequent numbers of the MICROCOSM.

Suffice it to say Dr. Pearce became an immediate convert to the Substantial Theory of Acoustics, and not only a convert, but a teacher of the entire principals of the Substantial Philosophy, at the same time publicly renouncing the wave-theory of sound as well as all other motion-theories of science.

This led him to take the lecture platform, while Dr. Audsley, employing his inimitable powers of graphic illustration, aided him as mechanical and mathematical experimenter and demonstrator.

Substantialists in America can now rest assured that the cause of the new departure is already on its feet in Great Britian, and that it will not be slow in the hands of such invincible advocates as Drs. Pearce and Audsley, in spreading to the principal colleges and universities of the continent. We certainly hail this as the auspicious day for Substantialism. The following is the first part of Dr. Pearce's lecture or rather *essay* as it perhaps may more properly be called:

DR. HALL'S THEORY OF ACOUSTICS.

BY C. W. PEARCE, MUS. D. CANTAB.

[From the London *Musical Opinion*.]

The study of acoustics is nowadays such a recognized feature in the curriculum of musical collegiate life that no apology is needed for a musician who ventures to write a paper upon that mysterious element of natural force which underlies the work of his daily life,—the great "power of sound," as Spohr poetically

and prophetically terms it. It is as a *musician*, and in no way as a scientist or mathematician, that I come forward to speak to musicians of a new theory of sound which has recently been set on foot, and is already making rapid strides in popular favor and acceptance in America. It is a theory which seems to me to offer a better and simpler explanation of the sound phenomena we are so constantly and intimately connected with than that which is at present so widely taught in this country. America is, as you all know, the land of Edison,—the birthplace of the telephone and phonograph, those wonderful instruments of modern days, which, when we first made their acquaintance, seemed to us well-nigh miraculous.

Mr. Edison is not the author of the theory of sound which it is my privilege to bring before you—he is a practical rather than a theoretical worker — but there are other thoughtful minds in America, the products of which come forth to the world in divers ways, and bear different fruit. Such a mind is that of Dr. Wilford Hall, of New York, who some thirteen years ago propounded what he called the "Substantial Philosophy." The main idea of this is, to say the least of it, a startling one; so much so that, at first sight, one feels absolutely disposed to regard the whole matter as absurd. It is, of course, a new idea,—entirely original, and perfectly independent of anything which has gone before it. Therefore, in order to give the "Substantial Philosophy" a fair trial, one has to proceed cautiously, and with an open mind, laying aside for the time all previous notions one may have entertained on the subject as the result of long and patient study of existing and current text books of sound.

Dr. Hall's first proposition is that every phenomena-producing or sensation-producing cause in nature must of necessity be a real objective existence,—that is, an entity or real substance. Substance, he tells us, is of two kinds,—material and immaterial.

A material substance possesses weight, impenetrability and *inertia*,—*i. e.*, its normal and self-evident condition is a state of rest, not of motion. It is, moreover, both visible and tangible, and no two of its particles can occupy the same place in space at the same instant of time. Immaterial substance, on the other hand, possesses no weight, is not impenetrable, but is capable of inherent activity. Although invisible and intangible, it can be proved to have a real existence, because of the power or force it possesses, by which it is capable of setting matter into motion.

Moreover, several immaterial substances can not only co-exist together, but can also co-exist and occupy the same space with particles of material substance at the same instant.

Let me explain by a very familiar example what is meant by this. A common magnet is a material substance which we can see and touch, and which occupies at any given instant a definite place in space; but in that magnet, existing with it, occupying the same place with it, is an immaterial substance which we can neither see nor handle, but which proves itself to be really in existence directly any object in magnetic sympathy with it is placed sufficiently near. Then we do, indeed, see the visible effect of an unseen force; for the object is immediately drawn to the magnet, even though a piece of glass be placed between the two material substances. But please note carefully that no object will be drawn towards the magnet which is not in perfect sympathy with it,—a magnet ever so strong will never attract a piece of wood.

Gravity is another substantial force, according to Dr. Hall; so, too, is odor. The perfume of musk will give off its fragrance for a year and more, yet no material substance emanates from the musk, or it soon would be visibly decreased in bulk. Here is another manifestation of substantial force which addresses itself to a particular organ of the body formed expressly by the Creator for its reception, and produces in the inner consciousness of animal life its own peculiar sensation. Sound, according to Dr. Hall, is another manifestation of substantial force. Here is a tuning-fork. Co-existent with every particle of this piece of metal, or material substance, is an invisible intangible entity or substance. It is exerting no force at present, or, at least, not to an extent capable of perception by human nerves; but the least touch will liberate that force, which, using the air as its natural conductor in precisely the same manner in which an electric current uses a telegraph wire, finds its way to that organ of the human body especially designed by the Creator for its reception, and produces in our consciousness that peculiar sensation of its own which we incorrectly call sound, but which is in reality *hearing*. Sound is the cause, hearing is the effect. Sound would exist as a real substantial force were there not a single ear capable of receiving it and translating it, as it were, to the brain as the sensation of hearing.

There are three things exterior to ourselves which are necessary for the production of this sensation. First, some material substance, which has in all its particles co-existent immaterial sound force, must be set into vibratory motion. Such a material substance is a tuning fork, the stretched strings of a piano, harp, or violin, the languid or reed of an organ pipe, and the vocal ligaments of the larynx. The vibratory motion of such material substances as these liberates the latent sound force, but only to a limited extent. Some other material substance must be thrown into sympathetic vibration with the first, and this second material substance is generally a contained mass of air which is known as a resonator. A tuning-fork is feeble and inaudible at a distance without its resonant case, and the strings of a piano, harp, or violin would be nothing without their respective sounding-boards, any more than the mechanism of an organ pipe could do without its contained volume of air of a certain length, or the vocal ligaments without the resonance afforded by the mouth, etc. The other thing needful for the sensation of hearing is a proper conductor for the pulses of sound force from the center of their origin to the ear of the listener. This conductor is in nearly every case the ordinary air that we breathe. A familiar experiment will soon prove this. If a bell, kept ringing by clockwork, be placed under the receiver of an air pump from which the air is exhausted, no sound will be heard from the bell, provided that it does not rest on the base of the receiver, or has in any way connection with the external air. A bell ringing thus, *in vacuo*, generates sound force just as freely as it would outside the receiver; but there being no conduct-

ing medium by which to manifest itself outside, the sound pulses return to the force element or force reservoir of nature whence they came, and thus lose their identity as fast as they are liberated by the ordinary sound-generating apparatus.

Dr. Hall assumes that there is all round us in Nature one vast reservoir in which is stored the essence of all force, only waiting to be liberated and made manifest to our consciousness by certain physical processes.

Sound is a special manifestation of a particular form of force so liberated. What is force? I will explain by means of a familiar illustration. A cannon ball is an inert mass of matter which will forever remain quiescent until it is caused to move by some extraneous power mechanically applied to it. It is moved or displaced by heat, by gravity, by the explosion of gunpowder, or by any other like means. Thus the cause of its motion is *force*, whilst the motion itself is the effect of the application of force to inert matter. Force then must be a real substantial entity, because it produces physical results, such as the displacement of material bodies. But substantial force can no more act of itself than can substantial matter. All forms of force have received in the organization of the universe the delegated power to travel in space by certain laws peculiar to each form as well as the power to affect and move other bodies of a ponderable nature. Matter, on the contrary, as we have already seen, is absolutely inert, and can neither move, change its course, nor stop moving, except by the application of extraneous and substantial force. The vibratory action of a sonorous body set into motion by some power outside itself is the ordained process of liberating sound force.

The pulses of sound force so liberated are conducted in one substantial forward movement *in all directions* by the free air, and produce in animals the sensation of hearing by entering the ear and coming into contact with the auditory nerve.

The existing or undulatory theory teaches something very different to this,—viz., that sound is nothing but the mechanical motion of air particles acted upon by the vibrations of a sounding body. Now, motion *per se* is no more an entity or a thing than is *time*, the one being *position in space changing*, the other being *duration in space changing*.* Motion, so far from being force, is the effect or result of force,—the mere position of a thing in space changing by force applied to it; and it matters not whether the thing that moves be large or small, whether it be a particle of matter or a planet, it can only change position by the application of force, which force in every possible case must be substantial, because it produces a physical result. The doctrine that the air is not only the conductor of sound, but that its motion is the sound itself, is equivalent to saying and believing that nothing can produce something. But the wave-theory is continually teaching that, outside of our animal consciousness, sound is simply an air tremor, a series of waves or undulations consisting of alternate pulses of condensation and rarefaction, caused by the rapid to-and-fro movements of the air particles.

These particles, thumping against the drum skin or tympanic membrane of the ear, excite the auditory nerve, and so produce the sensation of hearing. Thus, our only means of hearing ordinary conversation, the hum and bustle of daily life, or the infinite variety of sounds observable in the performance of an elaborate symphony by a full orchestra, depend entirely upon these drummings by the air particles in the immediate neighborhood of the tympanic membrane,—a tiny chamber no larger in diameter than an ordinary lead pencil.

But I need not take up time by describing further the wave-theory of sound, which is so familiar to all of us. Until I became acquainted with Dr. Hall's ideas through the agency of my friend, Mr. G. A. Audsley, I accepted it as being true because it was taught by so many distinguished and eminent scientists, and I feared it was presumptuous to doubt, even though I must confess that there were certain doctrines inculcated which required a certain amount of faith for their acceptance in the absence of perfectly clear explanation. It is only fair to lay before you some of these difficulties of the wave-theory, which, at any rate, demand more satisfactory explanation than that usually given in existing text books. My first doubt was occasioned by a passage in Helmholtz. On p. 13 of Ellis's translation of his "Sensations of Tone," I found this sentence: "In daily experience sound at first seems to be some agent, which is constantly advancing through the air, and propagating itself further and further." The author then proceeds to show that this is not the case,—it is the *wave motion* which advances, not the individual air particles themselves. Later on, in comparing water waves with sound waves—waves perceived by the eye with those heard by the ear—I understood from Helmholtz that, for the perfect perception of waves by the faculty of sight, it was necessary that a considerable expanse of water should be visible to the eye, and that the perception of waves by the faculty of hearing placed the ear at a similar disadvantage to that in which the eye would find itself if it attempted to perceive wave motion by looking at water through a narrow tube of the diameter of a pencil-case. How, then, could there be such a perfect analogy between optical and aural perception of wave-motion, as maintained by Helmholtz throughout his entire treatise?

Then as to the *transmission of sound*. As all sounds, according to the wave-theory, consist of the undulations of the medium through which they are driven by the vibrations of the sounding body, it is plain that the more easily condensable this wave medium is, the more easily will the undulations be produced, and the further will they be sent by a given vibratory impulse before dying out. Is not this reasonable? But what are the scientific facts of the case? Take a solid mass of iron a hundred feet long, and let the ear be placed in contact at one end, and it will distinctly hear the scratch of a pin at the other end. Yet let this pin be scratched against a piece of isolated iron in the open air, and with this atmospheric medium connected, as it is, directly with the tympanic membrane, the sound can not be heard six feet away. Why is this if sound consists of the wave motion of the medium which conducts it? The air being so very compressible and so easily thrown into undulations, ought surely to convey the sound thousands of times better by its wave motion

* All the definitions of terms, etc., given in this article are expressed in Dr. Hall's own words.—C. W. P.

than iron, which is infinitely more difficult to be condensed or thrown into waves. If, then, sound is nothing but the undulatory motions of the medium conveying it, why do not these waves, which are started in the iron bar (so difficult to condense), slip off at its sides into something easier to condense, and thus disappear from the more difficult medium before it goes even a foot? Suppose a stream of thick mud and a stream of clear water to be running side by side and touching each other; and that a system of waves be started down the stream of mud. These purely mechanical waves would take to the water, the more easily undulated medium, and would there travel on much further and much easier than in the mud, the more difficult medium to undulate. Again, if the system of waves be started in the stream of water they would run along the very edge of the mud for any distance without the least transference of undulations to the denser medium, simply because the water is the more easily thrown into wave motion. Hence we may ask, how can sound be merely a system of waves of condensation and rarefaction when it travels so much better in the medium which is the more difficult to condense and rarefy? If, again, sound travels through iron in the form of condensations and rarefactions, it is plain that the entire atmosphere surrounding the iron mass should be penetrated with this merely mechanical wave motion, whereas an ear placed within a quarter of an inch of the far end of the iron bar can not hear the sound of the scratching pin. The wave theory is powerless to explain these facts; but, regarded as an immaterial, substantial force, sound possesses the peculiarity of a repugnance—when started in a medium of one density—to change into that of another. The ultimate reason for this can no more be given than why electricity will travel through metal, but abhors glass, both being under the control of cohesive force, which reigns supreme in material bodies. All we know is that iron is a better conductor of sound than air or anything else. Sound travels through a given medium according to the conductive quality governed by the cohesive force existing in that medium.

(To be continued.)

A SLOVENLY SENSE OF HONOR.

A writer by the name of Root, the publisher of a Bee journal in Northern Ohio, recently signed the "Pledge of Honor" with one of our agents in order to obtain the Health-Pamphlet, and immediately proceeded, in abject violation of his pledge, to reveal its contents in his paper.

This he did while admitting that he had thus pledged himself not to reveal it, and while acknowledging the treatment to be a good thing and all it was claimed to be.

This virtually self-confessed perjurer pretends that he made the publication because he found the discovery was not ours, and to prove it he refers to a book by one Kellogg containing a reference to the same treatment! Yet what are we to think of this conscienceless old sinner, when he knew that the first edition of Kellogg's book was published in 1880, and when he had right before his eyes in the Health-Pamphlet itself, abundant proof that our discovery was made and put into practice forty-one years ago,—several years before that Kellogg was born?

Yes, reader, that embodiment of dishonesty had before his eyes the proof that nearly twenty-three years ago we had revealed the discovery to Richard F. Stevens, M. D., a prominent practicing physician of Syracuse, N. Y., who so certifies in our Extra MICROCOSM, and that at that time he read a paper on the subject explaining the whole treatment to a learned medical society, giving us full credit for the discovery as then new to the world!

Is it possible to conceive of more innate and villainous dishonesty in any character than that exhibited by this same Root who, while knowing these facts, shamelessly pretends that the discovery was not ours because forsooth he had found it pirated and printed in a book which he knew dated only ten years back?

Yet this self-confessed reprobate and hypocrite prates about our lack of Christian sympathy for the suffering, in charging $4 for a book that will save all doctors' bills for life, while he would enter no protest at all against an M. D. who would sell a prescription of a dozen lines in Latin, for which he would charge $4, which no one but the druggist could understand and therefore virtually a secret, and which in three chances out of four would do the patient no good!

But what mattered all these facts to him so long as he could gratify his selfish purpose in printing a sensational article at the acknowledged expense of his conscience and his honor?

Such a man should not be allowed in arm's length of one's pocket-book unless it was under a burglar-proof lock and key; and we solemnly declare that we would no more trust his promise, either verbal or written, in any matter of business, who could thus brazenly proclaim his own infamy and shame as a conscience-seared traitor to a sacred pledge of honor, and that too based on a deliberate falsehood as we have shown, than we would trust our open money-drawer to the meanest sneak-thief and ex-convict in New York.

If this Root's cuticle is as impervious to impressions as is his conscience, it would take an entire swarm of his most vicious bees to sting him into sensibility. We leave him to the tender mercies of his subscribers and his neighbors.

P. S.—After the above was written we heard direct from the same Kellogg referred to by this Bee man. A neighbor of his, one of our subscribers and an enthusiastic admirer of our Health-Pamphlet, sends us a copy of his publication containing a most malicious and unprincipled attack upon us and the pamphlet. He pronounces our sale of that information for four dollars a "*base swindle.*" Yet this insolent upstart sells, or at least seeks to sell the book from which Root quotes at $7.50 a copy—a superficial and platitudinous mass of the most common-place cullings and gleanings ever collected together within the same space.

We have spent days in searching through its reiterations and garbled plagiarisms without finding one single new and original idea or thought. Instead of swindling the student by charging him $7.50, he should be compelled to pay any man double that amount who would consent to waste enough precious time to read through such a medley of medical trash, which any bright student, with a library in reach and with an ambition to appear as an author without one original idea, could easily collect, arrange and print if he had enough money.

Among other pirated things he gives a garbled account of our treatment which he no doubt learned through the publicity given to it by Dr. Stevens in the lecture just referred to. Garbled as it is, and then approved by the young copyist, it contains about the only seed thought of any real value in his entire work.

As our informant assures us, the animus of the man in attacking our pamphlet is plainly manifest to every man and woman in the place where he operates. He runs a so-called health-resort which has been largely attended. By talking ostensibly of hygiene and insinuating a necessity for drug-treatment at the same time, as he does all through his book, with the importance of medical advice and attendance, he has managed to retain his patients and thus to bleed them out of thousands of dollars which would never have gladdened his mercenary eyes had such victims of his duplicity known of our Health-Pamphlet before visiting his institution.

But now a change has come over the spirit of his dreams. He learns of the pamphlet having commenced its salutary work among his patients, and fearing a stampede in consequence of this inestimable knowledge becoming general, he is goaded to desperation and comes out in this villainous attack hoping thereby to prevent his dupes from prosecuting further investigation.

But he is mistaken. He might as well try to dam the Niagara River with a walking stick as to attempt to check with his puny ravings the onward march of this priceless discovery.

We now give notice that every patient in his resort shall be supplied with this pamphlet *free of charge* and postage paid by making application to us.

Nor need he think for one moment that he can prevent their seeing this notice and thus possessing themselves of this treasure by his ribald disparagement of the work. We have the means of reaching their eyes in spite of all he can do, through the columns of this ubiquitous little journal which, during the past year, has carried the glad news of our health-giving panacea to more than 7,000,000 families in the United States and Canada, as our publication books will show, verified by the affidavits of more than twenty of our book-keepers and clerks.

So we warn Kellogg that he has struck dangerous ground when insolently assailing that revolutionary little missionary of glad tidings.

He boasts that he did not sign a pledge when he obtained a knowledge of the pamphlet, and has therefore a right to reveal its contents. We presume he did not sign a pledge, but that he wheedled some one of his patients to show it who had sent for it to save his life, and then ignobly violated the confidence imposed in him.

We repeat our warning that we, too, have not signed a pledge not to reveal our free offer to each and every one of the deluded victims of his resort and whose "Good Health" is a hundred-fold less his concern than their good money.

If they shall find that they can possess much better health at home, with this little "life-preserver," as Eld. Miles Grant calls it, in their pockets, than at his semi-drug institution, they will not be apt to waste much more of their precious money with him, and a depletion of his resort will therefore inevitably follow.

Of course he will rave as he is now doing, and possibly worse, when he finds that he has foolishly kicked against the pricks; but the lesson will teach him what many a young man smarter than he has learned before, that there are lots of money sometimes made as well as saved by minding one's own business.

THE COLLEGE OF SUBSTANTIALISM.

The prospects of this educational institution are brightening month by month. With the most beautiful grounds and site imaginable purchased, paid for and donated to this cause as announced last month, and with commodious buildings that would board and comfortably accommodate a hundred and fifty students, male and female, there really seems no good reason why the work of starting this institution should be much longer delayed.

Already the educational principles to be represented in the College of Substantialism have been scientifically demonstrated and abundantly sustained both in this country and in Great Britain by arguments and facts which have completely silenced opposition.

The rallying to its standard of such men as are referred to in our introduction to the lecture on another page, copied from the London *Musical Opinion* and *Trade Review*, presents sufficient proof to the thoughtful scientific student that this new departure in physical and metaphysical philosophy involves principles that can not and will not be ignored by the rising generation of scientific investigators.

Arguments which will thus prevail and can convert to the substantial theory of acoustics at their first presentation such conservative and veteran defenders of the wave-theory of sound as Drs. Audsley and Pearce, will not down at the pretended indifference or affected silence of all the Tyndalls, Thomsons and Rayleighs in Great Britain. However their silence may be interpreted by the superficial and prejudiced as only a proof of the contempt felt by these eminent authorities, level-headed investigators in every department of physical philosophy and all over the world will be forced to admit that a line of facts and argument capable of turning from the wave-theory of sound and from all other motion-theories of science men who have spent their lives in studying and teaching these views, must portend nothing less than disaster to our present acoustical text-books, and that, too, in the very near future.

In keeping with the scientific revelations of the new philosophy now making in England by the published lectures and arguments of Drs. Audsley and Pearce, we have learned that already an illustrated text-book of acoustical science is in contemplation, if not in actual preparation, more formidable and elaborate than anything of the kind that has ever appeared.

This work, as it will be illustrated by the graphic and artistic pencil of Dr. Audsley, can be judged of in advance, when the reader is aware of the fact that a single volume from the same pen and pencil—"The Ornamental Arts of Japan"—is now selling in this city by the Scribners at $300 to $400, according to binding.

Should Dr. Audsley undertake to produce such a volume on the "Marvels and Beauties of Acoustical Science,"—as the work will possiby be named,—it will, no doubt, as far outstrip all other illustrated volumes of the kind as his

work on Japan has distanced all previous efforts. This work, when finished, will have its christening, as we hope, in the College of the Substantial Philosophy on the banks of the Hudson, due notices of which will appear in the pages of this journal. In the meantime let every reader whose sympathies are with us in the prosecution of this work help to spread the news by assisting to extend the circulation of the MICROCOSM—the only Organ of the Substantial Philosophy. Price fifty cents a year. New subscribers, wishing the present volume VII., with all the back numbers, can have it for half-price—twenty-five cents.

OUR CRITICS SILENCED.

"And behold there was a great calm." This literally represents the state of things among our critics since the issue of the July number of the MICROCOSM up to the present writing. With at least fifty opposers of our views from all points of the compass, not a line has been received from any source with a single exception, save congratulations upon the utter overturn of the wave-theory of sound by the annihilation of the law of inverse squares upon which it is based.

One mathematician at Los Angeles, Cal., —the most critical and hardest to satisfy of all our opponents,—on reading our last letter to the *English Mechanic* and "Prof. Tyndall's Mistake," wired us: "You have shown the law of squared distance inverse to be all a delusion. I give it up. The wave-theory is dead."

We doubt not but this will be the conclusion of all our fair-minded critics, however strongly they may insist that their fractional methods and formulas were correct,—a fact, by the way, we have not really opposed from the start. But the basis of all that fractional reasoning having now been proved to be a monstrous fallacy and delusion, of what avail are the fractional results of a mathematical formula when the very foundation of that formula is shown to be an inexcusable if not intentional misrepresentation of the chief facts in the premises?

Whatever errors we may have fallen into in a few technical expressions in our early articles on the subject, we are now content to let our record rest, with the verdict of our ablest critics that the result of the whole controversy has been the destruction both of the law itself and of the theory based upon it.

A KIND WORD.

The following notice appears in the *Religious Telescope*, of Dayton, Ohio, the organ of the United Brethren Church, from the pen of our old-time contributor, Rev. Dr. I. L. Kephart, its editor. Whenever the new college he so kindly refers to shall be started, we surely want and expect Dr. Kephart to be numbered among its Trustees and Board of Directors:

Dr. A. Wilford Hall, author of "The Problem of Human Life," editor of the MICROCOSM, and "founder of the Substantial Philosophy," "health-cure," etc., having in the last few years, through the sale of his books and his "Health-Pamphlet," amassed quite a fortune, has purchased and paid for a site upon which to establish "a college or University of Substantialism." It consists of a very commanding plat of twenty-seven acres fifty miles above the city of New York on the banks of the Hudson, on which is a large building, containing sixty commodious rooms, that was erected a few years ago for a sanitarium, and for which the doctor has paid $62,000. He needs one hundred thousand dollars more to erect additional buildings and equip his college, and until that is secured the place will be used as a sanitarium. * * * Dr. Hall is a rare genius, and his many friends will rejoice that at last, after years and years of struggling with poverty, the tide of financial prosperity has set so strongly in his favor that he is on a fair way for consummating the great educational project on which his heart has been set so many years.

The Substantial Philosophy as advocated by Dr. Hall is as follows: "That every force of nature or phenomena-producing cause, whether in the physical, organic, conscious, or spiritual realm,—such as heat, electricity, magnetism, gravitation, light, sound, cohesion, life, instinct, mind, soul, or spirit,—instead of being a mode of motion, is a substantial, though immaterial entity, and as really objective as are any of the material objects around us."

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

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THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
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(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
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CAUSE AND EFFECT.

BY THE EDITOR.

Nine-tenths of all the controversy upon physical and metaphysical questions result from a singular disregard of the true relations existing between cause and effect. In attempting to explain phenomena or account for mechanical occurrences in the natural order of things, the majority of writers on scientific subjects seem to ignore the logical sequence of some of the most essential links in the chain of their investigations. They seem to repudiate, with indifference if not with contempt, the very axioms and necessities of mechanical science, and go on reasoning or trifling with logic as if effects could occur without antecedent causes or as if an effect could actually be the cause of itself.

For example, a number of scientists in the *English Mechanic* are at the present writing almost verulently controverting each other on the subject of *ether*, as the hypothetic medium through which heat and light undulations are propagated and by which these forces are supposed to produce their effects on sensuous and material objects.

Several of these writers oppose the necessity of such assumed etheric substance, and yet so far as we can see they believe in the motion theories which are based on this very ether by modern science. How light-waves or undulations, according to current physics, can occur or exist without this ether as the substance to be undulated is a matter they do not discuss, while they as studiously seem to avoid any reference to heat, light, or any other form of force as a substantial cause of the various phenomena observed.

They do not recognize such an entity as an immaterial substance at all; yet some of them speak of *ether* in contra-distinction to *matter!* What else can it be but matter if it is not an immaterial entity?

The very supposed necessities of science which led to the invention of ether by Huygens, and its more elaborate formularization by Young, unavoidably made it a material substance even possessing the properties of a "jelly," according to Prof. Tyndall, and having the "rigidity and elasticity of steel" according to Sir Wm. Thomson. Hence to talk of *ether* as something distinct from *matter* is to talk the most unscientific nonsense.

The essential and cardinal property of all matter, and that which is its most distinguishing characteristic, is its *inertia*,—its incapacity to move or produce any physical effect only as it is acted upon and caused to move by the application of some active force or form of energy. To talk of the action of one material body and the effect it produces upon another material body, is to use words without regard to their true signification.

Matter produces no effect in nature or mechanics, and never can be other than inert. Matter may be the passive instrument in the hands of an active substantial force or form of energy by which, as the cause of its motion, a physical or mechanical effect can be produced; but matter can only move as it is acted upon. Hence it must follow by every principle of logic, that force being the active agent in all causality, must be an immaterial entity since matter, being inert, can do nothing or produce no effect even when in contact with other material bodies.

Let this logical and necessary conclusion once impress itself on the mind of a physical investigator, and much of the intricacy and fog in which his mental operations are involved will at once be dissipated.

To try to conceive, for example, of one material body causing another material body at a distance to move or act by supposing the two bodies connected only by some other material substance, such as *ether*, and which, as simple *matter*, is just as inert as would be a cannon ball or granite rock, is to exhibit the most childish reasoning, or rather want of reason, in the premises.

Ether, according to all received definitions of its supposed properties, being matter, and

therefore inert, can no more act itself or produce action in any other material substance than can a scuttle of coal empty itself into the stove, start its own fire, and then put on the tea-kettle to boil. Physicists who have stupidly imagined matter to exist in such a refined or attenuated condition that it is entirely beyond their observation and without any proof of its existence, chemically, mechanically, philosophically or otherwise, and then seize upon this chimerical assumption as a sufficient basis for explaining the movement of a distant body by what is called attraction, exhibit such puerility in their reasoning exploits as to be unworthy of the intellectual capacity of children. If ether is material, with the properties of a jelly, it can evidently no more commence to tremble or quiver than can a bowl of calves' foot jelly, unless the application of mechanical energy shall put it into motion; and a man of the most ordinary mechanical acumen ought to be able to see it; while such particles of ether, constituted of inert matter, when once put into motion, can no more continue to move inherently and continuously in opposition to the resistance of gravity than can the grosser material particles of the supposed bowl of jelly.

Yet the ablest physical investigators of the present day gravely tell us not only that these ether particles have started into inconceivably rapid oscillations, without any known or even supposable cause, but that they keep them up perpetually not only in defiance of the incessant mechanical effects of their own collisions with each other, but in utter disregard of the force of gravity and the property of inertia which bring all material bodies to rest in a very short time without a continuous application of force.

But this is not the worst of this childish and self-contradictory theory. Not only do these material and inert ether particles keep up their own incessant oscillations while perpetually colliding with each other and in defiance of all such resisting impediments to their continuous motion; but the theory tells us, as if the absurdity was not already sufficiently monstrous to paralyze credulity itself, that the molecules of all solid bodies, which are supposed to be in similar oscillations, are actually thus kept in motion by the bombardment of those same particles of ether, and all, too, without the slightest tendency to bring either these ether molecules or the molecules of the solid bodies to rest!

That such mechanical folly can prevail as science in this enlightened age of investigation is a marvel greater a thousand-fold than could have been any one of the seven wonders of the world.

One of the writers in the *English Mechanic* who opposes the ether hypothesis as pure scientific bosh, and yet who as vigorously ignores the possibility of any such thing as an immaterial substance, really takes the preposterous position that a body may be attracted at a distance from another body, such as a magnet, without any substance whatever connecting the two bodies.

He adopts this assumption because, as he says, he is compelled to repudiate material ether as without proof or reason for its existence, and having no conception of the forces of nature as immaterial substances, he is left mentally at sea in the midst of an impenetrable scientific fog.

He sees with his open eyes the effect of the displacement of the armature at a distance from the magnet, but by denying the immaterial but substantial nature of the magnetic rays or threads of force, issuing from the magnet, he necessarily ignores the only possible cause of the phenomenon observed, severs the essential link in the chain of his reasoning, and like the stoical savage rests contented with the mere cognition of the fact as having occurred without intelligently seeking for any cause whatever.

He even denies that we have a right to assume a substance material or immaterial connecting the two bodies thus attracted together, and claims that it is just as logical and reasonable to believe that one might influence the other to move without anything whatever connecting them as to assume either a material or immaterial cause! Yet such writers pass for learned scientists in Great Britain.

We confess that this does not agree with our conceptions of the demands of the intrinsic and imperative logic of cause and effect. Substantialism has quite a different story to tell to the students of physical science. While it repudiates the entire doctrine of material ether with its bombarding molecules, and denies the similar movements of the particles of solid matter, it maintains the manifest existence of a world of substantial but immaterial force, consisting of numerous forms of energy, by which easily and rationally to explain every phenomenon observed in nature or in the mechanical operations of man.

Substantialism assumes as the most self-evident axiom of physical or metaphysical law, that no corporeal, vital or mental effect is possible without a substantial cause connecting the object acting and the object acted upon. To start out on any other basis of supposition is to deal in logical self-stultification at every step we take. Even a child ought to know that when a piece of iron jumps from the table toward the poles of a magnet with a sheet of

glass held between the two, that some substance must connect the magnet with the bit of iron, though he does not and can not see it. And as this substance passes without the slightest interruption through the glass, which is impervious to all matter however refined, that child would certainly and readily grasp the idea that the substance which thus connects the two metalic bodies and pulls the one toward the other must of necessity be an *immaterial* entity since it acts in defiance of material conditions.

How easily would a class of intelligent students be led step by step to comprehend the mysteries of physical science with this basic idea of Substantialism drilled into their minds from the first step of their scientific curriculum onward; and how easy would be the stages of their philosophical education, with all the current nonsense of the motions of molecules and the undulations of ether stripped from their school books, and with the substantial character of every force or phenomena-producing cause in nature substituted!

Such students would be taught to depend on their mental vision even more than upon their physical eyes for the real causes of natural phenomena; and even where their physical eyesight seemed conclusive, they should be taught not to depend upon it implicitly but to prosecute all their investigations as men seeing the invisible reality which always underlies the physically visible and purely phenomenal in nature.

When such student moves a book with his hand, he should see with his mental eyes that it was not his material hand at all which moved the book, but that it was the substantial force, directed and controlled by the substantial mental force within him that was the real cause of the physical movement of the book, while the hand was only the inert material instrument which the real vital hand under the control of the substantial mind used as its servant.

When students of science will start out with this axiomatic truth that all real causes in nature and mechanics are invisible and incorporeal substances, and that the invisible is the real in all observed phenomena, then will they be in a fair way of acquiring the elements of a sound scientific and philosophical education. Such students when they would finish their collegiate course, instead of having their minds stuffed with the incomprehensible and absurd mysteries of heat as a mode of motion, light as the undulations of a jelly-like ether with the "rigidity of steel," sound as but the motion of air-waves, magnetism as "the rotation of the particles of the magnet," electricity as etheric vibrations in currents, and gravity as attraction without any definite meaning attached to this word, they would learn that all these forms of force are real substantial but immaterial forms of energy liberated from the universal force fountain of nature supplied by the author of the material universe and each form endowed with its inherent laws of action and specific effects, as well as with its appropriate methods of liberation.

Such a student, should he become a machinist for example, while seeing his lathe rotating the piece of iron or brass which his tool was turning into some beautiful and useful instrument, would not attribute the cause of this powerful mechanical movement to the belt hugging the pulley of the shaft overhead, but would look further as one seeing the invisible, and would trace the connection of this rotating shaft to the crank and cylinder of the engine in the basement, and from the engine he would follow it to the boiler, and from the boiler to the furnace underneath filled with coal. But all these discovered links are inert material things, and can no more move themselves or cause the motion observed at the lathe, than could the piece of iron or brass he was turning pick itself up and put itself into the lathe.

Being an educated man and having learned at the College of Substantialism the true character of nature's laws and forces, he would search further and even beyond the coal for the real cause of the movement in his lathe and belt.

He would discover that the boiler was partly full of water, but even this is not the real cause; he would discover the steam issuing from the water which is thus expanded into vapor and which thus enters the cylinder of the engine, thereby apparently moving the piston to and fro.

Does he now stop his search and exclaim "Eureka?" Not yet, because he has not yet reached the *ultima thule*—the real substantial cause of all the various phenomena he has been tracing and observing in his search from the rotating bar of metal in his lathe down to the coal, boiler and water in the basement.

At last he looks into the furnace and sees the coal on fire, and feels the substantial rays of heat thus liberated from the fountain of nature striking his cuticle. With his mental eyes he now sees this substantial heat-force permeate the water through the metalic shell of the boiler, and then tracing it in the forced expansion of the steam, he looks into the cylinder of the engine and there beholds the invisible but substantial little giant placing its incorporeal feet against the head of the cylinder and its immaterial shoulders against the piston-head, and then Sampson-like, bow itself with all its might against the crank of the fly-

wheel to which the belt is attached and which leads to the lathe in the upper room. And thus he learns how all these effects have been caused.

How foolish would it have been in the machinist, because he could see neither the heat nor the vapor, to attribute the movement of both engine and lathe directly to the water in the boiler or the coal in the furnace, without any immaterial substance connecting the three, as does the writer in the *English Mechanic;* or how illogical to have attributed the movement of the whirling belt to the "rotation of the particles" of the cylinder-head, as did the distinguished president of the Royal Society of Great Britain in explaining the action of the analogous force of magnetism to the students of the Midland Institute at Birmingham!

Thanks to the light Substantialism is commencing to shed in the very homes of Tyndall and Thomson through the labors of such aiders and abettors as Audsley and Pearce and the hosts of converts they are making, this worse than London fog is beginning to lift. Already the philosophical clouds and mists of the motion-theories of science are commencing to dissipate under the penetrating rays from the magic lanterns of these two investigators, and it is but reasonable to predict that before another decade shall have been entered upon the scroll of time, both Great Britain and Germany will have been redeemed, with not a single school in both realms to be found teaching the wave-theory of sound or heat and light as modes of motion. May the writer live to see that day is the uppermost wish of his heart.

HIGHER CRITICISM.

BY THOMAS MUNNELL.

For nearly two hundred years the scholarship of both Europe and America has been more or less engaged in determining the genuineness and authenticity of ancient books. To be genuine a book must have been written by the author whose name it bears; and to be authentic, it must be a true record of facts. Herodotus, four hundred years before Christ, is called the "father of secular history," because for a long time but little confidence could be placed in what was claimed as matters of fact before his day; but since historical criticism developed into a science, much that was uncertain has been made clear both as to genuineness and authenticity. Attention was first directed to secular literature—its history, its poetry, philosophy and science—during which time many wild guesses were made calling into question books and writings of various kinds that never for a moment had been doubted. Not only has the existence of such a struggle as the Trojan war been doubted, but even the existence of such a man as Homer, thus involving both the genuineness and the authenticity of the Illiad. This study of ancient books has of late been called Higher Criticism, which, after having plied its strength and usefulness to secular writings, began to apply the same rules of critical judgment to the Bible—first to the Old Testament and then to the New. This was natural and by no means displeasing to the scholarship of the church. Some Christians, it is true, became no little alarmed to learn that the genuineness of the Five Books of Moses was first doubted, then disputed and finally denied. Prof. W. R. Smith, of Edinburgh, holds that Moses wrote but a very small portion of the Pentateuch—the Decalogue, chapters 21, 22, 23 and 24 of Exodus, his farewell to his people in Deut. 35, and a few other scraps, and that eight hundred years after his death "Ezra the Scribe" gathered up these scraps that had so strangely escaped the ordinary doom of such sybiline leaves, added the whole "Levitical Code," with all its forms and ceremonies, and so patched up a work to which he affixed the name of Moses, and put it off upon the Jewish nation just as if they had always possessed it and had always believed it to be the genuine work of their great Leader. This boldest and most reckless assault, coming from a man of undoubted literary attainments, and a professed friend of the Bible, whose supreme desire was only to rid that book of some of its most objectionable and indispensible features, at first staggered the confidence of some. But real Christian scholarship soon stepped to the front and checked the daring advances of this semi-scepticism with facts and arguments that never have been met. Of these arguments for the genuineness of the Pentateuch I can not in this brief paper give even a sample, and without going into any details, we might ask:

1. If Moses did not write the Pentateuch, how comes it that in just about one hundred places that Book says: "And the Lord spake unto Moses." These hundred communications sometimes contain many chapters without a break, and sometimes only a few verses, while at other times passages are cut up into dialogues with Moses. But if the Lord did not thus "speak unto Moses," Ezra in making *his* Book, to which he put Moses' name to win public confidence in it, only proved himself to be a deceiver and unworthy of confidence, for to take these hundred direct communications to Moses, and out of his own brain to fill up all the interstices between them and make such unity in the whole work, would not only be such a piece of mosaic as has never since been attempted, but would prove Ezra to have been one of the most accomplished scoundrels of the past Exilian or any other age. If the Lord did not, *through Moses*, establish the Levitical Code, what right had Ezra or any other "Redactor" to say that he did? And what right had Ezra to put nine-tenths of those sayings to Moses into the Lord's mouth if God never uttered them? And how could he undertake 800 years after the death of Moses to produce a true history of things which Moses himself failed to record?

Another point made by Mr. Smith against the genuiness of the Pentateuch is his assumption that the Jews had never practiced the ceremonial law through neither the reign of the judges nor the Kings nor until after the Exile. This, if true, would not prove their ignorance of the ceremonial law, though it would show that they had entirely

neglected it. But the neglect of a law does not prove that it had never been enacted, for there is perhaps not a State in our Union that has not law after law on its records that have been for years neglected and perhaps forgotten, and while Israel did evidently neglect much of the Ceremonial, and much also of the Decalogue for centuries, there are many indications of the existence of the former as well as the latter throughout the historical Books of the Old Testament, from Moses to the carrying away into Babylon. The great celebration of the Passover by King Hezekiah more than one hundred years before the captivity, in which all the ceremonies of the "Levitical Code" were brought into full requisition, and a similar Passover demonstration made by Josiah, are clear proofs that the ceremonial had been well known by their fathers. Of Josiah's Passover it was said (2 Chron, 35; 18) that "there was no Passover like to that kept in Israel from the days of Samuel the Prophet." Now, Samuel lived more than 500 years before Ezra appeared upon the stage, and as the above passage clearly implies that the Passover with all its Levitical forms was known in the days of Samuel, Mr. Smith and all his admirers must agree to fix the date of the "Levitical Code" at least 500 years before Ezra. Then, as there is no intimation that Samuel wrote the Pentateuch, but that it was well known in his day, they might as well let it go back to Moses where it undoubtedly belongs.

Once more—it is well known that Jesus the Christ in sixteen different places scattered through the four Gospels distinctly attributes the authorship of "The Law of Moses," as the Jews then had it, and as we now have it, to Moses. Was Jesus mistaken? Were the inspired Apostles all mistaken? Did any of them need Wellhausen, Graf or Smith to teach them Higher Criticism?

Can we for a moment suppose that Christ, merely because he had assumed our nature, was ignorant of the truth as to the genuineness and authenticity of the Pentateuch? If he was mistaken about that he may have been mistaken about many other things; and so if we could conceive of his indorsing a fraud such as their criticism implies "The Book of the Law of God by the hand of Moses" to be, who would trust Him as "the Way, the Truth and the Life?" Let this suffice for the present.

MODERN RATIONALISM AND THE RESURRECTION.

BY J. W. LOWBER, PH.D., LL.D.

There is so much to be written on this subject that it is difficult to tell just where to begin and where to end. In this brief article I will simply show that the supernatural can not be eliminated from either nature or revelation. When this is done there is no foundation left for rationalism, for if one miracle has been performed there may have been thousands so far as we know.

A Bostonian once said to me, after hearing a noted infidel lecturer: "Did he not destroy that superstitious idea about the supernatural?" I replied: "I think not, for the first man was a miracle even if he was created according to a process called evolution, for men are not made that way now. It required the supernatural to start the process called evolution, and also the supernatural to stop it."

The gentleman had nothing more to say. There is no reply to this, for the first man was a miracle upon any hypothesis whatever. The same thing can be said in reference to the first woman. What is called the rib story has been much ridiculed; but it is evident that man lost a rib, for you seldom find one satisfied until the lost is found. Adam, who was a type of Christ, arose from his sleep, and found by his side his beautiful bride; so the second Adam arose from the dead and found the church which is the bride, the Lamb's wife. In the Greek it is stated that God builded the woman out of the rib of Adam, so Christ arose from the dead and builded his Church.

The first Adam was a miracle, and the same thing can be said of Christ, the second Adam. We briefly call your attention to His resurrection, which is the great miracle of history; and it completely overthrows the fundamental position of modern rationalism.

The rationalist admits that Jesus Christ was crucified and buried in a sepulcher. He has some strange ideas about the effect of the crucifixion, but more of this hereafter. He can not deny the historic fact that Jesus was crucified and buried. Napoleon has said that facts are stubborn things. They are not only stubborn things, but they are the very things in which science and philosophy should constantly deal. Life is too important for man to spend his time in idle speculation. The fundamental fact in dispute between the rationalist and the Christian is the resurrection of Christ from among the dead. The rationalist can readily see that the resurrection proves the divine legation of Jesus. Hence the sharpest discussions between the rationalist and the Christian has been in reference to the resurrection.

It is claimed by some modern rationalists that the resurrection of Christ was only a revivication after a swoon. A Scottish lady, it is said, died to all appearances and was buried. Soon after her burial a grave robber cut off her finger to get a ring; she revived and frightened the midnight thief out of his wits, and returned to her home to the great astonishment of her husband and children. There is no parallel between this and the resurrection of Christ. The woman apparently died of disease, and was immediately buried. She was in the grave only a few hours. Jesus was put to death by crucifixion, the first shock of which was almost certain death. During the siege of Jerusalem Josephus persuaded Titus to release three of his friends who had been on the cross only a few hours. Two of them died, and it was only by the most tender care that the third one was saved. The heart of Jesus was pierced with a spear. There is no chance for a swoon when the heart has once been pierced. Jesus was in the grave one day and two whole nights, so there can be no question about His having actually been dead. If He had revived after a swoon, how could He have escaped either friends or enemies? Where did He spend the rest of life? The rationalist admits that Jesus possessed a perfect character. If this be true, He could not have permitted His disciples to preach what He knew to be a falsehood. If His death had been only a swoon, it would not have been possible for Him, with His pierced hands and feet, to pass among the disciples with the celerity with which He passed. This hypothesis is so un-

reasonable that the rationalist, if he wants to be considered rational at all, must abandon it.

Strauss claims that historic science requires us to admit that the disciples really believed that Jesus arose from the dead. How does this rationalist, then, get rid of the fact of the resurrection? In this way: He claims that, while the disciples were honest, their belief in the resurrection was a hallucination. That Mary Magdalene, the first to reach the sepulcher, had not entirely recovered from the disease of which Jesus had cured her. The facts in the gospel narratives are altogether against this hypothesis; for Jesus did not appeal to the imagination of His disciples, but to their senses. He ate and drank with them after His resurrection. Thomas was not imaginative, but required a thorough test of the senses.

Paul, through life, dealt in facts, and we do not find in the history of his work any peculiar aberrations. His first epistle to the Corinthians, which so fully treats of the resurrection, has never been questioned in reference to authenticity. The old theory that the disciples took the body from the sepulcher while the guard slept has now but few advocates. It is a well authenticated fact that the guard was hired to tell this unreasonable falsehood. The enemies of Christianity are constantly changing ground in reference to the resurrection of Christ. They seem to feel conscious that they are in trouble, and do not know exactly how to get out of it. The more efforts they make to explain away the fact of the resurrection the greater become their difficulties. The Christian wants the substantial in both nature and revelation, and can safely risk the truth of the Bible upon the fact of the resurrection.

(*Continued from our last number.*)

DR. HALL'S THEORY OF ACOUSTICS.

BY C. W. PEARCE, MUS. D. CANTAB.

[From the London *Musical Opinion.*]

The next difficulty is that of the wave lengths which are assigned to the pitch of musical sounds, and this was raised in my mind by Dr. Hall. Briefly speaking, the undulatory theory of wave lengths depends upon the velocity of sound in different *media*, and the number of vibrations of the sounding instrument required to make any given pitch of tone. The higher the pitch of sound, and the slower its velocity, the shorter the wave lengths become, and *vice versâ*. To obtain the wave length of any given sound through any given medium, according to the undulatory theory, divide the velocity per second by the number of vibrations per second. Thus, taking the velocity of sound in air at 1,120ft. per second, it follows that the note A, produced by the second string of the violin having 440 vibrations per second, must produce wave lengths of 30½in. The lowest note of a large modern organ (bottom C of the 32ft. pedal stop) has, by this calculation, a wave length in air of 70 ft. Were this note to be sounded in water—in which sound travels with four times its velocity in air—its wave length would be 280ft. from condensation to condensation, or from the centre of the wave to the centre of the next. But if this organ pipe be sounded in connection with an extended mass of iron—in which sound travels some fourteen times faster than in air—its system of waves from centre to centre of two adjoining ones would have the prodigious wave length of 980ft., or several times the wave lengths of the largest ocean billows. But, notwithstanding these actual wave lengths of nearly a fifth of a mile from the centre of one iron undulation to that of another, there is no amplitude or to-and-fro motion of the iron particles discoverable under the microscope. All correct ideas of undulatory or wave motion should make water billows having a wave length of 980ft. at least 98ft. high from crest to trough, according to the proportions which prevails in all systems of water waves.

Let us reason this out. If sound waves transmitted through air constitute air waves, then sound waves in iron constitute iron waves. It is impossible to evade this. Further, as atmospheric sound waves are formed by a small excursion to and fro of the air particles—thus constituting their amplitude, without which air waves could not exist—it follows that iron sound waves must also be formed by a small excursion to and fro of the iron particles, thus constituting the necessary amplitude of iron waves, and without which a wave is a nonentity. But as no such excursion to and fro of the iron particles occurs in a solid mass of iron when conducting sound, even when examined under the most powerful microscope, and, consequently, no amplitude exists in such supposed iron undulations, it demonstrates that there is no wave motion in iron as the result of sound, and hence that sound must pass through iron by some other law; and, if through iron, then through air, as there evidently can be no two different modes or principles of sound propagation through different substances—one *wave* motion, the other something else.

Should it be argued, however, that, in the propagation of sound through iron, the particles may move to and fro, producing a certain amount of amplitude as required in all wave motion, but not sufficiently to be visible under a microscope, then such invisible and infinitesimal motion—even if it occurs—would not constitute sound capable of addressing the human *ear*, because the *eye* is admittedly one of the most refined and sensitive of the avenues to perception; and, this being so, these supposed motions of the iron particles, which can be so easily heard by the unassisted ear, should, if they take place at all, be plainly visible to the naked eye. But as this assumed amplitude, or motion of the particles, can not be seen when the sight is magnified a million fold, it is conclusive evidence on the very face of it that such motion, if it takes place at all, is a million times too trifling to be heard. This is one of the difficulties of the wave theory, which can not possibly exist in the substantial theory, and I fail to see how it is going to be answered.

Professor Huxley remarks: "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 mean merely 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 negativing the hypothesis, as five hundred."

But for the sake of enabling us to proceed

with our case against the wave theory, let us suppose that this difficulty about the enormous wave lengths with no amplitude at all has been satisfactorily disposed of. Other and greater difficulties remain. Here is another. How can we reasonably account for the commonly observed phenomenon of an echo or reverberation by the wave theory of sound? All the text books tell us that an echo is caused by reflection. The reflection of what? Of the sound waves caused by the action of the vibrating body. We will suppose that the human voice emits the sound which is reflected. I stand—we will say about eighty feet from the reflecting surface—and sing a certain note. According to the undulatory theory, the sound waves caused by my voice travel away from me, strike the reflecting surface, and return to me with a faithful but fainter reproduction of the note that I sang. Now, a sound wave consists of two pulses—one of condensation, the other of rarefaction. One or the other of these pulses must come in contact with the reflecting surface, in order that the wave may be reflected. It is not difficult to imagine how a pulse of condensation can be reflected, because the air particles of which it is composed are at that moment moving in the direction of the reflecting surface. But how is a pulse of rarefaction reflected? Clearly in this case the air particles are moving away from the reflecting surface, quite in the opposite direction. Therefore, how can such a pulse—by the ordinary laws of mechanics—be reflected at all? But it is not only one wave which has to be reflected, but *many*. Every vibration of the vocal ligaments produces a separate and independent wave—several hundreds in the course of a second—and all these numerous waves have to strike the reflecting surface and come back to me, making their way through the waves behind them (which are now proceeding in an opposite direction) as best they can. We are told that the action of the air waves is the same as that of water waves in principle, the only difference being that the former are due to longitudinal vibrations of the air particles, the latter to transverse vibrations of the water particles.

Now, let us see how water waves behave when they come in contact with a reflecting surface. Water waves, striking a perpendicular wall at an angle, give no trace of true reflection, but fall back and break up into confusion amongst succeeding waves, thus instantly losing their identity. Nothing can reflect which has not a substantial forward movement. A wave is only the forward movement of the form of the water's disturbance, and not of the water itself, the particles constituting the wave having only an oscillatory motion to-and-fro in a direction at right angles with the direction of the wave or swell itself. This is even seen in a field of grain, and especially in flax in blossom, in which true waves are produced by wind, but in which it is evident that no reflection at the angle of incidence is possible. The law of angular reflection is only conceivable in bodily forward movement (under velocity) of the very substance which is reflected. A discharge of india-rubber balls from a gun against a plane surface at an angle gives a correct illustration of this angle of incidence at which sound reflects, each ball rebounding at the same angle of direction that it had in striking the plane surface, thus showing the true law of all reflection, especially of sound as a substantial entity having an analogous forward and bodily motion. In the case of an ear trumpet, or speaking tube, the concentration of sound is only a succession of reflections of forward-moving substantial sound force, following this angle of incidence, rebounding from side to side of the tube, thus collecting the larger quantity of sound force admitted into the big end of the tube into a condensed form at the small end. Here, then, in the case of echoes and all reverberations of sound, the wave theory appears to me to be incapable of satisfactorily explaining ordinary natural phenomena from an ordinary common sense point of view.

Another difficulty with regard to wave lengths is this: We are taught that while the wave *amplitude* of any musical sound may vary to any extent, the wave *length* must always remain constant. That is to say, if a note of a given pitch be sounded, first *fortissimo* and then *pianissimo*, although the amplitude of the two wave systems will be very different, the length will be exactly the same in each case. But how is this teaching to be reconciled with plain facts? Once more I must remind you that we must study the action of water waves if we would understand that of sound waves in air. In all true wave motion, as observed on the surface of water, the slightest change in the wave amplitude or in the height of the crests in any given system of waves, produces a corresponding change in the wave lengths, keeping them, as I stated just now, in the invariable proportion of one to ten. That is to say, as the amplitude decreases, so does the wave length decrease; and if this is true of water, it is true of air; consequently, a sound started at a given pitch and intensity ought to become *higher* in pitch as its intensity decreases, because its wave length has become shortened in proportion. As musicians, we know this is not the case, and if the wave theory be true, all loud sounds must necessarily be low sounds, because of their intense amplitude and consequent length of wave; and, *vice versâ*, all soft sounds must necessarily be of considerable altitude, because pitch depends upon the length of the sound waves. But there is another fact to be observed with respect to water waves. Their *velocity* is always in exact proportion to their amplitude of vibration,—that is to say, their forward velocity of travel corresponds exactly to the depth of the trough between two waves; or, expressed more technically, their velocity is in proportion to the distance from crest to trough. For example, start a system of large waves in a still pond by dropping a large heavy stone into the water. These waves will be observed to move off with a speed precisely proportioned to their magnitude, possibly fifty or a hundred times faster than will a system of waves started by dropping a small pebble into the same place.

Now let us for a moment look at the essential difference between sound and this true wave motion. *Loudness* of sound, we are taught, consists entirely in amplitude of vibration, or in the width of swing of the air particles as they oscillate to and fro, whilst the sound waves are advancing. But when it is considered that all sounds, high and low, faint or loud, travel through air as a medium with precisely the same uniform velocity, and that the so-called varying amplitude of the air

waves has no effect whatever on sound velocity,—the whole wave theory stands condemned as untrue, whether scientists are able to see it or not. We organists know very well that, in listening to an organ or orchestra playing at a distance, all the sounds, soft or loud, high or low—that is, all so-called sound waves, big or little—reach our ears at exactly the same velocity, since precisely the same interval of time in the succession of the various notes occurs with us some long distance away as at the very place where the organ or band is playing. But if the wave theory be true, then the loud *forte* sounds ought to reach us quicker than the soft *piano* sounds, because, their amplitude being greater, they should travel at a greater velocity. But we know better than this. If, then, sound is propagated by true wave motion in any manner resembling the action of water waves, then a sound started in air should become higher and higher in pitch, and go slower and slower in velocity the further it travels. This is precisely what takes place on the surface of water, since these waves, as demonstrated, travel slower and slower just in proportion as they become reduced in height, and thus get nearer together, thereby diminishing the wave lengths (which represent higher pitch in sound) as the distance from their source increases.

Writers on sound seldom appear to have grasped the idea that one vibrating instrument will produce sound that can be heard a mile away, whilst another sounding body of the same vibrational number and of manifold greater action on the air can not be heard a dozen feet away in a still room. This is a well known fact. Concerning the relative intensities of sound, the wave-theory teaches that the greater volume of sound heard anywhere in a room can only be due to the greater amount of motion communicated to the air of the room; and, again, that what is loudness in our sensations is, outside of us, nothing more than width of swing or amplitude of the vibrating air particles. Hence, it follows inevitably from such a law that the sounding body which vibrates furthest, or causes the greatest disturbance of the air, should produce the loudest sound, and should be heard at the greatest distance. But, on the other hand, if Dr. Hall's substantial force-theory be correct—viz., that pulses of sound force radiate from the sounding body in synchronism with its vibrations, then it follows that the volume or loudness of tone should depend entirely upon the sonorous nature, quality, or property of the sounding body, and without any necessary relation to the incidental disturbance (if any) which it may produce in the air. In other words, if Dr. Hall's theory be true, we should naturally expect to find some sounding bodies of a given size and of a given pitch which would occasion very little atmospheric disturbance, yet which would produce sounds of great volume and intensity, —the very thing which does actually occur in numerous instances. A tuning fork, for example, held in the fingers, or a wire-string stretched over rigid supports, when caused to vibrate at its best, and to swing to and fro with an amplitude of fully one-sixteenth of an inch, can not be heard more than eight or ten feet away in a still room, notwithstanding the powerful condensing effect such large vibrations must (according to the wave-theory) have upon the air. Yet a tiny locust, familiar to almost everybody in the United States of America, weighing not the one-hundredth part of either the fork or string just mentioned, and with a vibrational tremor scarcely visible even when in close proximity, will sit on a green leaf and issue sound almost deafening to the bystander, and which can be distinctly heard for more than a mile in all directions, as Darwin himself admits in his "Origin of Species." Thus a sounding body with not the one-hundredth part of the mass, and with but a small fraction of the mechanical action on the air such as is caused by the tuning fork or stretched string, actually produces a range of sound more than eight hundred times greater. Dr. Hall states that the pitch of the note sounded by this insect is as nearly as possible that of the A string of a violin.

I need not remind you in this place that in ordinary speech it is neither the loudest voice, nor that which is produced by the greatest amount of exertion, which travels the furthest. Often and often, the most penetrating speaking voice is possessed by individuals who are incapable of any great amount of physical exertion. Hence the intensity of sound external to our senses consists in the amount or quantity of sound force which is liberated, and this amount depends upon the sonorous capabilities of the vibrating instrument itself. Consequently, if a student desires to know upon what the intensity of sound really depends, he will, by Dr. Hall's theory, be referred not to a number of imaginary motions of the air, but to the nature of the metals and other material substances of which musical instruments are made, so that he may be able to accurately gauge the amount and penetrating capability of the latent sound force therein contained. The organ factory, the musical instrument maker's work rooms, the successful voice trainer's studio, will be the best places for acquiring the true knowledge of what sound really is, and how to usefully employ that knowledge in actual practice.

(To be continued.)

OUR BUSINESS AT THE NEW YORK POST OFFICE.

BY THE EDITOR.

When we reached this city to go into business some thirty-five years ago, at the time that the post office was located in the old Dutch church at the southeast corner of Nassau and Liberty Streets, and observing the vast amount of business there done, it became our ambition, at some future day, to do more of this business than was done by any other individual or firm in New York City.

So much were we impressed with this crowning triumph of our life, as to prospective business achievement through the medium of the United States mails, and so steadily has it grown upon us that we have often spoken of it to our intimate friends, and have as often been laughed at for our pains.

For many years, however, this *Ultima Thule* has evaded our grasp and has seemed to beckon us at a dim and shadowy distance. Still we have never become discouraged, nor have we

lost hope in the pursuit of the *ignis fatuus*, but even when we had fallen into the hands of the Philistines, as in the closing volume of the *Scientific Arena* three years ago, with our eyes almost plucked out and our limbs bound with hickory withes, our faith in manifest destiny never forsook us.

And now we are proud to announce to the readers of the MICROCOSM that the year ending with the first day of the present month has witnessed this final and crowning ambition of our hopes for which we have so long labored and struggled.

We have just learned through the officials of the New York post office,—which confessedly does more business than any other mailing centre on earth, not even excepting London,—that during the year just past, we have presented a greater number of money orders for payment, and have signed for a greater number of registered letters than any other firm or individual in this city; and that while the mailing harvest of other business houses goes by fits and starts so to speak, according to seasons of greater or less business activity, ours has been a steady and continuous onflow like unto a never-failing financial Niagara.

Not only this, but what is better, and that which pleases us most, is the admission of these same officials that with all this enormous business through the mails, less complaints of irregularities or missing returns for orders occur with reference to our transactions than those of any firm in the city doing any considerable amount of business through the mails.

Surely a record like this is one to make a man feel cheerful in his old age, especially when he is able to point to the fact that during this year he has received and responded to more than 10,000 registered letters, more than 15,000 money orders, and more than 20,000 postal notes, besides double the amount thus represented in checks, express orders, etc., of which no special record has been kept.

As a sequel to this unparalleled success, the MICROCOSM, which has been the medium for all this business achievement, has itself grown in popular favor and extent of circulation as no other paper of the kind in this city or any where else can show. Its subscription list has more than quadrupled within the year, and even now during the dullest business season new subscribers are pouring in at the rate of from 800 to 1,000 a month—a prosperity no other journal in New York can boast.

The ruling ambition of this ambitious age, with all sorts of people, is to "break a record" in some one of the thousand different fields of human contest both of brains and muscle; but the record-breaking achievement just described we must confess suits us best of all and fills our cup of ambition full to the brim.

MME. BLAVATSKY.

BY THE ASSOCIATE EDITOR.

In the June number of the MICROCOSM, vol. 6, will be found an article by the editor of this paper on Theosophy as expounded by Prof. Elliott Coues, of the Smithsonian Institute of Washington, who is the recognized head of the occult science in this country. The professor delivered a lecture in this city in which he declared his unbounded faith in all the mysteries of the Eastern philosophy, and also declared his ability to project his astral body to some other part of the universe where it would be recognized, and would hold conversation with those advanced in theosophical lore, while his physical body would remain in New York on the lecture platform or elsewhere performing its ordinary duties.

Remembering this, and the visit of Dr. Hall to his lecture, we were surprised to find in one of the leading New York papers an extended report of a conversation held with Prof. Coues, in which he seems to have rejected completely his former views, and declares that theosophy, with all its mysteries, is simply bald jugglery, and adduces many surprising facts in support of his statements. He alludes to Mme. Blavatsky as a woman who "swears like a pirate" and "smokes like a chimney," and who uses her theosophical mysteries as a means of raising a dust to cover many questionable and immoral antics. He declares the organizations known as theosophical societies in this country to be organized for financial purposes by Mme. Blavatsky and her dupes and tools, and that these societies when formed, being made up of both sexes, have incidents which would hardly be reported on the minute books of the assemblies.

He declares that the wonderful mysteries which are said by Mme. Blavatsky to exist in India in support of her system of philosophy, such as the hidden temples and sequestered pyramids of which we have all heard so much, are made up of pure and unalloyed jugglery, and of the simplest kind, such as sliding and trap doors, false windows, etc., etc.

In short, he declares the whole system to be a fraud of the vilest description, gotten up for the advancement of the schemes of Mme. Blavatsky, whom he paints as an ingenious impostor and a woman whose moral character would hardly pose as a model in American society. Referring to her book, the *Isis Unveiled*, he declares that the MS. was stolen from *Baron de Palm*, and that when she entered her room and pretended to be in a trance and in communication with the spirits of the other world, she would each day deposit pages of the stolen MS. on the table, declaring them to be the production of the spirits with whom she had been having intercourse.

Prof. Coues seems to be thoroughly disgusted with his whole experience with this mysterious sect, and probably rues the day he was fascinated by its mysterious machinery.

Conscientious truth-seekers can take to themselves the assurance that in these systems of so-called philosophy, where there is so much dealing with the mysterious elements of the universe, which they claim can only be comprehended by a very few, and those of their own select circle, that there is something which, according to their own admissions, will never

become of any universal value, and which, judging from the past experiences with such systems, only bring individual misfortune. Truth is as broad as the universe itself, confining itself to no special locality, and needing no darkened chambers for its manifestations, and takes no umbrage at the presence of the inquisitive investigator.

ARTIFICIAL PROCESSES.

BY THE ASSOCIATE EDITOR.

It is wonderful to note how human intelligence can plan and produce contrivances to meet the emergencies of the hour when Nature seems by some freak to have withdrawn her goodness. There evidently was a time when all the demands for the maintenance and cultivation of life were satisfied by plain material conditions, but either through the increase of our desires by circumstances attending civilization and advancement, or through the violent attacks made upon natural conditions by our present modes of living, which in some way render them impotent to supply our wants, we find a continually increasing mass of occasions where there is necessity for artificial processes to meet our requirements, and in almost all cases we find them to be equal to, if indeed they do not surpass, the efforts of Dame Nature herself.

There is no doubt but that under perfect and absolute methods of life, Nature unassisted is equal to the occasion, but man being inherently an erratic creation, constantly violating these natural conditions, finds himself through his transgressions surrounded with resulting afflictions, which Nature is apparently unable to remedy unaided, and thus there are supplied opportunities for human ingenuity which are met with astonishing ability. Take the bodily ailments, such as weakness of the eyes or ears, and we find art ready to correct deficiencies. Another surprising illustration is furnished by the dumb, who are brought to their unfortunate condition by deafness, where art steps in and enables the person, by a cultivation of a particular muscular system, to carry on a vocal conversation. Limbs and teeth are supplied which after a time perform their functions almost as well as the natural furnishings, and we should be careful in scoffing at the prophet who would declare the dawn of the day when the internal and more vital parts might be supplied by scientific art. Already skulls and ribs and breathing tubes have been contrived and put into successful operation, and who knows but that the time may come when the present tremendous death-rate of consumptives may be decreased by the ingenious contrivance of some mechanical device to take the place of the lungs. The past has led us to expect great things from the future.

In the exterior world we find that art has supplied the failings of nature in such contrivances as ice machines, where this necessary article can be furnished for the world at an almost minimum cost, in incubating apparatus, where our resources in this peculiar line can be extended to an almost unlimited degree, in scientific grafting, whereby our many products are immensely improved and invigorated, and even in intelligent animal selection, where the benefits are appreciated by every farmer and stock-breeder.

Truly this furnishes us with astonishing revelations concerning human ability to improve upon natural conditions.

HYPNOTISM.

BY THE ASSOCIATE EDITOR.

The utilitarian spirit which is characteristic of the American people has placed them far in advance of the world from a commercial standpoint, but leaves them much behind the European nations in scientific and philosophical research. The subject of the greatest agitation in scientific circles at present, is to be credited to the French scientists who are investigating the effects of mind over matter, with a view of rendering to the world some practical and beneficial results from such study.

The new science is termed Hypnotism, which is simply a development of the principles advanced by Mesmer a century ago, but it is now proposed to give the subject a universal application especially in medical and surgical circles, to take the place of such uncertain and dangerous drugs as morphia, chloroform, cocaine, etc.

It is claimed that a person upon whom this hypnotic or mesmeric influence is exercised can be told by the operator that the weather is cold, and he will immediately apply for an increase of clothing, and if informed that the temperature is warm will as suddenly begin to divest himself of his apparel, he can be given a potato and if informed that it is an apple will eat it until attention is directed to some other similiarly fabulous subject. The senses and will seem to be entirely at the mercy of the operator who can command or punish or caress without the slightest interference of the patient.

If such a principle can be made practical, it will have a great influence for good, but we can easily perceive how the universal posession of such a subtle influence might be a power for unlimited injury.

THE BEE-MAN ONCE MORE.

BY THE EDITOR.

Stung by very sharp letters from all parts of the country Mr. Root, to whom we paid our compliments last month, weakens sufficiently to print one of those letters in his journal. This letter is so full of common-sense and simple fairness that we copy the same at the close of these remarks.

Mr. Root is certainly a very weak-minded journalist, if not almost an imbecile, to print such a letter as this after so outrageously sinning against light and knowledge and after publicly confessing his total disregard of his promise as a gentleman.

His main plea for making public the secret of the discovery,—or a small part of it which in his bigoted blindness he supposed to be the whole of it,—was the wrong, as he insists, of any man selling for a sum of money a discovery he may have made however valuable it may be or however much such discovery may conduce to the comfort and wealth of the purchaser.

This man has not discrimination enough, it seems, to know that the whole patent office system of this and of all other civilized nations is based on this very recognized right of every inventor or discoverer to the money value of his brain-work wrought in the interests of

community. Such an anti-secret humbug as this pretended moralist would be summarily kicked out of the Patent-Office should he be employed there, and should he essay to ventilate his ridiculous opposition to a just moneyed compensation for original discoveries, on the assumed ground that no useful discovery should be maintained a secret from community under pledge of honor.

In the case of mechanical inventions or new chemical combinations there is no necessity for maintaining secrecy longer than during the process of obtaining a patent, as such exclusive right given by government to the inventor or discoverer for seventeen years against all infringers, is his ample protection.

No one, not even the semi-idiot of Northern Ohio, objects to such inventor or discoverer maintaining his secret against pirates by pledge of honor until such time as his patent can be granted, which of course then takes the place of secrecy; nor would even such puling moralizer prate about the unchristian practice of selling such patented discovery for its fair cash value to the purchaser of the same.

But there is a class of discoveries which even if patented would not protect the discoverer in the slightest degree in the true value of his brain-work, as such secret when once divulged and made public could be used privately by any one without the least chance of detection, thus as really swindling the discoverer out of the cash value of his brain property as would the man who would boldly manufacture Root's patent bee-hive and either compel him to submit or force him to the expense of employing counsel and suing out an injunction.

Plainly the only protection to the owner of such unpatented but intrinsically valuable discovery, which would prevent every dishonest scamp from pirating it, is to maintain it a secret and require all who obtain its benefits to pay a fair valuation for its use, the same as if it were patented and could thus by sanction of law be protected against infringment. The spirit and essence of the two cases are precisely the same, and the discoverer in both cases has the same intrinsic and moral right to the cash value of his brain property. But a large class of moralizing cranks and lunatics of which Root is a conspicuous type, do not possess common sense enough to see the substantial parallel in the two cases.

To show the self-contradiction of all his reasoning, look at his complete indorsement of the entire professional work of the family physician. He says:

"Any thing that comes up having a tendency to spoil our faith in the family physician tends towards danger and evil."

Yet all his rodomontade against selling a secret for a fair valuation of what such secret will accomplish or save for the purchaser, is a dead assault upon every doctor in the land. The whole professional business of the doctor so far as his therapeutical relation to his patients is concerned, is based on practical secrecy.

As we stated last month, the family physician is justified by Root in selling you for $4 a prescription of a dozen lines of Latin quail tracks,—so far as your knowledge is concerned, —and which no one but the druggist can decipher, neither of whom will reveal to you the intrinsic nature of the drugs to be dealt out and swallowed, and which you could not comprehend if they should, since the explanatory language would be as much of a secret as is the original $4 prescription.

These secret prescriptions, which do not contain a thousandth part the reading matter of our little book, and which constitute the chief source of gain of most of the docters of the world, are the worst swindles known, according to this Root, as they reveal nothing after they are sold, but remain to all intents and purposes a dead open-and-shut secret to the buyer as much after he has paid out his $4 as before! Yet this pretended opposer of selling a secret discovery would not throw a straw in the way of the 100,000 professional men in this country who make their living by selling secret prescriptions which remain to the purchaser as much a secret after purchasing it as it was before.

Not so with our Health Pamphlet. When a man buys it for $4, every sentence and idea it contains becomes his own property. It is no longer a hidden mystery couched in the undecipherable phrases of a dead language. Should we be guilty of such a sale of a secret, which absolutely reveals nothing to the purchaser, we should regard ourself as a swindler of the deepest dye, and should blame no such humbugged purchaser for prosecuting us as a fraud.

But this is not the feeling of the purchasers of our pamphlet at $4. Ninety-nine in every hundred, male or female, regard the $4 as the best cash investment they ever made, and thousands of them declare, as our open files will show, that no amount of money would buy the knowledge thus procured, could it be taken from them. And why is this not so, when the possession of this pamphlet saves the purchaser from all doctor's bills, and the purchase of all drugs for life?

But we had no intention of writing so much on this subject when we started out. We wished simply to sting Root at the tenderest part of his cuticle we could find. We trust he will *feel* if he can not *see* the point of our argument. Here is the telling letter that his revived conscience forced him to print, which we heartily commend to our readers:

Mr. Root:—I noticed your editorial * * * for May 15, and I wish to say I think you have done a great wrong to perhaps hundreds of people. I will explain. If I had read your editorial before I had purchased the secret I should never have bought it, for the reason I have such confidence in your criticisms; but I have practiced the treatment, and it has saved me a great deal of sickness and money, and I would not sell it again for $1000. You say it is well known to our doctors. If that statement is true, why did they not prescribe the same for me? I have had several doctors treat me during the last 20 years for what they called "inaction of the lower bowel," and every little while I would get billious and have a sick spell. * * * * * Now, can you not see that there are others to whom the treatment would be just as beneficial as it is to me, and that your editorial will for ever deprive them of that which, if they had, they would not part with for any amount of money? therefore you have done them a great wrong, saying nothing about whether you wrong Mr. Hall or not. You say Dr. Hall claims it was revealed to him by the Almighty.* I can not

* This was a bald and unmitigated invention of Root in his general scheme of disparagement and falsification —EDITOR.

find any such statement in the pamphlet, in the light that your editorial gives it, any more than you claimed that God revealed that spring to you, there by the windmill; and I believe both of you in your finding the knowledge of the spring and the secret. * * * Even admitting that it is an old remedy, is he not a benefactor for bringing it before the public? and is it not worth $4.00 to any family? Do you not bear witness that it is "valuable"? and would you have known it if it had not been sold for $4.00?

And now Bro. Root, just one thing more: Two years ago this village had an epidemic of meningitis. Four of my children had it. *Two died*, and I believe before God that this treatment would have saved my boy's life. * * * In closing I will say my heart is full because I think you have done wrong, and a great wrong, to our fellow-men. I am not selling, nor interested in the sale of it, nor in Mr. Hall.

ADOLPHUS NEWTON.

Norwich, N. Y., June 6.

MATTER AND FORCE DISASSOCIATED.

BY ISAAC HOFFER.

The hypothesis that "force disassociated from matter is nothing" is a philosophical proposition that has always been considered unanswerable, and therefore taken as one of the strongest proofs that force is not an entity.

Men, whose minds are not trained in the philosophical way of thinking and reasoning, do not consider that a proposition which has only the absence of a disproval to sustain it, or the absence of every thing as the basis and foundation for its support, is established as a philosophical fact.

They are skeptical and still hold to that old philosophical proposition that "something coming to nothing is impossible in nature and in thought," and hence reason that if force disassociated from matter is nothing, then force *in matter* is nothing. They inconsiderately argue that nothing must be a very flimsy substance to make force from; and that the process of converting nothing into the forces of nature, or of eliminating *something* from matter that is *nothing*, must be a very interesting operation.

They express the hope that some of our scientific institutions will secure the service of a philosopher who is familiar with the interaction of matter and nothing, to give an exhibition of, to them, the wonderful process of disassociating something from matter that is nothing, or transforming nothing into something through association with matter.

While these men still have some doubts about the possibility of separating force and matter they are constrained to admit that philosophers must be familiar with the process of their disassociation, or else they could not treat it as a legitimate subject of inquiry; and could not offer such an apparent absurdity as a test proposition in philosophy.

While hypothetical and theoretical philosophy fully explains all the properties, characteristics, activities, and laws of matter, these uninformed inquirers after scientific truths want to see for themselves an exhibition of the residual matter from which force had been disassociated—matter reduced to its original condition before it generated force in accordance with philosophical theories.

They say, that theories tell them that molecules are "pieces of matter of measurable dimensions, with shape, motion and laws of action—intelligible subjects of scientific investigation," and they want to see the effect of atoms and molecules of inert matter, entirely separated from force, starting dynamic action of their own accord, and thus generate force by which they are continued in action. These men can not get into their thick heads the idea that something which has no action in itself, and no capability to act, like matter, should nevertheless of its own accord produce action in itself; they can not comprehend that matter can be the source of force and at the same time the passive substance for its operation—the acting moving power and the thing acted upon and moved; and that when matter ceased to act force is at end, and is nothing.

These apparently contradictory operations are easily reconciled and explained by the atomic and molecular theories. These show that when matter has placed itself in a proper condition to generate force, the hypothetical atoms and molecules, by a law of their own not discerned in nature, commence dynamic action by entering into a general bombardment, bouncing themselves against each other on all sides, and driving each other apart in every direction; and while thus engaged in repelling and scattering each other, they, at the same time, gather themselves together into bodies and masses, and unite themselves by a cohering force exactly equal to the repelling action; thereby preventing a total dispersion and confining each atom and molecule to its own immovable position with sufficient space to move and keep up their dynamic action. Even these full and explicit explanations do not satisfy these hypercritical searchers after true philosophy. They raise the objection that the laws which these atoms and molecules prescribe for themselves, and implicitly obey, are of too extreme a tenuity and too infinitely elastic; or else they would not permit passive matter to be its own conditioning power and self-exerting agent of activity, or allow atoms and molecules of matter closely united and firmly held together by cohesion, at the same time to continue in ceaseless action; or permit equal repelling and uniting action, in the same particles of matter, to produce a bombarding motion.

Since these critical researchers have been informed that matter can be disassociated from force, and that molecules are measurable pieces of matter, they want to see the shape, condition and action of these molecules when freed from the effects of gravity, magnetism, affinity and cohesion, and from all repelling and dispelling forces.

An exhibition of this kind would be quite as interesting as an exhibition of the process of disassociating something from matter that is nothing, or of transforming nothing into something through association with matter. There is no reason why philosophers should not be able to demonstrate, to the satisfaction of the doubting world, all that theories have fully established as demonstrable philosophical facts.

Lebanon, Aug. 11, 1890.

LIGHT. GEN. I.

BY PROF. D. JAMES, A. M.

In the first verse is summed up the operations detailed in the remainder of the chapter. The "beginning" mentioned by Moses includes the period or periods occupied in the

transformation of a "void" and "formless" earth into a habitable globe. It is not probable that Moses mentions a beginning to the universe, anterior to which, Deity was alone in an infinity of nothingness, nor the time when the "foundations" of the earth itself were laid, but that he confines himself to the changes which occurred in the surface and immediate gaseous surroundings of the earth whereby it was fitted for the existence of living things. From Job (28-9) it may be inferred that, at the commencement of the period which Moses calls the "beginning," the body of the earth was covered with water, and that a "cloud" or "liquid ring," as Prof. Vail calls it, enveloped the watery earth, producing that "darkness upon the face of the deep," which surrounded the earth like a "swaddling band." A partial dissipation of this cloud permitted light to reach the liquid surface of the earth. How long light was permitted to act on this aqueous surface, we can not know. The close of the first "day" was probably caused by the recondensation of the cloud, which as yet had permitted the light to shine feebly. This cloud yielded gradually again to the force of light, and more effectually than before. The second "day" had more light than the first, and the formation of the atmosphere was the creative act. The waters "above" had now something in which to float. "The waters were separated from the waters." The return of another dense cloud caused an awful darkness again to envelop the earth. The fourth day witnessed an increased amount of light, the continents were raised, and the sea was confined by "bars and doors." During the fourth period, or day, the atmosphere became so far perfected, that it served as a lens through which the heavenly bodies could be seen. Not until the *morning* of the sixth day did the cloud finally disappear. The Deluge may have been the return of this cloud, and that catastrophe might be regarded as the close of the sixth day. Some such theory as this meets both scriptural and scientific demands. Let us see. The first heaven and earth were formed for the reign of the first Adam. A second heaven and earth, called the "new," is in process of creation, now, for the second Adam. The two creations are analogous. Judging by the past, many hundreds of centuries must yet transpire before the heaven and the earth become new. If the second creation shall occupy immense periods of time, why does any one contend for days of twenty-four hours in the first creation? Why not let the Bible explain itself? The surface of the earth, so far as it has been examined, testifies to "periods" and awful catastrophes at their terminations. This seems to be what Moses means to say, and he has given a graphic description of one terrible catastrophe—as if to state, in plain terms, this is the way the "days" closed. St. John has given a description of the catastrophes which are to mark the periods of the new creation. Mr. Williston is respectfully invited to develop the analogy here outlined. The division of the second creation into periods, or days, will certainly lead to an explanation of Moses.

In the first creation, *light* is the agent used in the transformation; in the second creation, light is also the chief agent—the first being physical and the second spiritual. All the forces used in the Mosaic creation appear to have been developed by, or from, physical light, just as all the forces operating in the Christian emanate from the "Light of the World."

Physical light is a compound. It is the scientific book of seven seals. Who shall be a lion to open it? Immortality awaits him. The "creation" which occurs in our zone every year, whereby a world "brown and sere" is transformed into a "thing of life and beauty, is caused by the agency of light. Whence come the forces that are so powerful and active in its presence. If an awful cloud should "roll the heavens away like a scroll," so that the light of the sun could not reach the earth, our world would become void, stagnant, formless and dead. Hence, the analysis of light must reveal the source of the forces in operation here. No one disputes the substantiality of the light of the second creation. By analogy, the light of the first creation must be substantial also. There is no escape from this conclusion. The Bible settles the question in favor of Dr. Hall. Having disproved the undulatory theory, he offers another to the scientific world. Why should any one hesitate to accept it? Surely that mighty force which served as chief agent of the Creator in the stupendous operations of the first creation, and has been the very life of the world ever since; which is so soft and gentle that its touch is not perceived by the petal of the tenderest flower that "sips the dew;" which colors the rose and the ruby lip, and paints a world in every hue that delights the eye; and which discloses all secrets to the mind—surely this marvelous thing is not the undulations of an imaginary ether. Light is the prime cause of terrestrial undulations—storms, earthquakes, etc. Certainly it is not the cause of itself. All kinds of motion in the physical world may be traced to the agency of light, for without light nothing was made that is made. How can a scientist content himself with the absurd idea, that this active and powerful agent is only a "mode of motion?" Light causes motion, and moves, but it is not mere motion. That it is the most glorious substance in the physical world, "all nature cries aloud." In some mysterious way, we owe to its benign agency the clear water that slacks thirst and the bread that keeps us alive. No language can describe it—it is simply the agent of Him who created all things, and in it He hides Himself from mortal eyes. In its embrace is locked up the secrets of the Most High. Who will be found worthy to look into this mystery?

THE "WILFORD HALL" LIFE INSURANCE COMPANY.

BY THE ASSOCIATE EDITOR.

We are now being called on by active and enterprizing life insurance men with a view of investigating the claims of an organization based on the "Wilford Hall" Health Pamphlet and Treatment.

As outlined last month by the editor, such an organization could well afford to give a preference in price of life policies of twenty-five per cent. discount to persons pledged to a regular use of this drugless treatment as set forth in Dr. Hall's pamphlet.

Indeed, it is the opinion of some insurance men who are aware of the effects of this treatment on the general health, that even 50 per cent. preference could safely be allowed and

still show a better financial result for the company adopting it as the basis of their risks, than that now scheduled and reported by any of the old companies.

As illustrated in the case of Dr. Hall himself, the proof is clear to demonstration. For more than twenty-five years he has persistently tried with the leading life insurance companies to obtain a policy on his own life, and has submitted to numerous medical examiners, not one of whom would venture to recommend such risk after sounding and testing his lungs. Invariably they have assured him that his utmost-lung-power did not equal that of a child four or five years old. Yet, with his left lung nearly useless and the other inefficient he has survived in good health all these years alone by the use of this marvelous remedy without medicine, and even now bids fair to live to see his name and his discovery at the head and front of one of the most successful life insurance companies in the world.

I am writing this on the 18th day of August, 1890, the 71st birthday of the editor of this journal, as the doctor sits happy over a congratulatory telegram from two very dear friends at Seattle, Wash., and I take occasion here to state my belief that he would even now —way past the age of eligibility in any existing company—be a safer risk than most of the average cases at the age of 50 who are gladly taken by every life company doing business. All this comes alone from the treatment which is now creating such a furor all over the world.

Dr. Hall well deserves the credit which will be due him in after generations for the original discovery of a system of treatment for the promotion of health and longevity which bids fair immediately to work a revolution in the scale of life expectations and risks in all present insurance companies; and surely the renown of having founded the Substantial Philosophy and thus paved the way for the College of Substantialism, will need little more to make it complete when rounded out with the "Wilford Hall" Sanitarium and "Wilford Hall" Life Insurance Company, both of which will soon be accomplished facts. On these two last named institutions we hope to have more to say in the next number of the MICROCOSM.

THE PROBLEM OF HUMAN LIFE.

As the result of our offer of this book for half price $1.00, in last month's MICROCOSM, the orders have been pouring in much faster than we were able to get the books from the bindery. We ask pardon of all those who were delayed and will say for the benefit of future purchasers that we are now ready to supply any demand that may be made. Every one interested in the advance of original scientific investigation in popular lines ought to own this book. The regular price is $2, but for a short time it will be sent postage paid on receipt of $1.00.

From thousands of letters and newspaper notices which have been received concerning this book, we print the following as an indication of the high favor with which it is received by representative papers of both the English and American Press:

"A Masterly and Triumphant Refutation."

[From *The Christian News*, Glasgow, Scotland.]

One of the most trenchant and masterly opponents of this theory (Darwinism) 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 & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them.

"THE BOOK OF THE AGE."

[From *The Methodist Protestant*, Baltimore, Md.]

This is the book of the age, and its unknown author need aspire to no greater literary immortality than the production of this work will give him; and thousands of the best educated minds, that have been appalled by the teachings of modern scientists, will "rise up and call him blessed." Hitherto it has been the boast of atheistic scientists that the opponents of their doctrines have never ventured to deny or to solve the scientific facts upon which their theories are based. But our author, accepting these very facts, unfolds another gospel; and Tyndall, Darwin, Haeckel, *et al*, are mere pigmies in his giant grasp.

"And the Dumb Ass Spake with Man's Voice."

[From the Wellsburg, (W. Va.) *Pan Handle News*.]

"Several copies of the *Microcosm*, edited by Dr. (?) A. Wilford Hall, have found their way to the NEWS office. Mr. Hall was formerly a preacher, but is now a materialist. Prof. A. E. Dolbear, formerly of Bethany College, rapped him severely over the knuckles not long ago, regarding his wave theory of sound."

Great Moses! Can not some benevolent society in W. Va. catch this escaped lunatic and place him in a straight jacket for the safety of community? Possibly Prof. Dolbear for his own credit will undertake the job, as he surely will have need to be saved from such idiotic friends.

Those wishing to see how Prof. Dolbear rapped the "materialist" referred to over the knuckles "regarding *his wave-theory of sound*" would do well to turn to that discussion in the bound MICROCOSM, Vol. VI, page 29.

PROF. CROPPER AS A LECTURER.

We are pleased to learn that Prof. John T. Cropper, of Clinton, Mo., is lecturing throughout the West on various subjects analogous to substantialism such as the "Origin of Man," "The Nature of the Soul," "What Constitutes Man," &c. We learn that these lectures are well attended.

We hope to hear soon that Prof. Cropper has determined upon placing at the head of his list of lectures "The Substantial Philosophy." Such a lecture properly announced and properly elaborated would draw as no other subject would, since more than *ten million* copies of the "Organ of the Substantial Philosophy" have been circulated and read by the people of the United States and Canada during the past year.

We are receiving the most urgent letters from all sections of the country begging us to come and lecture on Substantialism. But such a thing is utterly impossible at present, or until the territory has been well covered with our Health Pamphlet. After that is accomplished, we may be tempted to take the field and lecture in the interests of the College of Substantialism, due notice of which will be given.

A WORD TO OUR AGENTS.

Let no agents for our Health-Pamphlet fail carefully to study and then to adopt the suggestions we are about to make in regard to the method of making sales. There are many families in almost any neighborhood who need this drugless remedy, and if they once had it would not part with it for a hundred times its cost, but who, on account of so much fraud and misrepresentation in the sale of all sorts of articles, will not risk the $4 required to secure the remedy.

We believe we have hit upon a plan of meeting this well-founded objection and thus of allowing every family in the land to avail themselves of this priceless boon without any fear of fraud or possibility of deception. It is as follows:

Let the local agent sell the pamphlet to any responsible family conditionally on a month's faithful trial, by such family signing the pledge of honor and depositing the $4 with a third person to be mutually agreed upon, the money to be returned to said family on their agreeing never thereafter to use the treatment in case it should prove unsatisfactory after a month's trial.

No family, on this basis, need risk the loss of the $4 unless they are sure that they are getting the full worth of their money, as the tieing up of $4 for a month is nothing compared with the probable value of the remedy thus conditionally purchased, judging from the testimonials of others. And no local agent, having our coupon offer, need hesitate to put out a hundred pamphlets in a neighborhood on these terms, since our own experience shows that but a very small fraction of such families will ever wish to give up the treatment and receive back the $4.

Besides the advantage here named, this method of sale will completely disarm all enemies of their objections, since none but an honest agent and an unquestionable meritorious treatment would dare to offer sales on such a condition as this. Think of a doctor, for example, offering his prescriptions, drugs and services to families on such terms! He would expect to starve to death in a year or else be forced to go into some other business.

As proof that we believe in this method of selling the Health-Pamphlet, we have been making the same offer for more than six months, and we will make affidavit that not one in one thousand ever thinks of wanting to give back the pamphlet and receive the money. On the contrary, nearly all write us that no amount of money would induce them to give up the treatment.

By this method of sale, conditioned on the treatment proving satisfactory, thousands of families seriously in need of it, and who are spending their means and their health on useless drugs, would at once be induced to purchase the remedy who would never venture to make the purchase unconditionally from their mortal dread of being swindled.

We believe, that should all our local agents at once adopt this conditional method of making sales, they would dispose of a million pamphlets in less than a year. Of course, one of the conditions would be, that if the pamphlet be returned, it must be unsoiled, thus to be in a condition to be sold again.

There may occasionally prove to be a dishonorable family who will *lie* or *even steal* to regain the $4 in escrow after learning all about the treatment; but the required iron-clad pledge never to use or allow any member of the family to use it after receiving back the $4 and returning the pamphlet, will very likely be apt to deter almost any family in a civilized community from such dishonesty.

We will only add in conclusion, that although a few dishonest purchasers of the discovery and one or two dishonorable journals have roughly revealed the treatment in order to injure our sales and thus defraud us out of our just rights in the discovery, yet not one person in one million, taking the country over, ever hears about the treatment through these means or is any the wiser for the malicious intent. As proof of this fact, the last week before going to press with this number has been our most successful week since the commencement sixteen months ago, yielding a net sale of more than 5,000 pamphlets.

A VERY HIGH INDORSEMENT.

The leading medical journal of the United States to-day is admittedly the *Medical Record* of New York. We are justly, as we believe, proud of the fact that this high authority in the science of therapeutics unequivocally indorses our treatment as set forth in the Health-Pamphlet in an editorial in which its constant application even *for cases of insanity resulting from constipation* is warmly recommended and urged.

True, our nonprofessional name is not mentioned in connection with the treatment as its original discoverer. But if asked, that editorial writer will tell any one making the inquiry that 25 years ago no such radical treatment was known to the medical profession, though 41 years ago we made the discovery and demonstrated it in our own person to dozens of our scientific friends.

If the garbler Kellogg, referred to last month, wants proof of the correctness of our original claim to the discovery let him look through the 38 back volumes of the *Medical Record* and if he can find the discovery definitely named in the first dozen years of its existence, or until it was picked up from our own imprudent revelation of the secret to others, we will bind ourself to pay said Kellogg $500. Yet this insolent upstart and calumninator prints in his own slanderous sheet that the treatment was old and well known to the profession, thus intimating that we stole it from some medical work. Either he never read our pamphlet at all and don't know what the treatment really is, or else he deliberately misstates the facts in the premises to mislead his readers and thus prevent their availing themselves of its incalculable benefits. While *we* speak from the record and from the proofs, *he* speaks from the wish which is father to the utterance.

A NEW CONTRIBUTOR.

Next month we will introduce to our readers our new contributor from the Pacific coast,—Prof. Alonzo Hall,—who bids fair to become one of the ablest defenders of the Substantial Philosophy. We have engaged him as a permanent and regular writer for our journal, and our readers may expect at least a page article from his pen each month hereafter. Our cause needs the mental activity of young men who can think and write scientifically, and we are no little pleased at the accession of Prof. Hall's vigorous pen.

One Thousand Indorsements During August.

"If I were going to die and wished to leave you as a legacy the most valuable bequest I possess on earth, it would be a *life-preserver* in the shape of Dr. Wilford Hall's Health-Pamphlet. Miles Grant."

These are the words written to a friend in England by Rev. Miles Grant, the famous pulpit orator of Boston, Mass. He also writes us, Aug. 14th:

"Dear Dr. Hall,—Inclosed please find check for thirty more of your Health-Pamphlets. About the middle of September I start to the Pacific coast to spend several months in California, Washington and Oregon, and I want as a part of my mission to distribute as many of your '*life-preservers*' as possible. Within a few days two men, one of them a minister, said to me, 'I would not take $10,000 for the knowledge obtained from that Health-Pamphlet.' Your brother in Christ,
"Miles Grant."

J. F. Wood, Medical Lake, Wash., writes, Aug. 1st:

"Dr. Hall,—* * * Whatever Dr. Kellogg may say of you as a humbug and charlatan, I know that your treatment has done me more good since I adopted it three months ago than all the other remedies I ever tried. My bowels had been in a torpid condition for years and I was gradually sinking into consumption after following all the directions in Dr. Kellogg's book. I went to a sanitarium in Southern California where every known hygienic appliance is used, but not until I had my attention called to your Health-Pamphlet did I obtain any relief. The doctors had given me no hope only to linger along as best I could, as medicines did me no permanent good. * * * Now all is changed. Appetite, digestion, assimilation all restored. Of course I can not tell how long I can live, but I do feel as if I had a new lease of life. * * * Yours very truly, J. F. Wood."

H. H. Blackman, Esq., Attorney-at-Law, Ozark, Ala., writes, July 29th:

"Dr. Hall, Dear Sir,—I have suffered much from stomach and bowel troubles, which have hung over me like a nightmare almost from my infancy, until I came into possession of your wonderful discovery set forth in your Health-Pamphlet. I can never thank you enough for the benefit your treatment has been to me, and whenever I meet my brethren of the bar I lose no opportunity in calling their attention to this marvelous preventive and cure of disease, many of whom have requested me to send for a copy of the pamphlet. I assure you that the day is not far distant when you will be universally regarded as the greatest benefactor the nineteenth century has produced. * * *
"Your sincere friend, H. H. Blackman."

Rev. V. LeRoy Lockwood, D. D., of 75 Park Avenue, Bloomfield, N. J., writes, August 18th:

"My Dear Dr. Hall,—For several years I have been an interested reader of the MICROCOSM, and some months ago I secured your Health-Pamphlet which I read through three times before laying it aside. The whole thing is so simple and rational that I determined at once to give it a fair trial, and I am now so much gratified by the result that I feel it my duty to send you this unsolicited testimonial as to its wonderful therapeutical qualities. I am convinced that if faithfully used it will prevent many of the ills that flesh is heir to, as well as cure those already existing. Those who hope to secure the benefits of your discovery from the mere hints concerning the treatment thrown out by unscrupulous parties, without a careful reading and studying of your entire treatise, will find themselves mistaken. Your charge for the pamphlet is so small as to place it within the reach of all classes, and you certainly deserve as much renown for your discoveries in the cause and cure of disease as Columbus achieved in the realm of geographical science. Cordially yours,
"Rev. V. LeRoy Lockwood, D. D."

W. S. Knight, Plant City, Fla., writes, Aug. 4th:

"Dear Doctor,—About the 20th of February last I had a severe attack of fever, and with all that could be done with drugs I became very low. In this condition I lingered along improving slightly till the first of April, when I was taken down with the grippe and my fever returned, completely prostrating me. Resort to the usual drugs seemed to take no effect, and in this half-dying condition I lingered along till the 20th of May, when my attention was fortunately called to your Health-Pamphlet and treatment, which I adopted at once; and although I felt sure I was rapidly going into consumption, I began immediately to recover. My appetite which had long vanished returned and in less than a week after the first application I felt like a new man. My neighbors saw the change and congratulated me upon the improvement, but knew not the cause. From that day until now not one drop of medicine has passed down my throat, and I thank the Lord for having made known through you this wonderful remedy to humanity. No language can express my gratitude. I am to-day a well man and unhesitatingly give your Health-Pamphlet all the credit for the same. * * *
"Truly yours, W. S. Knight."

L. A. Steen, Passaic, N. J., Agent for the Society for the Prevention of Cruelty to Children, writes, August 3d:

"Dr. Hall,—It is now three weeks since I commenced the use of your treatment, and it has done wonders for me as well as for my wife and even our baby. I have suffered with piles terribly and with sick headache most of my life and my wife from female troubles, but we are now sure of permanent relief. I consider your treatment the greatest of earthly blessings and I have often thanked God that it ever came to my knowledge. This must be the feeling of thousands of sufferers who are now using it. Asking God's blessing on you and your work, I am gratefully yours, L. A. Steen."

Mrs. Rev. E. M. Woodruff, of Elizabeth City, N. J., writes, August 11th:

"Dear Dr. A. Wilford Hall,—I have been using your treatment for about five months with constant improvement to my health both of body and mind. I am very grateful to our Heavenly Father that there was one man who was given to know the true nature and cause of the diseased conditions that suffering humanity is heir to, and who was enabled so clearly to point out the true remedy that the most unlearned can understand it simply by reading this little book of forty-eight pages. I am constantly recommending this treatment to my friends here and elsewhere. I learn that there are already 200 families in this city using it, and I believe before another year there will be 2,000, which will be the case if my efforts will avail. Your sincere friend,
"Mrs. E. K. Woodruff, 856 Elizabeth Avenue."

Dr. S. G. Meriwether, M. D., of Meriwether, S. C., writes:

"Dr. Hall,—I have used your treatment on my son to good effect, though not so good as would have resulted but for his prejudice. * * * As a physician I am fully satisfied with your treatment, and I honestly believe that it is destined in the near future to bring about a tremendous revolution in the practice of medicine, and you will receive the thanks and blessings of suffering humanity for your discovery. It is impossible now to foresee or predict the range of diseases to be cured by this treatment in the future. It is so simple and so much out of the way of drug medication that those incapable of reflection will scout it as short lived. But mark me, the time will soon come when the fortunes that are made by the manufacture of drugs will be swept away by this little book and the traffic become a thing of the past. Your pamphlet, doctor, is worth much more than you charge for it.
"Yours very truly, S. G. Meriwether."

F. C. Brill, Staunton, Ind., writes, July 28th:

"Dear Sir,— * * * I purchased your Health-Pamphlet five months ago of Dr. L. S. Byers and took the prevailing grippe the same day I received it. I have no doubt I should have died but for your 'life-preserver.' I am a hereditary consumptive, two of my sisters having died of that disease,—one last November, I was fast following her to the grave. But all hail! to the rescuer who came to my relief. I am on the high road to health, and I tell you, doctor, I have no language in which to express my gratitude to you. Sincerely yours,
"F. C. Brill."

Rev. W. J. Ward, Claytonville, Ills., writes, July 29th:

"Dear Dr. Hall,—Two months ago I was suffering with neuralgia of the stomach and could get no relief except temporarily by the use of morphine. I was advised by my presiding elder to try your remedy. I at once sent for your pamphlet, and was most agreeably surprised at the result. In three days' time my trouble had all left me: I could eat anything I liked, and in two weeks my health was fully restored much to the surprise of my friends, who could hardly understand how it was possible for a man as badly cut down as I was, to make such rapid recovery, by means of a remedy without medicine of any kind. I am recommending this treatment wherever I go, as a slight token of my gratitude to you. Very sincerely, W. J. Ward."

☞ We have just issued an important circular to our agents authorizing them to sell the Health-Pamphlet conditionally upon one month's trial. Every agent should send for this circular and at once adopt the plan suggested.

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
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DIAMONDS.—HOW TO FIND THEM.

BY THE EDITOR.

Some thirty years ago when the Pikes Peak gold excitement first broke out, we conceived the idea that possibly diamonds might exist in the gold-bearing sands of the Rocky Mountains, as they were known to have been found in the gold mines of Brazil.

The gold excitement which originated in the finding of the "color" in the bed of Cherry Creek at the point where Denver City now stands, produced one of the most intense furors of the kind ever witnessed, especially throughout the Western States. But while others were excited to fever heat over this reported discovery of gold, and rushed madly for "Pike's Peak" with whatever outfit they could secure, dreaming only of yellow fortunes, this writer was absorbed in the possibility of finding something vastly more precious and valuable than gold.

To this end he set about a careful study of the history of the diamond-producing districts of the world, especially those of Brazil and Golconda,—the South African mines not having been discovered for some years thereafter.

These investigations led him to the conclusion that in all diamond-producing regions there exists a vastly greater number of "sparks" or very small crystals in proportion than those of any considerable size suitable for setting as gems. And hence, that the true method of prospecting for a diamond-producing district would be to search for the smallest visible sparks of which, in the nature of such formations, an enormously larger number of such tiny stones must exist.

In view of this information gathered patiently from his various researches, the writer conceived the construction of a machine for the special purpose of finding "sparks" and of thus, first of all, definitely determining upon a geological locality where a diamond formation exists, before attempting a search for larger stones which is so uncertain and precarious.

It is a fact that all diamond-producing districts, so far as history informs us, have first been discovered by the accidental finding of a large gem, and we believe that no systematic search for a diamond mine has ever been instituted with a sole reference to the finding of sparks as the real indication that larger diamonds may there exist, and may afterward be found by suitable and systematic mining operations.

We will add also that it is our conviction from noting the natural formation and distribution of the mineral and metalic substances of the earth's crust, that hundreds of diamond regions may actually exist where no large gem has ever accidentally been picked up to attract attention to the spot, and that there is little doubt but that the richest and most prolific mines on earth are yet to be discovered in localities least suspected and which have lain hidden from human knowledge for the very want of a suitable and systematic method of searching for the indicating seed-gems which must necessarily exist by thousands to where a single crystal of any observable size could be formed.

As is well known in all the prominent mines of the world, a large diamond is seldom to be found near the surface, but deep down in the earth. May not regions exist where larger gems than were ever yet found may be hidden far below the surface with nothing but the smallest and almost invisible sparks above to point like an index to the wealth lying beneath?

Hence the necessity, with which we were so strongly impressed, of some device especially adapted to the discovery of diamond sparks of the smallest size—a machine so constructed that an hour's search in any locality would be sufficient to determine with almost absolute accuracy if the region in question did or did not possess the conditions of soil and mineral deposits suitable for carbon crystalization.

The handling of a few bushels of sand and gravel in the bed of any stream, dug from different depths, if so manipulated as to show of an absolute certainty that not one single "spark" exists, would be a sufficient proof of the non-existence of the suitable conditions for diamond formation.

Accordingly, with this end in view, we invented and constructed the machine required for the purpose named, and took it with us to the Rocky Mountains, saying nothing about it to even one of the thousands of our traveling companions, whose single thought was gold and gold only.

On reaching Denver, or where Denver has since grown into a great city—for then there was but one adobe hut and a hay-stack the day we reached there—we camped and pitched our tent on what is now Blake street, not far from the junction at Cherry Creek with the Platte River, while hundreds of adventurous gold-seekers plunged wildly up into the mountains, some sixteen miles distant, cutting their way to Black Hawk or Gregory, and what soon thereafter became Central City, forty miles away, where it was reported that a Georgian from California had made a rich discovery of gold. While the rush of teams and "Pike's Peakers" that were pushing their way by various routes to the new gold region continued in an unbroken stream, we remained quietly camped alone on the northeast bank of Cherry Creek, and so cool did we remain in the excitement that we were the butt of many a joke for having come all the way from the States with a span of mules, driving seven hundred miles over the then uninhabited plains to camp almost in sight of the mines, and apparently without any desire to get a share of the golden treasure that lay smiling in the various gulches surrounding Black Hawk.

But, as before intimated, our anxiety was none the less intense for striking wealth, though by a different color from that of the yellow dust on which every heart but our own was set; and although we were doomed to disappointment, as the sequel will show, we were none the less sanguine and happy in contemplating the reasonable possibility before us, and in casually uncovering our "diamond machine" closely concealed in our wagon, and in ruminating on its wonderful capabilities in finding and developing the great diamond fields of the Rocky Mountains, which we confidently supposed must exist in connection with such a marvelous gold-producing region.

At last, when the passing crowd was not observing, we harnessed our mules and started alone up Cherry Creek in the exact opposite direction to the rush of the so-called Pike's Peakers. A few miles brought us to clumps of willows by the water's edge, where our mules could graze and where our own operations with the wonderful machine could be carried on in secret, unobserved even by a passing Arapahoe hunter.

Here we made our first experiment with the simple device on which all our thoughts had been concentrated from months before we had left New York all the way across the plains, and although it revealed no diamonds in the numerous tests to which it was applied both in Cherry Creek and in the different streams on both sides of the snowy range during the four or five years of our laborious sojourn in that rugged region, yet our faith in its possibilities never weakened in the least, but rather grew stronger at every test we gave it.

Of course no machine, however perfect or efficient for the purpose intended, could be expected to reveal diamonds where none existed in the soil on which the tests were made.

At one time during our wanderings along the upper waters of the Arkansas River, above where Leadville now stands, we prematurely shouted Eureka! supposing that we had struck diamonds. They were quartz crystals of a peculiar brilliancy and of the exact octahedron form of the diamond. Indeed so sure were we that at last we had struck real diamonds, that we became nervous over the result, and stopped all operations to take a good long rest in our little tent which our mule had so kindly packed for us over the range, and there to contemplate the beginning of the end of our successful enterprise.

But fortunately we had provided ourself in Maiden Lane, New York, at one of the diamond importers, with a few very small "sparks," no larger than the heads of the smallest pins. These we kept constantly by us, not only to compare in appearance with anything we might discover in the way of crystalized formations, but to subject to certain mechanical tests by which a real diamond, however small, could not be mistaken. And such was the confidence we had in the effectiveness of our prospecting machine to find any real spark that might be present, that on two separate occasions we showed our faith by throwing a spark that had cost us several dollars into a bushel of dirt, sand and gravel, and after a thorough mixing have brought it safely to light by passing the dirt through the machine. This test we would be willing to make again on a wager, provided we were a betting man, and will undertake to restore a dozen sparks from a bushel of dirt without the loss of one.

We have just intimated that the real diamond, if no larger than the smallest visible

grain of sand, furnishes a mechanical test by which it can instantly be distinguished from all other mineral substances, so that in prospecting for diamonds this crucial test should never be forgotten. And here, better, perhaps, than later on, this infallible test may be described as an illustration of how more than once it undeceived this plodding prospector.

It consists in the wonderful property of the *non-crushability* of the diamond by steady pressure, even between two polished surfaces of steel. That is to say, a real diamond spark can be placed on one piece of steel and another, like the head of a hammer, may be pressed upon it with a man's entire weight, until the steel surfaces meet, and the spark will remain undistorted and unmarred, though a perfect mould or matrix will be left of the diamond, half in each of the two steel surfaces, as polished and glistening almost as the diamond itself. Such a test, however, applied to any other mineral substance, such as quartz, ruby, emerald, sapphire, etc., even with a very slight pressure, will instantly crush it to powder.

Of course, notwithstanding this uncrushable characteristic of the diamond by a steady pressure, a very slight blow will shiver it into fragments.

The pressure test just described we had repeatedly made on the same octahedron spark, and knew it to be infallible, and therefore our supposed find of real diamonds was soon ingloriously dissipated after taking a rest and getting out our small kit of tools.

On crushing our new-found "gems" to flour with a pressure of a dozen pounds, while the real little spark looked up at us as pure as when first taken from its Brazilian bed, after our entire weight had been borne down upon it, no one can describe the blue horrors that almost darkened our vision and our hopes.

In a word, this was substantially our experience for four mortal years of sojourn and wanderings in the various gulches and canfions of the Rocky Mountains, many times living for months among the Ute Indians, during which time the face of a white person was not seen, till we had become fully convinced that if a diamond formation really existed in that entire Rocky Mountain region, we had not been fortunate enough to strike it.

So worn and weary but greatly improved in general health by our Pike's Peak experience, we returned to the States with the same team of mules with which we went, having buried our diamond machine on the bank of one of the Eagle Lakes, near what is now called Gunnison.

For twenty-five years under many financial vicissitudes, we have at different times threatened to go diamond-hunting with our still much cherished prospecting machine, and many friends having heard of our experience have caught the same fever and have urged us to make known to them the construction of the device.

At this very writing a dear friend, and one of the best business men in this city, getting a salary of nearly $4,000 a year, is so anxious to go to South Africa to prospect for new diamond fields that he declares his readiness to drop everything and start if we will reveal to him our prospecting apparatus, having heard through a mutual friend of our various exploits in the Rocky Mountains.

Believing as we do that there are numerous other fields in South Africa where diamonds can be found, even possibly surpassing in richness those of the Trans Vaal regions, and that even in the southern portions of our own country—Georgia, South Carolina and Tennessee—rich deposits of diamonds exist, we have often thought of making known to the world the details of our prospecting device, and thus setting numerous prospectors at work.

Hitherto we have scrupulously kept the secret of the device to ourself—not one person on earth have learned it, in the hopes of some day utilizing it in a financial way, by engaging in a grand prospecting enterprise. But another diamond mine in the shape of our Health-Pamphlet has stepped in to eclipse even the dazzling brilliancy of an old mine stone, and has nearly settled us down to the conclusion of giving our prospector to the world. We will see.

THE ACOUSTICAL CRISIS APPROACHING.

BY PROF. ALONZO HALL.

I am persuaded that, in the near future, the battle between the Substantial Philosophy and the wave theory of sound will be decided, and one of them will be relegated to the junk-shop of exploded hypotheses.

The reader may at first think I should have used the term substantial theory of sound in place of the Substantial Philosophy, but I use it advisedly, for, if the current theory should prove to be so clearly demonstrated as to convince its latest antagonists, Doctors Pierce and Audsley, and necessarily the editor of the MICROCOSM, then the whole fabric of Substantialism will collapse as suddenly as did Professor Tyndall's collodion balloon in his initial acoustical experiment.

The editor of the MICROCOSM leaves no room to doubt this, as may be seen on page 114, July number, present volume of the MICROCOSM.

Now that the two champions, Pierce and Audsley, by reason of their proximity to the English scientists who have been so free with their "demonstrations" in proof of the wave theory, will force them to do battle in its defence, it behooves all lovers of true science to

think carefully, and if possible to devise experiments which, by reason of their accuracy, will prove beyond a doubt the correctness of their assumptions.

It seems to me that, if sound phenomena were the result of wave-motion, the experiments performed by the great lecturer should have left no room for the suggestion of a doubt as to the accuracy of the experiment or the conclusions derived therefrom.

If, for example, it can be clearly shown that two sounds of the same pitch, by reason of the interference of their waves, may destroy each other, that is to say, if no sound can be heard at the point where the condensations of one series of waves unite with the rarefactions of the other series, then truly hath the wave theory triumphed.

In the interest of truth, therefore, I think that every investigator, whether substantialist or wave-theorist, ought to bend his energies to a complete and absolute exposition of the truth or falsity of this so-called law of interference as applied to sound.

I unhesitatingly believe that if the editor of the MICROCOSM could make two sounds of equal pitch interfere and no sound be heard, he would do so. It would be done, too, without the humiliation of having to apologise for the *octaves* and *overtones* that listeners have always heard in former experiments.

I desire here to point out why Professor Tyndall failed to give a perfect demonstration of the law of interference in his celebrated experiment with the double siren.*

He first explains very clearly how a sound wave is propagated in still air: The condensation leaves the source of sound and advances in all directions. Associated with this condensation is a rarefaction which together form the hypothetic sonorous wave which, at a short distance from the center or source, would consist of a shell of air of a "certain thickness," the outer half of whose volume would be in a state of condensation, the inner half in a state of rarefaction.

To have a perfect phase of interference, a person who has formed a clear mental picture of the wave described above, should see another shell or sound-wave having exactly the same center, the same radius, and the same thickness of the first wave; the outer half of whose volume must be in a state of rarefaction and the inner half in a state of condensation. Any one with a good mental eye would readily see that the four phases constituting the two shells would establish another phase or another shell having the same center, of the same radius, the same thickness, but the whole of whose volume would be *still air*. This would be interference, and the scientific investigator of the Tyndall school should scorn to stop short of so perfect a demonstration.

In Professor Tyndall's experiment he was a long way from the accuracy demanded. The double-siren, as he was forced to admit, is indeed a "highly composite" instrument; too much so, ever to be used to generate two pure tones of equal pitch.

In the experiment referred to, the two tones or sounds emanated from their respective sirens, and of course the two series of sonorous waves had different centers. At a distance of, say, ten feet from the instrument, the shell "of a certain thickness" from either source or center would be in contact with the similar shell from the other center *only* in a circle, and that circle dependent on the distance between the two centers. There could be no possible phase of opposition except on that circle; the entire remaining volumes of the two shells should, according to the wave-theory, still sound.

Another defect in the use of the sirens (two of Dove's as arranged by Helmholtz) is the size of the surface of each disc, which, by reason of the twelve orifices in the outer circle sounding simultaneously, creates a sound source of immense area, and with two such monstrous centers, no wonder he failed so ingloriously to supply the conditions that should be so easily maintained.

I shall now propose an experiment which I think will supply all the conditions necessary to produce sound interference, and if there should be no interference it will be the fault of the theory.

It is required to employ the simplest form of siren, viz.: a disc with, say, twenty orifices, in a circle near the rim. A tube attached to an acoustic bellows is placed with its mouth immediately under one of the orifices of the disc. It is evident that when the disc revolves at sufficient speed a musical tone is generated, but it is from only one point of the circle, instead of from all parts of it simultaneously like in the Dove siren. Gearing should be attached to the disc so that it may be made to revolve at a uniform rate of speed—say eleven times per second—and of course the tone so generated would correspond to 220 vibrations per second—or A below middle C of the scale.

With the disc so arranged it will be necessary, in addition to the first series of holes, to make twenty other holes so they will be on the same circle with the first series, and so arranged that each of the new series will alternate with one of the old series. By a simple mechanical arrangement, the second series of holes can be opened or closed while the disc is revolving.

Everything being in readiness, an ear is stationed say ten feet from the disc, and the gearing set for an eleven-per-second-rate. The ear hears the tone A below middle C. As each individual wave is generated by a single orifice passing over the mouth of the tube, it is evident that so long as the velocity of the disc and the strength of the current of air are constant, the amplitude (*i.e.*, the condensation and rarefaction) of each wave generated must be the same, and the ear hears the same tone.

If now the second series of holes are opened, a new series of waves with the same amplitude, because made in exactly the same way, are sent off, each wave of which alternates with one of the first series. The first series continue to be propagated with unvarying amplitude, because the forces concerned in forming them have not changed. The second series advancing to the ear in alternate order with the first series *ought* to produce a phase of interference and no sound be heard.

Are not the conditions for perfect interference that I have demanded here fully complied with?

Will the two series of waves neutralize each other? Even Professor Tyndall will admit that a tone corresponding to 440 vibrations (A above middle C) will be heard, and without the

* The reader, if in reach of the "Problem of Human Life," should not fail to turn to page 226 and read the author's masterly discussion of the *siren* argument as set forth in Prof. Tyndall's treatise.

complications of overtones and harmonics. He might urge, though, that 440 puffs per second from the same disc would be equivalent to substituting a different instrument with double the vibrations; but he has taught us clearly that the only office or function of the prong of the fork or the sound-producing body is to carve and mould the air into condensations and rarefactions; and they, as they are formed propagate themselves through the air. The objection might be good if a tuning fork of 440 vibrations was instantly substituted for the one of 220 vibrations, as in that case the amplitude of the new wave would be different. In the proposed experiment, the effect will undoubtedly be that of sandwiching, so to speak, one set of waves between a set already forming, each set of which are, or ought to be, of the same amplitude as the first set was before the new set was projected.

What I desire particularly to urge upon acousticians, both of the substantial as well as *motion* school, is to bend their best energies to devising a perfect demonstration by which wave-motion in sound propagation may be proven beyond a reasonable doubt.

If substantialists could devise experiments that would not be open to objection on account of their inaccuracy, and still fail to show interference or the mutual destruction of both waves, or possibly a complete demonstration in favor of wave-motion, they should surely be entitled to the glory of doing what Tyndall *et. al.* have not the moral courage to attempt.

I repeat, therefore, if it is possible, the question of wave motion in sound generation ought to be settled very soon. The College of Substantialism would be an absurdity if it were forced to teach the undulatory theory of sound.

Let us all attentively observe the discussion of the question now sure to take place in England, and above all let us resolve to be satisfied with nothing short of the Truth.

DR. HALL'S THEORY OF ACOUSTICS.

BY C. W. PEARCE, MUS. D. CANTAB.

[From the London *Musical Opinion.*]

It must not be supposed for a moment that this or any other new theory of acoustics can alter in the least degree any of the *facts* relating to the different sound phenomena which have been from time to time carefully observed and described by scientists. It is the manner in which these facts are accounted for and explained which is called in question: the facts themselves remain. Such a fact is Helmholtz's great discovery of what is the cause of all differences of quality or *timbre* in musical sounds, —viz., that quality of tone depends upon the number, orders, relative intensities of the partial tones of which a clang or composite tone is made up. This great achievement of Helmholtz was carried out by means of a system of resonators, which enabled him to successfully institute a search amongst the mass of tones composing a clang—fundamental and supplemental—and thus to analyze their true character, and thereby prove their actual existence as the true cause of *timbre* or quality of tone. All these carefully observed phenomena are so many facts which no one in his senses would ever venture to deny. But their theoretical explanation is quite another matter. To account for these overtones, undertones, differential tones, resultant tones, etc., in addition to the fundamental tone of the sounding instrument, all produced by the different forms of vibration actually occurring in a single string. Helmholtz was obliged to assume, in accordance with the wave-theory, that they all consisted of separate systems of purely mechanical air waves driven off from the string, crossing and recrossing each other's paths in every conceivable direction, with the same air particles oscillating in no less than a dozen systems of waves, primary and incidental, all of different amplitudes of swing (according to a dozen different degrees of intensity), and all of different rates of oscillation (according to a dozen different pitches of tone). Yet all these conflicting and battling wave systems had to enter the ear in their dozen conflicting bombardments, and all at the same instant were obliged to produce as many systems of similar wave motions in the tympanic membrane. Page after page of Helmholtz's book is given up to the detailed description and illustration of these supposed conflicting motions of the air particles. Yet on p. 40 and 222 of his great book, "The Sensations of Tone," we read: "Any particle of air can, of course, execute only one motion at one time. It is evident that at each point in the mass of air, at each instant of time, there can only be one single degree of condensation, and that the particles of air can be moving with only one single determinate kind of motion, having only one single determinate amount of velocity, and passing only in one single determinate direction."

Here, says Dr. Hall, is a predicament. Our sense of hearing tells us by the aid of resonators that upper partial and other supplemental tones are present in nearly every musical sound that we hear. This can not be denied. If the wave-theory be true, the presence of these supplemental tones can only be accounted for by the law of superposed wave systems. All waves are due to particle vibration. Therefore, by this law, any one particle must be capable of executing several modes of vibration at the same instant, which we are clearly told by Helmholtz is impossible.

It is obviously no answer to this objection to say that what we hear is the algebraical sum or difference of the mass of wave systems in conflict around us, because, by the law of *interference* (of which I shall say more presently) our ears would then have to present to the brain but a very distorted account of the music being performed. Some sounds would be nearly, if not quite, doubled in their intensity; others would be nearly, if not quite, extinguished.

Dr. Hall's theoretical explanation of Helmholtz's discovery is brief, but will be worth quoting here: "Every conceivable shade of a vibration of a stretched string, for example, whether fundamental, incidental, or supplemental, liberates a corresponding phase of substantial sound force from the fountain of natural energy. These substantial but immaterial sound pulses, without the slightest disturbance of the air even an inch from the vibrating string, radiate in all directions at the same instant as overtones, combination tones, resultant tones, fundamental tones, etc., and, being immaterial substances, do not conflict, but pass through each other undisturbed and unmarred, as if only a single tone were in-

volvèd. Thus the ear has no difficulty in recognizing all the scores of tones of an orchestra at one and the same instant, distinguishing each peculiarity by a suitable act of attention, just as an experienced perfumer can analyze a dozen different substantial odors issuing from a single bottle at the same instant."

Such a common sense explanation of the differences in tone quality seems to me to prepare the way for reasonably accounting for the interesting and beautiful voice figures in sand and other substances, discovered by Mrs. Watts Hughes, and described by her in a paper read before the Musical Association, on June 6th, 1887. An illustrated description of these voice figures appears in *Cassell's Magazine* for May, 1890. It is curious that in her paper Mrs. Watts Hughes speaks of the *penetrating force* of a musical sound very much as Dr. Hall does, and no attempt was then made to explain the appearance of these phenomena (which in many cases took the exact shape of vegetable forms, recalling the lovely frost work traceries of winter upon our window panes) by the wave-theory. Some words which fell from my old friend, Mr. Behnke, during the discussion which followed are well worth quoting here. He thought that "we were only at the threshold of discoveries of sound phenomena," and remarked that "cold water is continually thrown on all these things, because people are satisfied with what they have learnt when they were young. We are all apt to run in grooves, and if anybody has the hardihood to come forward and show us anything new, or that which we have not found out ourselves, we are inclined to pooh pooh it, and give it the cold shoulder. This ought not to be."

I fear that I am greatly exceeding my space, but I must, with your kind permission, say a few words about the so-called *interference* of sound. Of course it is manifest to any one that a stronger force can overcome and kill a weaker one; and that music can not be heard whilst noise is going on. The tiresome mechanical piano-organ in the gutter seems perfectly dumb to an observer on the other side of the road if there is the ceaseless roar of street traffic going on, because the intervening air is so charged with noise that it can not conduct the feebler sound pulses of the musical (?) instrument. All this goes without saying; but Dr. Hall asserts that it is quite impossible that in still air two musical sounds can kill each other and produce absolute silence. I am well aware that in many existing text-books of sound there are some pretty and interesting pictures, showing how this ought to be done; but it is a well-known fact to any one who has tried to do it, that such an extinction of sound appears to be impossible. Organ pipes of the same pitch, scale and power are popularly supposed to be able to extinguish each other's sound; but hear what a practical organ builder says upon this point in the *English Mechanic* for February 28th, 1890: "I have tried two organ pipes of similar scale, power and pitch, both open and stopped, and found no silence to ensue from their conjunctive speech. I have kept them twenty feet apart and gradually drawn them together by elastic conveyances, and let them actually touch each other, and have observed no silence. I have held them sideways, in fact, every way, and turned their mouths in various positions, and failed to find silence." Surely this testimony is conclusive. The phenomenon most commonly referred to by wave-theorists in order to prove the law of interference is the fact that the two prongs of a tuning fork will so interfere that, if held cornerwise close to the ear, there will be no sound heard. The Rev. J. I. Swander remarks that, "So far from this having anything to do with the supposed law of interference in the two supposed systems of sound waves sent off from the two prongs of the fork, the essential theoretical half-wave length, absolutely necessary to this law, has to be entirely ignored, since the two prongs are within one-eighth or one-fourth of an inch of each other; whereas in an A fork the half-wave length should be fifteen and a quarter inches apart. Then, instead of only interfering cornerwise they should produce silence in all directions, especially in the direction of swing of the two prongs. As this silence is thus shown not to be interference of atmospheric undulations at all, according to the wave-theory, it remains what it manifestly is, a mere vacancy or absence of sound force in the direction of these prong corners, caused by the peculiar manner in which a tuning fork liberates its sound from the force element of nature." As we all know, the explanation of "beats" is usually made to depend upon the law of interference. Mr. Audsley is going to explain the cause of beats, according to the new theory, in his next Musical Association paper. I will not, therefore, trespass upon his domain.

Space forbids me to enter more fully into this subject upon the present occasion. I have, doubtless, gone beyond my natural province as a musician in writing upon what some people would call a subject quite outside my proper vocation. But, as I said at first, the science of acoustics is now a recognized branch of musical study. I have myself been examined in the wave-theory, and have satisfied my examiners. In various ways I have had this interesting and fascinating subject continually before me for the last ten years, and various inconsistencies and difficulties have been perpetually cropping up. I know absolutely nothing of Dr. Hall personally, and have simply in this article endeavored to collect from his scattered writings in the MICROCOSM and elsewhere a concise and connected account of his theory. All the statistics, definitions and attacks upon the wave-theory, which are here given, are quotations from his published works. I do not hold myself responsible for their accuracy and trustworthiness, or otherwise. My object has been to obtain for Dr. Hall a hearing, he having complained that insufficient attention has been accorded him. But his theory is still in its infancy, and requires much formulating and putting into shape before it can ever hope to obtain credence or acceptance. Whether it may or may not be true, time will prove. But, whatever comes of it eventually, it has raised doubts and uncertainties concerning the wave-theory, which ought to be answered conclusively and set at rest. We musicians have quite enough to do without going very deeply into purely scientific and mathematical questions. It is certainly not a musician's province to give up his time wholly to the theoretical nature of sound,—here the scientist must step in; and what a wide and useful field lies before him! When the true nature of sound is better known, we shall no more have to depend upon blind chance for the acoustical properties of a concert hall or other public building; an architect will be expected

to know what sound really is, and to plan his structure accordingly. The wave-theory has not yet succeeded in giving us this, and if more practical use had been made of it, we should never have witnessed so many truly lamentable spectacles of fine organs boxed up in chambers from whence the sound force generated could find no ample conducting medium.

In conclusion, I may state that Mr. Audsley has been exhibiting an instrument which seems at first sight to afford a visible and striking proof that sound may be a real substantial force capable of setting in motion a material object with which it has vibrational sympathy. Here are four small and very thin canister shaped vessels of aluminum, closed save at the projecting necks. These are of equal size, being in reality resonators, all tuned to some note, say C^4. The resonators are attached to the ends of four arms, also of aluminum, provided at the crossing with a small cup or boss, which rests upon a sharp steel point attached to the top of a small pillar stand. By this arrangement the suspended resonators are perfectly balanced, and revolve with the greatest ease. The rest of the apparatus consists of a tuning fork (C^4), mounted on a resonant case. When the stand bearing the four resonators is placed directly opposite the open end of the resonant case, and the fork is bowed in the usual way, the resonators begin to revolve, and continue revolving as long as the fork is sounding distinctly. The resonators will only revolve in one direction under the influence of the sound force, and that is the opposite direction to the course they take when moved by any real agitation of the air. They will not respond to any other fork not tuned to their own pitch. This *acoustical turbine*, as it is called, would appear to prove that sound is a real force, but capable only of acting sympathetically upon bodies having the same vibrational number.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 8.

It is in the most ancient writings the strongest evidence of our theory is found. Strongest because it addresses itself at once to the reader's understanding, and is not dependent upon the uncertainties of scientific opinon for their value. It here comes in the form of circumstantial evidence, which weaves a net-work so positive and undoubted in its meaning, that it is impossible for me to look over the vast fields I have scanned again and again, and not be fully convinced that ancient man saw the last remnants of the earth's annular system in the terrestrial heavens. The writings of Homer, Hesiod, Collimachess, Thucydides, Euripides, Virgil and a host of others are replete with annular legendary fragments that can not be understood until the annular sun illuminates them, and with this light I will explain a thousand features of mythology, and make it one of the grandest and most fascinating fields of thought. I will show that primeval man saw at least *two rings revolving about the earth! And moreover worshiped them as gods!* I have rescued their names from the wreck of ages, as I will prove in the sequel.

As most interesting to the ordinary reader, I will present first, some of these legendary annular fragments as they gleam from the pages of "Holy Writ," and I find them there in astonishing abundance in every book from Genesis to the last page of the Apocalypse.

On the first page of Genesis I am told that "God made the firmament" (or heaven) and divided the waters that were above the heaven from the waters that were under it, or on the earth. This statement is plainly this: that ancient man was familiar with the fact that there were waters or "seas" *on the earth's surface and waters in the skies.* But if there were waters "above the firmament," I say they revolved about the earth as rings or belts! Implacable law settles this fact at once and forever. For they could not remain there a moment if they did not, any more than a moon or a stone. Now these upper waters were called the "Great Deep," by Hebrews, as will be seen. With the ancient Greeks it was the *Okeanos* that *surrounded the earth*, and the *Altus* or "*high deep*" of the ancient Latins. With this thought how plain and simple is that other expression "and the *earth* was waste, and darkness was upon the face of the *deep.*" If I had any doubt that this deep was on high, that doubt would be at once removed by the succeeding expression: "And the spirit of God* moved on the face of the waters," for, all races of men in all time, believed that God dwelt on high! To place those waters on the earth and the spirit of God there is unnatural in the highest degree.

We have, then, in the very beginning of Genesis a plain and positive reminiscence of annular phenomenæ, that had indelibly impressed the mind of man. There was doubtlessly a dark canopy of annular vapors, the traditional realm of "*Old Night*" of which more hereafter, and the first light burst through that canopy as it moved polarwise and thinned away. Let the reader see how these circumstantial facts are linked and dovetailed together.

If there were waters above the firmament they were manifestly a canopy, and the habitation of the Deity. But if a canopy, it cut off the sun's light, hence the "darkness" on the "deep." But necessarily that canopy grew thinner, and if thinner light had to come forth.

Taking another view. I say if there was "darkness" then the sun's light was shut out, and that too by a canopy of vapors or "waters above the firmament." That is, if one of these conditions really existed, all *must* have existed. And the fact that they are thus unintentionally related and co-linked proves that those conditions did exist. What then must be the strength of my position if we find this same character of dove-tail, and unintentional testimony as we proceed?

Let us see. We read a little further and find the statement that the "Great lights made their appearance on the *fourth day.*" If this be true, then they did not shine in upon the earth on the first, second and third days (or ages), but if they did not so shine a canopy prevented it. In other words, if the "lights" did not make their appearance until the fourth day then there must have been "waters above the firmament" that shut out their light. Did the Author of Genesis state this fact to keep the harmony of evidence? Did he aim to prove that the earth had an annular canopy? Yet this is just what he has done.

* Literally the "spirit or wind of the gods."

To the philosophic mind it is utterly impossible to form a satisfactory conception of these things unless it sees the earth shrouded in revolving vapors, and when we throw the calcium light of science upon them we can not avoid the conclusion. If now we admit that the first page of Genesis mirrors an overarching fund of watery vapors the whole narrative is astonishingly philosophic and plain.

I need now explain the occurrence of the "light" on the fourth day so that the reader may see more plainly the harmony as we proceed.

Why did not the author of this Hebrew legend say "sun" and "moon" instead of "lights"? There seems to be an intimation here that the light that appeared was simply light diffused over the canopy that appeared and that the sun and moon themselves could not yet be seen. As we consult annular law, we find this to be the case; and we also find in the succeeding part of the narrative that it *was* the case.

As the canopy floated northward to fall and thin away, as I have before shown, the vapors could not reach the polar point, since there is no radial or centrifugal force there; or if they did they would immediately fall. It is plain then that much of the time during annular declination the polar skies would be clear, or so nearly so as to show the stars, and man must have been familiar with the fact. Hence the expression He made the "lights," and "the stars also." The author seems to have mentioned the stars because they were seen, and failed to mention the "sun" and "moon" because they were not seen. The presumption is at least that the canopy yet hid the sun and moon, and we find this to be the case, for, as we read a little further, we are informed that there was a time when the "Lord God had not caused it to rain upon the earth." Now all rains, storms and tempests are caused by sun power, and if there ever was a time when it did not rain then the sun's heat and light did not reach the surface of the earth as they now do. It is scarcely possible that the Author of Genesis would have made this statement if it had not been the prevailing opinion that there was a time when the earth was free from rains and storms, and such an opinion could hardly have obtained if it had no foundation in facts. But these facts are strongly supported by the foregoing concurrence of testimony. For, if there was a canopy of vapors "above the firmament" it intercepted the direct heat of the sun and necessarily produced a rainless age, so that we have here another harmonious witness. Further, it is very plain that as all winds and other atmospheric disturbances are direct results of solar heat, a rainless time predicates a *green house world*, measurably free from such meteoric changes as we now witness. If there were no winds there would be no commingling of currents of different temperatures, for different temperatures only are the cause of rains and winds. Now a canopy of vapors "above the firmament" would necessarily produce a green house world, for it would be a veritable *green house roof*, reciving all the solar heat coming to the planet and simply forcing those conditions that would prevent rains, winds and tempests, in short, true Edenic conditions. Scarcely have we surmised that a rainless earth shows a green house canopy and an Eden world and climate than we are plainly told that there *were Edenic conditions on the earth.* Man dwelt *naked* on the earth. Then, I say it was a warm world and free from rains and storms and winters: just such an Eden as the infant race *must have had to develop in.*

There is nothing more emphatically expressed and maintained by the sacred penman than the fact of an Eden in which lived primeval man. Now I submit the position that there never could have been an Eden on earth while the sun shone unintercepted by a canopy of annular vapors—unless there were "waters above the firmament." Then again we learn that man afterwards was clothed in the skins of animals. Then I say the climate, at first warm, *had grown colder.* If man lived naked in Eden, and afterwards protected himself by clothing, there was a change of climate. This can not be gainsayed.

Elsinore, Cal.

A FINAL EXPLANATION OF THE LAW OF SQUARED DISTANCE INVERSE.

BY THE EDITOR.

There are a few writers who still fail to see the force of our reasoning on the squared-distance law as laid down by Prof. Tyndall and as universally adopted by scientists.

One mathematician asks how the fractional decrease of sound, according to this law, can be self-contradictory and destructive of the wave-theory, as we have insisted? Let us, in a few instances, try once more to make ourself clear to the youngest reader of the MICROCOSM.

We have repeatedly admitted that according to the usual fractional method of calculation, which all our critics have elaborated in their various arguments, the result of a very small fraction of a millionth of the first intensity, as at one foot from the bell, is lost and gained in passing the ear forward and backward through the last foot of the 1,000.

There can be no dispute, for example, according to this fractional process of reasoning, that at two feet from the bell the sound is reduced to one-fourth of that at the first foot; at three feet to one-ninth; at four feet to one-sixteenth, and so on, according to inverse squares, up to 999 feet, where it is reduced to $\frac{1}{998001}$ of the intensity at one foot, and at 1,000 feet to one-millionth of that first intensity. Neither is there any dispute, *according to this fractional method*, that the one-millionth of $\frac{1}{998001}$ would be but a very trifling part of the original first intensity at one foot.

Dr. Blake made it $\frac{1}{1000000}$ of that first intensity, as the reader will see by the May number of the MICROCOSM, a fact which we will cheerfully concede to be correct, according to the theory, if it will relieve the minds of our critics.

But this is not the point of our charge against the theory at all. We charge that the wave-theory, according to its teaching deduced from this fractional process, sets

forth another and entirely different phase, and one of the grossest possible absurdity and self-contradiction, and this contradictory phase is that on which our whole charge of inconsistency was made, and, as we claim, triumphantly sustained. Let us in the briefest possible manner repeat it here, and then defy every critic both in this country and in England to answer our argument:

The wave-theory deduces from this law that it takes four bells at the center to make the sound as loud at two feet as it is at one foot with one bell sounding at the center. At three feet that it takes nine bells; at four feet that it takes sixteen bells; at 999 feet that it takes 998,001 bells, and at 1,000 feet that it takes 1,000,000 bells sounding at the center to equal the intensity of one bell one foot from the center. This the wave-theory tells us is exactly in accordance with Tyndall's law of squared distance inverse, a fact which none of our critics will dispute. But right here is where we claim that the monstrous self-contradiction of the theory comes in. Let us now demonstrate it.

According to this *bell*-phase of squared distance inverse, if the ear is moved back toward the bell one foot from the thousandth station, it of course, as all wave theorists admit, requires 1,999 of the central bells to be silenced to maintain the one intensity constant, whereas according to the fractional method, as calculated by Dr. Blake, it should require only the $\frac{1}{1000}$ of one bell to be silenced! Is there a mathematician on earth so dull that he can not see self-contradiction in this? Let us carry it out and see how completely it vindicates our exposure of the theory:

As 1,999 bells out of the 1,000,000 have to be silenced in moving the ear back this one foot, in order to maintain constant intensity, it follows that the next step silences 1,997 additional bells, the next 1,995 bells, the next 1,993 bells, and so on, *corresponding to the differences between squares*, just as certain as that moving the ear all the way back from 1,000 feet to one foot requires the silencing of 999,999 of the 1,000,000 bells, the last step silencing three out of the remaining four bells! This is absolute demonstration.

Plainly, if moving the ear back one foot from the 1,000th station requires the silencing of 1,999 bells to maintain the one intensity constant, *then, if no bells were silenced, the sound would be increased to the extent of 1,999 bells at the center!* Would not therefore this single foot step (from 1,000 to 999 feet) increase the intensity 1,999-millionths of the whole sound at the first foot? Answer ye sapient mathematicians who have pooh poohed our charge against the theory as an absurdity.

This being so, what becomes of the fractional method which makes the increase of sound by this one foot backward step *but a small fraction of one-millionth of one intensity?* A more barefaced and unanswerable self-contradiction can not be shown to exist in any scientific theory ever formulated.

And if moving the ear back one foot from the 1,000th station, with none of the 1,000,000 central bells silenced, increases the sound 1,999-millionths, it follows unavoidably that it makes the sound, according to this phase of the theory, 1,999-times louder at 999 feet than it was at 1,000 feet, because, at 1,000 feet it was but one-millionth of the intensity at one foot, while at 999 feet it has gained 1,999-millionths additional intensity!

Thus at each additional step back toward the center (with no bells stopped off) the ear gains according to this contradictory phase of the theory, a corresponding increase of intensity as just shown, exactly as the differences between squares become less and less. Thus, at 998 feet it gains 1,997-millionths more; at 997 feet, 1,995-millionths more; at 996 feet, 1,993-millionths more; at 995 feet, 1,991-millionths more, and so on with all the steps down to the first foot, thus aggregating an increase of 999,999-millionths of the entire sound at one foot over that heard at 1,000 feet!

Can anything in the whole range of physical science be plainer than this? Yet a hundred critics, confused and muddled by the working out of the fractional method have rendered themselves incapable of looking into the true inwardness of this bell-phase of the theory and thus have placed themselves on record as possessing no real comprehensive grasp of a difficult scientific problem. They should be ashamed to acknowledge to the world that they can not see the self-evident inconsistency in these two phases of the theory as here pointed out.

Yet because of such inability to reason out the matter logically and see the contradiction between these two phases, some of our supposed former best friends have turned angrily against us and have dropped the MICROCOSM, even refusing to correspond with us in a friendly manner. Shame to such backboneless substantialists!

They seemed incapable of realizing that the wave-theory might possibly contradict itself in its different applications of this law as laid down by Prof. Tyndall. Even those who had abundance of proof that the entire theory was but a mass of self-contradictory teachings seemed to become utterly oblivious to such a possibility in connection with this law; for, as soon as they saw that their fractional ratios were regular, they shut their eyes and

went to bed, apparently content, without once looking for the ubiquitous self-contradictions of the theory; and even after we had pointed them out in the ridiculous phase just set forth, our critics had become so magnetized by discovering this fractional regularity that they could see nothing else, and seemed determined to look no further.

Of course what is true of 1,000,000 bells sounding at the center, as just shown, in order to make one intensity at 1,000 feet, is also true of one bell at the center, with its sound divided up into 1,000,000 parts, one part only of which is heard by the ear at this thousandth station according to this phase of the theory. Any intelligent reader will comprehend this and, by applying our figures, will be able to carry out a corresponding analysis of the whole argument.

In our former articles a few incidental errors were perpetrated in the use of terms, resulting from a want of carefully distinguishing between these two phases of tho theory. This was, no doubt, a large part of the reason for the friends of our cause not grasping our real charge against the wave-theory as deduced from its reasoning upon this law. But we flatter ourself that there is no such excuse for any fair-minded critic in the presentation of the case as given in the foregoing argument.

We now dismiss the matter with this final, and as we believe, conclusive reply to our critics in vindication of our own original charge, that according to the teaching of the wave-theory in carrying out this law of squared distance inverse, the sound of the central bell must become 1,999 times louder by moving the ear back a single foot,—from the 1,000th to the 999th station! If we have not fastened upon the theory this monstrous and unparalleled absurdity then we have never sustained a scientific proposition in the whole course of our editorial life.

SPIRITUALISM, THEOSOPHY, CHRISTIAN SCIENCE, ETC.

BY THE ASSOCIATE EDITOR.

North Danville, Va., Sept. 4, 1890.

DR. A. WILFORD HALL, 23 Park Row, N.Y.:

Dear Sir,—You will doubtless recognize the writer as a reader of the MICROCOSM and the first purchaser of your "Health-Pamphlet" in this place. It is this acquaintance that I have with you that inspires me with a desire to have your opinion on a subject brought to my attention just eight months ago, "Spiritualism." I am perfectly ignorant of any personal knowledge of even its simplest phenomena, the tapping of a table. Since my attention was first called to the subject I have felt a deep interest in it, and have read the two books written by Dr. Saml. Watson on that subject, "The Clock Struck Three" and "The Religion of Spiritualism." I have also read "Lights and Shadows," by D. D. Homes, and several other books on the subject, and have been a reader of *The Religio-Philosophical Journal* during that time. So while ignorant of all phases of its phenomena, I am not ignorant entirely of its philosophy and its revolutionary tendencies towards religious creeds and society generally. Nor am I ignorant of many of the low and degraded phases of the subject. Indeed, I realize the many dangers connected with it, and that it should be approached with the greatest caution, wisdom and solemnity.

If you have given this subject a thorough investigation, there is no one whose opinion I would value more than yours. If, however, it has received only a partial investigation at your hands, I would be glad even in this event, to know something as to how you are impressed. I am aware of the disfavor with which all, at least in this section, look upon those who profess a belief in this subject. But I am in search of truth, and this alone induces me to write to you. An early reply will be kindly appreciated by,

Yours truly, J. J. FLIPPIN.

The above communication from Mr. Flippin represents what should be the attitude of all honest investigators in either the philosophical or religious realm of thought; anxiety for a thorough comprehension of the subject and a frank willingness to receive what conscientious intelligence determines to be the truth, irrespective of the favorable or unfavorable impressions of society. Should this feeling of unprejudiced and disinterested decision have characterized the investigations of the ancients we would not have the story of Galileo's struggle with the ecclesiastics of the seventeenth century, nor the long list of geniuses and philosophers who labored through life for the establishment of some cardinal principle, only to receive condemnation and repudiation while alive, but honor and glory when death made its relentless call, when men were then led to consider candidly and soberly the value of the life spent. Nor, in fact, would there be the records of strifes both secular and sacred, where lives were lost, happiness ruined, property devasted and time spent, had there been this universal seeking after the right and truth of all controversies. When, therefore, this principle is manifested we are in duty bound to grant the respect deserved, on whatever side of the controversy our enquirer may stand.

With regard to spiritualism, which has established itself as a system of religious philosophy within the past few years and which has a large and growing number of adherents, many only privately so on account of the contumely and disrepute connected with the subject, we believe it to have resulted primarily from an exaggerated conception of the dual nature of man. It will be found that the majority of spiritualists are opposed radically to all that is orthodox in theology, and that its rank and file are made up of men and women who were inclined to revolt against modern theology, while still believing in the great truth of personal immortality. When, therefore, the idea of a spiritual universe was recognized outside the veil of orthodoxy, with the included principle of a possibility of material

communication with this invisible realm, it found many who were anxious to be convinced and who were readily persuaded to join hands with the new faith.

We do not for an instant question but that the primal development of the doctrine was due to the conscientious convictions of the investigators, while at the same time we believe that these convictions arose from disordered mental and physical conditions.

All persons have experienced sometime during their lives, especially when alone, the supposed appearance of objects of a ghostly character which, if escape were possible, were left as monarchs of the premises, investigation seldom being resorted to, although if this were made future apparitions would not be experienced. The reality of these appearances is believed in by thousands of otherwise well-balanced and sensible people and in this ghostly-sense they are genuine spiritualists. With the ignorant multitudes who, like the well-known animal which receives its food and never looks from whence it comes, these apparitions are experienced and believed in, without any further thought in the premises, except a strong desire for their future discontinuance, but with the more enlightened these apparitions taking place, and mark you always in accordance with the intelligence and circumstances of the person, which shows their dependence on mental conditions, provoke inquiry as to their causes and characteristics. A second appearance is sure to decide on the reality of the apparition, and this second appearance is sure to occur if any credence whatever was given to the first and any solid thinking and inquiry done. This line of investigation led to the modern philosophy of spiritualism which, however repugnant the idea may be to its followers, is simply an evolution from ordinary ghostology.

As soon as the doctrine began to assume prominence, practical schemers and pretended believers were immediately on hand to take advantage of the credulous. This, however, does not form a conclusive argument against spiritualism as this same ghoulish fraudulency is exhibited in connection with everything of a public character, even religion, in its most orthodox type, and notwithstanding the fact that these pretenders have been exposed hundreds of times in their "table rapping," "chair lifting," and "musical instrument" manipulations, and have been shown to be nothing but common sleight-of-hand tricksters and are even repudiated and condemned as imposters by all honest-minded spiritualists, yet they manage to make fortunes out of simple-minded visitors, who would just as easily be deceived by the great magician Hermann had he not the honor to declare openly that all his work was simply a deception of the eye by the quickness of his hands.

The ridiculous character of these *seances* should be sufficient to engender predjudice against the mediums and to cause one to doubt severely the honesty of their claims; imagine a visitor from the mysterious world who wished to manifest his presence, simply wrapping on a table, or playing on an ordinary banjo or tambourine; it would seem to us to be much more in harmony with his advanced state of existence to rush up and shake hands with the investigators, for certainly this would form an indisputable demonstration, and would prove as easy as the table-wrapping performance, so far as his ability to cope with material environments is concerned.

A careful examination of the spiritualists throughout the world who are really sincere in their belief, will display the fact that the very large majority are persons who have experienced during their career some grave sorrows, and who are consequently of an extremely nervous and morbid temperament. Their feelings are easily worked upon and they can be made to see and hear, and walk and converse with things which have no reality whatever, except as phantoms of a diseased imagination. We have in mind a man with whom we have had business dealings of late, who through sickness and other adversities has been brought to a condition of extreme nervousness and who, although not claiming to be a spiritualist, and who probably is acquainted with none of its principles yet, declared to us positively, that he had visions in his room, and on his walks throughout his large country house; that these talked with and comforted him in his melancholic conditions and assisted him in his decisions. We consider the man on the verge of insanity, but believe, that if his physical condition could be changed so as once more to restore him to perfect health and steady and sound nerves, spiritual communications with him would be simply a relic of the past, and we hold the same opinion concerning the great majority of spiritualists throughout the world to-day. We believe modern spiritualism to be a cultivated disease of the nervous system, and that universally strong and healthy physical conditions would inevitably prove its funereal cortege.

To the philosopher who is investigating the rationale of these psychological systems the evolution and continued development of this system of supernaturalism presents an aspect of serious importance in that, the tendencies of advanced civilization and consequent intellectual advancement among the lower and middle classes of society is towards these religious systems which claim ability to give practical and comprehensible manifestations of spiritual phenomena, the genuineness or fraudulent character of such claims being beyond their ability of demonstration. Their development may also be considered due to the inherent yearning in the human mind for something beyond the physical conditions of the universe, which are not in themselves sufficient to satisfy and appease such longings. For this reason such doctrines as Swedenborgianism and spiritualism will, in the future, rapidly supplant the modern orthodoxy of opinions, unless more liberal efforts are made by established systems of theology to give to the laity more of the rationale and less of the dogmatics in their teaching. Among the more educated classes, we think such systems of mysticism and visionary delusion need look for nothing but merited contempt and unrelenting controversy. In the case of Swedenborg, we regard him as a great man, who had an unusual comprehension of spiritual philosophy, and at the same time a prophetic power which enabled him to see that the time was coming when the human race, owing to the practical and material nature of their environment, would be attracted by any system of religious belief which appeared to present a more tangible and materially comprehensible system than that advocated by orthodoxy. So

far as the fundamental truths of Christian philosophy are concerned, the Swedish seer does not essentially differ from our regular systems, but in the prominence which he gives to the comprehensibility of spiritual phenomena lies his power, and all of it.

Such systems as these are more to be feared by orthodox Christianity than bald infidelity and materialism, which will never attain a controlling influence over the minds of men on account of their phlegmatic relegation of all past, present and future accomplishments to mere terrestrial conditions. The controlling power and motive force of the human mind is *uncertainty*, and the doctrine will never be accepted which pretends to satisfy men that life with all its concomitant phases of intellectuality and spirituality begins and ends here.

The poet struck the keynote of human aspiration and human dissatisfaction with absolute knowledge however far advanced, when he said:

> "Hope springs eternal in the human breast,
> Man never is, but always to be blest."

An advanced modification of spiritualism is presented in *Theosophy* which repudiates as "commercial" all the manifestations and *seance* impositions of the mediumistic spiritualists. Its great forte lies in clairvoyance and in the projection of what is termed the astral body, so that the person can be practically ubiqutous in conversation as well as in presence; the perception, however, of this astral organization is only possible to those advanced in theosophical affairs and probably the conversation has also its distinguishing characteristics which render it comprehensible only by those acquainted in its peculiar terminology. We have never heard this latter virtue claimed, but would respectfully suggest it to theosophists, as it would certainly be undignified to say the least, for such a superior organism as the astral body to be found conversing in our ordinary materialistic anglo-saxon, to say nothing of Chinese or Hindoostanic jargon. By referring to last month's MICROCOSM the reader will find from the chief mover in theosophical circles, who was well acquainted with the founder of the system Mme. Blavatsky and her abettors and lieutenants Col. Olcott and Mr. Judge, a virtual repudiation of the whole system as a humbug, promulgated by a vicious woman for personal purposes. When such a doctrine of occultism advanced by such a source can be made to capture and enchant some of the strongest intellects and largest bank accounts in the world, it is sadly evident the power which anything mysterious or hoodooish has upon our mental constitution, all of which could be avoided by a little common sense and fearless investigation. We would not be at all surprised should some of Mme. Blavatsky's followers, disheartened and discouraged by Prof. Coues' exposure of their pet doctrine, be found organizing a joint stock company on the strength of some jocular sea-captain's yarn to hunt the fabulous mermaid in the Indian ocean, it would, indeed, be no more ridiculous than their past exploits with the unmaidenly Blavatsky.

While considering this subject of psychological effects upon human conditions it will not be out of place to examine another doctrine which, having its throne in the ethical city of America, is creating a considerable noise throughout the country. Its founder and principal exponent is also a woman, although we hope not of the Blavatsky type, and is known by the appelation Christian Science.

This doctrine, so far as we can learn from writings of Mrs. Eddy and her coadjutors, is that sickness and disease of all kinds are simply disordered conditions of the mind, and can be completely eradicated from the body solely by the education of the mind to such a position that it believes the body has no ailments, and *presto change*, the patient jumpeth up, takes his couch, and perambulates without any extraneous efforts of a remedial nature being requisite. True, such healing processes are attributed by Christian scientists to the miraculous intervention of Christ, but the fact that such claims are repudiated and scoffed at by all the clergy and laity outside this peculiar and diminutive fold will not lay us open to the charge of liberalism or infidelity when we declare it as our positive belief that every one of the cases thus healed would be as effectually cured should the same efforts be made and by the use of any other name or power or symbol in which the afflicted person had the same confidence as in Christ. If this is true, and numerous cases in everyday experience so declares it, then this so-called wonderful and miraculous Christian scientism resolves itself into pure and simple mental healing into which the Supernatural does not enter in the slightest or most remote degree, and we can not help believing that so strong a minded person as Mrs. Eddy, as well as her numerous co-laborers, must recognize this principle just set forth and only use the Scriptural accounts of miracles and the influence they carry with them as means to an end which they know no other way of accomplishing.

There ought to be no question among thoughtful people concerning the marvelous influences of mind over matter, and the system of Mrs. Eddy, if carried on in a legitimate manner, would prove a powerful influence for good within the limits of physical ailments which can be reached by arousing and diverting mental attention from a brooding over bodily abnormalities and disorders, but, as in almost every other principle of advantage with which the human race has been blessed, this also has its use and abuse. We have heard of cases of disease where there was manifested the greatest amount of suffering for the patient and criminal cruelty on the part of the "scientist" physician who forbade the calling of competent medical assistance, claiming ability to manage and cure the case, and representing all other aid as imposition and of no avail, when the "scientist" so called, must have positively known that the case was beyond the reach of her peculiar methods. This method of Christian science, as before stated, is to make a person *imagine*, if possible, that no sickness prevails, and, if successful, the patient is healed. We learn *en passant* that a fee is charged for such "medical" attendance, but believe that if the patient tried to raise the imagination of the physician to such a pitch as to believe he or she had been paid for services rendered, there would be an immediate reply that the new doctrine was not applicable in financial matters. This method of Mrs. Eddy has opened up to us a large field for competent scientific investigation as

to psychological power in dealing with material conditions, but we should bear in mind that the system has a limited sphere for successful operations, to which it should be rigidly confined, and we should also be careful, as honest investigators, to separate from this system all the supernaturalism with which it is, we believe, fraudulently saturated, reducing it simply to a practical recognition of the effects of mind over matter. The word "miracle," is made too free use of at the present day, and we can not help attributing it very largely to intellectual indolence on the part of theologians and others who, to save investigation of unusual phenomena, attribute the direct cause to divine interposition. While we believe fully in the manifestation of miraculous power in the ages when such abrupt and startling methods were necessary for the education and control of a people who had no understanding of physical laws, and could not be ordered by natural conditions, and while we are not prepared to positively dispute the occurrence of miracles even at this day, yet we are satisfied that many of the experiences, especially in the religious world, which are attributed to special interpositions of Providential power, should be traced to the ordinary courses of what we are pleased to term natural law, recognizing, of course, the fact, that these laws were inaugurated and are controlled by the Deity.

Time was, when any system which claimed to any degree, a spiritual or supernatural aspect, however ridiculous and blasphemous such pretentions might be, was protected from either rigorous investigation or open condemnation by the outside world, by a veil of universal mental sanctity which was painfully fearful of outraging or questioning anything which might eventually prove sacred and holy; but the time has now come when through a better understanding of nature's God and nature's law, these systems can no longer feast upon the unquestioning credulity and gullibility of mankind, as man will not now be appalled by any superstitious sanctity from enquiring into an inconsistency between two principles which, in the very nature of sound theology, as well as scientific philosophy, ought to harmonize.

THE LAW OF CENTRAL AND CIRCULAR ACTIONS IN NATURE'S ACTIVITIES.

BY ISAAC HOFFER.

That there are in the activities of nature central and circular actions is evidenced by innumerable instances both in organic and inorganic productions, and in the actions and movements of the heavenly bodies. By central actions are meant such actions as commence in, or act from, a central point, and extend action or energizing power outward. By circular action is meant any rounding or circular action that produces round forms, or circular motion, or motion that returns through any circuitous route to its source; or where dependent and reciprocal actions are necessary to complete a cycle or continue an activity.

Concretions are formed on a central point, or nucleus, around which concentric layers are gathered from matter in a state of fusion or solution. The rounded balls or boulders so abundantly found in some large masses of igneous rock formations show that there must have been innumerable centers of consolidation around which layer upon layer of fused matter cooled and hardened.

Nodular spathic iron ore, and many rounded concretions, are instances where matter in solution aggregated around a central point.

There are centers of action, repelling and attractive, indicated and manifested in the minutest particles of matter. Heat forms repelling centers that expand and separate material substances, that in some instances cohesion seems to be almost entirely destroyed. Bubbles in water are round, and water separates into globules. Granulation shows central actions and in many substances produces rounded forms. There are storm centers in the atmosphere and circling actions in the oceans.

Gravity, one of the universal and all-pervading forces of nature, seems to be drawing matter from all directions towards a common center, and this common center seems to be the center of the earth; and no doubt this force has a centralizing action wherever its influence can be made effective, even in minute particles of matter.

Vital force in all its incipient actions commences in minute central points, forms spheres, and develops them into cells of living matter, from which plants and animals are organized in accordance with the particular forms of the vital energy.

In animal life, especially in the human family, are vital and mental centers of action and circulating movements. The heart sends the blood through all parts of the body, and keeps up its propelling action so that the blood is forced to move in an apparently continuous circuit. The brain is the center of mental action, the great storehouse of knowledge where information is received and knowledge stored. It is the little central dynamo from which the intellectual energy of man transmits energizing, directing and controlling power throughout the body, and compells the physical powers, and even other forces of nature, to be its subservient agencies. It utilizes impressions received through the senses, converts them into knowledge, and makes this knowledge the power through which it acquires dominion over matter and life and over the forces of nature.

The renewal, or reproduction, of life, vegetable and animal, is a cyclic and multiplying action extending through a series of changes from seed to seed. So common are these wonderful cyclic actions in life that we scarcely notice the astonishing changes that take place in the development of a seed until it reproduces its like. It is a remarkable fact, too, that seeds of most plants, and eggs of animals, are of a rounded form, thus showing a universal tendency of a central and circular action in vital energy.

Between vegetable and animal life there are many reciprocal and dependent actions, which show their close relation and connection, and here the two form a circuit of life-giving agencies. The wastes of one supply the wants of the other, and rounds of reciprocal actions are the sustaining powers of both.

A beautiful illustration of the reciprocal dependence of vegetable and animal life can be seen in a common aquarium. By placing a fish in a vessel of water, the water will in a very short time become unfit for the fish to

live in, but by placing water plants with sufficient earth or stones in the vessel, the water will be purified by the plants so that the fish can live; but when the plants begin to die and decay, snails or worms that will eat the decaying vegetables must be added, or the fish will die; with the snails added the water will remain pure for an almost indefinite time. Here are a series of actions and reactions necessary to maintain a certain condition that will enable both vegetable and animal life to exist, which shows how closely related and how dependent upon each other these two kingdoms of life are, and how beautifully the law of reciprocal action between them is balanced. The purity of the atmosphere has been brought about and is maintained by similar reciprocal actions between vegetable and animal life; through the absorption of carbon by the former, which is exhaled by the latter as a useless and dangerous substance, the purity of the atmosphere is maintained, and the circuit of actions and reactions continued.

The earth rotates around its axis and revolves with all the planets of the solar system around the sun as their central point; and the sun radiates light from this central position through the whole of this system. Here is positive proof of central action and circular motion, and a clear indication of reciprocal dependence; showing that in all creation there is a close relation and connection, and that while there are special centers of action, and circular and cyclical movements in the minutest particles of matter, and throughout all nature up to the forming of worlds and systems of worlds, and moving the same in circular orbits through boundless space during endless time; yet in all these apparently independent bodies of matter and actions of forces there is such a close relation and reciprocal dependence as to show that all nature is one, and that all her activities are energized, brought into action and controlled by some Great Power, *whose centre of action exists everywhere, and whose limiting circumference is nowhere.*

In the movements of the heavenly bodies we have an illustration of the law of central and circular action on a scale of grandeur and magnitude that surpasses all human comprehension, and yet the same law prevails everywhere, in the minutest particle of matter as well as in a system of worlds. Evidently the general and universal forces of nature have in themselves an inherent law of central action, and of a circular, cyclical or reciprocal moving power, and that these actions and movements always produce corresponding effects and results where the conditions are favorable, or where no special forces interfere with these general actions and movements.

The agencies of activity in nature, whether general or special, always operate from an interior or central point. The sun is the central acting agent of the solar system, and the rays of light radiating throughout this system are no doubt the causative agencies of activity in all the movements of the bodies within that system, and have much to do with all the activities that take place upon the earth.

Without the rays of the sun this earth would be a solid body of inert matter, notwithstanding the theory that the interior of the earth is in an extremely heated condition; for without the heat produced by the sun's rays, the surface of the earth would long ago have been frozen into a solid actionless mass.

The fact that the earth is part of the solar system and receives continually volumes of energizing power from the sun, seems to indicate very strongly that the sun receives in some form a return from the earth, and that there is reciprocal and compensating action between the two. However this may be, it is a well known fact that the sun is a great central source of activity, and that the movement of the immense bodies of the solar system at a high velocity around this central source of activity, shows a great circular moving power; but grand and striking as this illustration of the law of central and circular action in the solar activities appears, there is in man a concentration of forces, and of laws governing their activities, that constitute a more varied and more perfect system of agencies of activity than can be found anywhere else in nature.

In man matter, force and mind—the three elements that constitute everything manifested and indicated in nature—are united in one interacting personality. In this personality are centers of chemical action with perfect laboratories; a center of vital action supplying the chemical centers with vital energy, and receiving in return the vitalized chemical products, and thus forming a complete circuit of reciprocal action. But at the head, and in the head, of this personality is another center of action, with an energy that permeates every part of the personality, and reaches out beyond it in every direction. It is the central sun that lights up the whole personality, discovers its needs and its dangers, and takes charge of it with all its surroundings and makes every provision for its needs, its safety and its comfort. It receives in return from the other parts the fullest and most perfect portion of the vitality.

Here are distinct centers of action in a three-fold personality, all in perfect unity of action and reaction, each dependent upon the others, and all sustaining each other and making together a complete whole. In all nature there are no more and no different forces at work, and no different laws governing their actions than there are in this personality. Man is a complete world in himself—a perfect cosmos; and as a center of activity he stands at the head of creation, as the embodiment of all the agencies of activity in the past, and as the controlling energy in the progressive development of the future.

Lebanon, Pa.

THE COLLEGE.

Our mail contains each day numerous inquiries from our friends throughout the country concerning the status of the proposed College of Substantialism, offering to send their sons as students so soon as we advise them of the terms and our readiness to receive them. While we are rejoiced to note such interest on the part of substantialists, yet we fear they have but a slight appreciation of the enormous work necessary for the successful inauguration of such an enterprise. It is a well known fact that only a very small number of our educational institutions are on a self-supporting basis, the fees charged being simply enough to pay the board of the student and the taxes and repairs on the ground and buildings, the professorial chairs being supported by endowments. Seriously realizing this, we are laboring earnestly to place the college on a firm financial basis so that failure will be impossible; and with the help derived from our Health-Pamphlet, the returns from which are being sacredly guarded, the College of Substantialism will soon, we trust, be an established fact.

IMPORTANT TO OUR READERS.

We have now put into circulation more than 250,000 copies of our Health-Pamphlet, all within less than eighteen months since the first copy was sold to Dr. Elihu Pettit of Philadelphia, Pa.

A large number of these copies have been given away to the clergy, to M. D.s, and to poor families who have sent postmaster's certificates as to their inability to purchase $4 worth of medicine in case it should be prescribed by a physician.

We have received on account of this distribution more praise and glorification within the time named from those who have been restored to health by the use of our treatment than has ever before been showered upon any one man during his whole lifetime.

At least 14,000 volunteer testimonials have reached this office, breathing such expressions of gratitude as were never before read by man, a brief specimen of which appears on the last page of the MICROCOSM from month to month.

The envy of a few professional men has been aroused by this marvelous success of the Health-Pamphlet, and a few ripples of opposition have occurred in different sections of the country, but the revolutionary work has seemed to sweep on with such resistless force that even its most malicious opponents have finally deemed it wise to keep out of the way.

It is believed by those in a position to know, and who are connected with the great drug manufacturing centers in this country, as well as with the importing drug trade, that this whole business has fallen off more than one-half during the year just closed, all of course in consequence of the stoppage of orders from retail druggists.

Within another year it is confidently believed and predicted that a majority of those in the trade, both as manufacturers and dealers, will be obliged to seek other means of livelihood, alone in consequence of this ubiquitous Health-Pamphlet and the physiological revelations it makes to those who possess it. The feeling is already becoming universal that this revolutionary pamphlet is the beginning of the end.

Notwithstanding the quarter of a million copies already sent out, we have just hit upon a plan for a more widespread dissemination of the little "Life-Preserver," as Rev. Miles Grant calls it, than ever before, and we are pleased to say that our local agents are sending by the thousand for our circular unfolding this new method of at once putting a copy of the Pamphlet into the hands of every family on the American continent.

We now say to the reader: *if you have not seen this circular, send for it at once.* A postal-card will do. You will see therein a picture of the foam-crest of the approaching cataclysm that is destined within another year to sweep drug-medication out of existence.

That we are naturally elated at the stupendous success of this universal Health-Restorer, it were mere affectation to pretend to deny; and believing as we now do and must that humanity as a whole is destined to be lifted during the coming generation to a plane of longevity by this simple discovery of at least 25 per cent. above that of the present and past generations, is all the assurance we need in our declining years of the permanent establishment of an imperishable monument to our memory. We say this with no vaunting pride, but with that satisfied composure which comes of conviction doubly assured.

Having enjoyed the recuperating and disease-defying benefits of this discovery for forty-one years, at the beginning of which time we were hopelessly sinking into a consumptive's grave, and having now passed our 71st birthday in a more robust state of health, as Dr. R. F. Stevens, of Syracuse, N. Y., believes and declares, than any man of our own age on earth, it is not strange that, as one without a personal enemy in the world, we should desire others to reap a similar fruition by the use of similar means.

VOL. VIII. MICROCOSM, APPROACHING.

One more number will complete this volume. Now is the time for new subscribers to order Vol. VIII. By so doing and sending the 50 cents now, the present volume, including all back numbers, will be sent free. It contains a store of useful, scientific discussions, worth many dollars to persons who wish to cultivate a habit of close thinking. Such thought-encouraging culture will be useful through life in whatever business department a man's energies may be engaged. Do not lose this opportunity if you wish to *think.*

INDUCEMENTS TO CLUBS.

Old subscribers may commence renewing now, if they feel disposed, by sending in the 50 cents. But (which is better) if they will send in the names of *two new subscribers* with $1, their own subscription for Vol. VIII. shall be marked paid.

Remember, these two names must be new subscribers, not renewals, as we expect every old subscriber to renew by sending 50 cents for the next volume unless he can secure two new names.

A club of 10 new names will be supplied with Vol. VIII. at 30 cents each, while a club of 20 at one time with $5 will be marked paid for the next volume.

OUR SCIENTIFIC LIBRARY.

Since the "Problem of Human Life," our first scientific book, was issued, we have published nine other volumes, making ten in all, bound substantially in cloth, namely:

1. Problem of Human Life	$2.00
2. Six volumes of MICROCOSM	8.00
3. Two volumes of Scientific Arena	2.00
4. Text-book on Sound	50
Total	$12.50
All these volumes will be sent by express for	6.00
Or by mail, prepaid, for	7.50

We make this offer at actual cost for the purpose of spreading a knowledge of the Substantial Philosophy.

☞ Since the notice, a few months ago, that the editor's large photograph would be sent at cost (25 cents) to those desiring it, several thousand copies have been ordered. It is quite natural that persons sending for the Health-Pamphlet should wish to inspect the present appearance of the man who forty-one years ago made the discovery of the treatment and who has steadily practiced it upon himself ever since. As a further encouragement to this wish on the part of purchasers, the doctor now proposes to send a copy of this photograph free to every person who shall hereafter send the $4 for the Health-Pamphlet provided the desire for it be expressed in the same letter with the remittance.

☞ Those who may wish to consult a thoroughly educated and experienced physician with reference to this new system of treatment and the conditions of their own health, would do well to inclose $1 to Richard F. Stevens, M. D., Syracuse, N. Y., and receive a personal letter in return. Dr. Stevens is the very best medical authority on the subject living, as he has used the treatment continuously for twenty-three years both upon himself and in his practice.

AND STILL THEY COME.

We venture to say that never, in the history of the medical or curative practice of any school, has there been such an enormous and continuous flow of correspondence giving testimony of restored health and vigor, and breathing heartfelt thankfulness to the discoverer, as in the case of our Health-Pamphlet. We have over 15,000 such testimonials in our office, and only give a sample from month to month. Read these letters and remember that *we offer to refund money if you are not satisfied after thirty days' trial.* For our reliability consult Bradstreet's or any reliable agency.

The following from Rev. A. L. Wilson, a Methodist clergyman, at 28 E. 45th St., Bayonne, N. J., will speak for itself:

"Dr. Hall, Dear Sir,—With pleasure I send you the inclosed. My case was such that I wanted to test fully the PERMANENT effects of the 'treatment.' I think I have had sufficient time to do so. You are welcome to use my name as it is a small return I can make for the wonderful benefits that I have received.

"Yours truly, A. L. Wilson."

"Dear Dr. Hall,—I have been using the 'treatment' nearly thirteen (13) months (I began Aug. 21, 1889). For nearly five years I had suffered from chronic malaria I tried many remedies, but in vain. I could not break its hold upon me. I was in a sad plight when I ordered the 'Pamphlet.' What a blessing it has been to me. I have taken only twenty-five grains of quinine since Aug. 13, 1889. NO OTHER MEDICINE HAS PASSED MY LIPS SINCE THAT DATE. How is that for a system that was saturated with malarial poison? The past year has been the best in my life, and because of the faithful use of the 'treatment.' Surely it is a priceless blessing, for it has brought me that which is worth more than gold—HEALTH. Yours truly,

"A. L. Wilson."

Rev. R. J. P. Lemmon, D. D., Benton, Ark., writes, Aug. 29th:

"Dear Dr. Hall,—I have delayed writing you that I might give your new discovery as full a trial as possible. I received your Health-Pamphlet in February last, and when I read it I did not think it would be of any great benefit. First of March I was taken with la grippe and was treated for three weeks by three of the best doctors we had. I got worse all the time. My head was badly affected and my suffering from the lower rib down the entire left side, including my back and the urinary organs was intense. Voiding from the bladder was so excruciatingly painful that it was like suffocation.

"Towards the last the flow would be followed by blood which would sometimes gush out in large quantities. As I was growing worse under medical treatment, I determined to try yours, and to my great astonishment and delight the second application entirely relieved all pain from head to foot and I slept as sweetly as a baby.

"I have thoroughly tested its virtues and know whereof I speak. Yours most fraternally,

"R. J. P. Lemmon."

Mrs. C. W. Pinco, Columbia Falls, Me., writes, Aug. 26th:

"Dear Dr. Hall,—I have been using your treatment for one month and have found it very beneficial. Indeed, I feel like a new person. The foundation of all my complaints was liver trouble, from which I have suffered since I can remember, and I am now fifty-seven years of age. This has been the cause of numerous other troubles, such as *dyspepsia, chronic diarrhœa*, etc., etc. I have always had to diet carefully to save me from severe suffering. But thanks to your treatment my diarrhœa, from which I had long since abandoned all hope of recovery, has been entirely checked and I feel great relief from my indigestion. I now look forward to many years of comfort both for myself and my friends. Gratefully yours, Mrs. C. W. Pinco."

B. R. Sanburn, P. M., Search, Mo., writes, Aug. 29th:

"My Dear Sir,—Sometime since I received your Health-Pamphlet but did not try the treatment till I was taken down with a burning fever akin to typhoid. My wife wanted to send for the doctor, but I told her I would test your treatment. My first trial, although easing me, did not break the fever. After waiting awhile I tried again, and brought on a profuse perspiration, completely breaking the fever. I have taken it since and am now at my work, feeling better than I have for months before. I also use your treatment for kidney trouble and feel greatly benefited thereby. I regard your system as a God-send to humanity, which, when known, will completely revolutionize medical science. B. R. Sanburn."

Rev. Joel Harper, Cortez, Col., writes:

"My Dear Dr. Hall,—I received your Health-Pamphlet about five months ago, since which time I have been using your treatment regularly, and it has been of great service to me. It seemed to me, previous to its use, that I could not possibly get rid of a feeling of lethargy, depression and a disinclination and, indeed, inability to do anything more than I was actually compelled to do. I commenced your treatment and in a week I felt a different man. The lethargic feeling was gone, I seemed lighter, my step became more elastic and my work a pleasure.

"I have spoken to several about your pamphlet and they have purchased it, and without exception speak very highly of its effects. Anything I can do to help forward your cause, be assured I shall gladly undertake. Very truly yours, Joel Harper.

"Pastor of Congregational Church."

A. F. Blundell, Esq., General Manager of Omaha Electric Company, writes, Sept. 16th:

"Dr. Hall,—I inclose $3 for "Problem of Human Life" and enough MICROCOSMS to cover the amount. * * * I have been using your treatment for three months. At the time I commenced I had lost all ambition and energy. I was not really sick so as to be confined to my bed, but was becoming useless and listless. No sooner had I commenced your treatment than I noticed a great change in my physical condition, and I have been steadily improving ever since, and I can say in truth that I am enjoying better health to-day than at any time since I was a boy, and I am now thirty-eight years old. Never before this summer have I been able to get through the heated term without being severely indisposed, for from three to four weeks. This season the heat has not troubled me, and this I attribute alone to your remedy without medicine. I have no words in which to express my thanks that ever your Health-Pamphlet fell into my hands. * * * Yours very sincerely, A. F. Blundell."

Rev. John A. Bright, Abilene, Kan., writes, Sept. 20th:

"Dear Dr. Hall,—Yesterday I had a long pleasant conversation with my personal friend Hon. John M. Price, of Atchison, Kan. He is being wonderfully benefited by your treatment, and has no end of praise for your discovery. A few months ago when I last saw him he was in a bad condition, I feared he would not live the summer out. But to my astonishment I find him a new man—rosy-cheeked, fat, hearty and cheerful—all of which he attributes to your Health-Pamphlet. He advises me to apply at once for the agency and to distribute the pamphlet among the suffering as the best work I can do for humanity. * * * Yours very truly, John A. Bright."

Rev. W. S. Hanks, Canterbury, Conn, writes August 1st:

"Dear Dr. Hall,—I began the use of your health-treatment Feb. 1, 1890, intending to report results in precisely six months, but am induced to write at once.

"When I received your pamphlet I was suffering severely with dyspepsia. Many sorts of food I dared not attempt to eat, and I seemed to be threatened with chronic constipation. I easily mastered the art of applying the remedy to my own particular case; so that in a few weeks I knew precisely what to do, how to do and when to do. And then the best results began to appear, as a matter of course. My dyspepsia disappeared, leaving my stomach eager and able to digest anything. And my appetite is now of the best, so that I need not hesitate to feed omnivorously, although I have always been, and still prefer to be, temperate in both eating and drinking.

"Please send me your best terms for the sale of the pamphlet, as it is a work in which I can conscientiously engage. Sincerely yours, W. S. Hanks."

J. P. Little, P. M., Sumner, Fla., writes August 13th:

"Dear Dr. Hall,—Inclosed is my cheque for * * * Please send me two copies of your hygienic treatment. I have been using your system in my family since June 1st, with marked improvement in the health of us all. I had been subject to attacks of sick headache from biliousness and indigestion all my life, and had to use a good deal of purgative medicine, but since June 1st have had none of my old troubles and have left off my medicines. Having thus satisfied myself that the treatment is beneficial, I have begun to recommend it to my friends. Truly yours, J. P. Little, P. M."

James H. Chesnut, Hot Springs, Ark., writes August 14th:

"Dear Dr. Hall,—I have been using your treatment for about three weeks, and have gained in that time about eighteen pounds. All my friends are perfectly astonished at my improvement, and can hardly realize that they are looking at the wasted, worn and sick man of former times. Send me some of your "Extras," as I intend to push the sale of the Pamphlet in this vicinity.

"Yours truly, James H. Chesnut."

☞ Don't fail to send for our "Extra" MICROCOSM. Copies sent FREE.

Press of H. B. ELKINS, 13 and 15 Vandewater Street, New York.

The Microcosm

A MONTHLY JOURNAL OF SUBSTANTIALISM AND COLLATERAL DISCUSSIONS.
THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.
A. WILFORD HALL, Ph. D., LL. D., Editor and Proprietor.
(Author of the "Problem of Human Life," "Universalism Against Itself," Editor of the *Scientific Arena*, &c., &c.)
ROBERT ROGERS, S. L. A., Associate Editor.
Address all communications to A. WILFORD HALL, 23 Park Row, New York.

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THE "WILFORD HALL" COLLEGE.

BY HENRY C. COX, A. M.

The fact that Dr. Hall has given a property worth $62,000 toward the College of Substantialism should provoke the many other friends of the cause to raise a liberal endowment for its early opening.

The purpose of this brief note is to call the attention of the lovers of truth to the feasibility of providing for its organization at the opening of the next college year, September 6, 1891.

1. As it was under the *nom de plume* of "Wilford," that Dr. Hall first issued that wonderful book the "Problem of Human Life," I suggest the above as the name of the college. That, or the "Wilford College of Substantialism." However, I shall be in happy accord with whatever name shall best please the founder of that system of philosophy.

2. Let there be an early temporary appointment of nine trustees by Dr. Hall, whose duty it shall be to solicit funds for the endowment. As a matter of convenience, a working majority of the body should be near the office of the publisher of the MICROCOSM.

3. Let this Board issue certificates of the amount of $25, each certificate entitling its holder to one vote in the permanent organization, and four constituting a scholarship, to be surrendered to the institution upon the graduation of the young man or young woman in whose educational interest it shall have been employed.

4. Let them arrange for contributions in smaller amounts to be set aside, so far as necessary, for the endowment of the Chair of the English Language.

5. Make all sums contributed payable on May 1, 1891, if by that date it shall have been found that the endowment is sufficient to warrant an opening in September, 1891. Otherwise let payment be deferred one year, if thought well.

Though a poor teacher, such is my interest in Substantialism that I herein subscribe $100 upon the terms named above. If all the other friends of Substantialism will subscribe five per cent. of their net annual income, I feel assured that the new college may open under the most favorable auspices a year or two hence.

As a partial reward for the long years of arduous toil which Dr. Hall has passed in the interests of Substantialism, individually I should feel proud to see him duly installed as President of the new college long years before it shall please the good Father to call him to a higher reward and honor.

If anything in the above shall or shall not meet the views of the hosts of Substantialists throughout the country, I shall hope that it may at least serve the purpose named in the second paragraph.

REMARKS BY THE EDITOR.

As intimated by Prof. Cox—one of the earliest and ablest friends of the Substantial Philosophy—we have already purchased and set apart a valuable property fifty miles above this city, on the west bank of the beautiful Hudson River, which has cost $62,000 and which we are ready to deed over, free of all encumbrance, to the suitable Board of Trustees as soon as the same can be organized.

But we think one year, as suggested by Professor Cox, altogether too brief a time in which to think of opening such an institution, though none too brief for completing the organization and getting ready for going to work in earnest to obtain subscriptions for its endowment.

In order to hold out inducements for the subscription of liberal amounts—the names of each subscriber to appear from month to month in the MICROCOSM—let the time of calling for such subscriptions by the duly elected Treasurer of the Board be not sooner than May 1st, 1893. This will give sufficient time for each subscriber to save up the amount subscribed out of his or her surplus earnings, and thus not to feel the contribution. To attempt to accomplish such a great work precipitately, or within a few months, is often to fail for want of time to mature plans, rally friends, etc.

Let this, therefore, be regarded as the announcement of the endowment enterprise preparatory to starting the college, and let each friend of the cause of Substantialism as soon as possible write us, stating the amount he or she will give by May 1st, 1893, provided the college is then ready to be opened.

Let each subscriber remember that according to Prof. Cox's suggestion, $100 thus sub-

scribed will constitute a paid-up scholarship for the education of one young man or woman to be named by the person making the subscription.

We trust that friends who may have children to educate, as well as others who may wish well to the cause, will send their names with at least a promised subscription sufficient to pay for a scholarship for some deserving person, which subscriptions will be regularly printed in succeeding issues of this paper.

As a further encouragement to this work, we hereby promise to give in cash, in addition to the buildings and grounds already purchased, an amount equal to all the subscriptions that may be received up to the date named, provided they do not exceed $50,000. Nor shall we stop at this, should our continued success in the sales of our books justify, and we assure the reader we are straining every nerve to increase this extra fund to more than $50,000 as our own individual part of the endowment of the College of Substantialism.

The Rev. Mr. Kimball, the famous "church-debt raiser," who calls weekly at our office in the interests of circulating our Health-Pamphlet among the sick and suffering, would be the best possible general missionary agent to go forth in the interests of this endowment fund. In fact, he is the very man to undertake to raise this debt which is now due coming generations in connection with the cause of Substantialism; and he would lay up more treasure in heaven, as we honestly believe, by creating such an endowment-fund for the spread of true science and true philosophy on the broad foundation of unsectarian Christianity, than by raising a hundred million dollars of ordinary church debts, useful as such efforts may be to society.

We shall see Mr. Kimball personally upon the subject, and shall urge upon him the importance of this grand missionary work, in connection with the spread of our Health-Pamphlet among the needy to which he has become so much devoted.

In the meantime let Substantialists begin to send in their conditional endowment subscriptions as above suggested.

The purchased grounds and buildings on the west bank of the Hudson, as previously announced, consisting of twenty-seven acres of lawns, orchards, gardens, shrubbery, vineyards and other small fruits, including stately groves of more than 260 native forest trees, is admittedly the most magnificent site for such an educational institution that exists anywhere on the American continent.

The view witnessed from the veranda of the main building, which will seat more than 300 persons, is enchanting in the extreme, commanding a vista of fifty miles in different directions, taking in the broad Hudson for more than ten miles, and a landscape of the most romantic and picturesque undulations imaginable, embracing the distant Catskills, the Berkshire Hills, etc., the whole forming the grandest view ever seen from a single standpoint in any part of the world. In fact, as a stationary panorama it is the admiration of all who have visited it.

As stated in a previous number of the MICROCOSM, a hotel was permitted to be started there the past summer in view of revenue for the college, but from serious objections growing out of the infamous relations of the whiskey traffic, we were obliged to dispossess the lessee, and now have the gates of the "Wilford Hall Park" closed and the place kept sacredly under the watchful care of a competent gardener and his wife.

At first it was believed to be a judicious move to use the present substantial main building of more than sixty rooms as a sanitarium, and to this end we have just expended in plumbing and fixtures more than $1,000 in putting an abundant supply of pure water throughout the entire building. But after deliberate reflection we became convinced that the winter air at such an altitude—500 feet above the Hudson and under the very shadow of "Storm King"—would be too keen and fresh for the sick or feeble, though the very health-giving elixir required for the college student.

Hence we see no way at present of utilizing these premises for increasing the revenue of the college without greatly deteriorating the loveliness of the property by renting it from year to year as a summer resort. We have concluded, therefore, to maintain it unoccupied at the minimum expense, in all its unparalleled beauty and grandeur as the future home of the College of Substantialism.

Whether or not, in the midst of our incessant mental and physical strain, we shall live to see this institution inaugurated, is a secret locked up in the archives of the near future. Let this be as it may, our bequest to that educational work should be made secure at once, in the contingency of our death, in order that young and energetic educators who, as Substantialists "dyed in the wool," can have the means at hand for organizing the institution at the earliest moment and then carrying it forward to the credit and honor of the noble cause it is to represent and foster.

Without any disparagement of the scores of able young Substantialists scattered throughout the country that might be mentioned, we here name two who will occupy a prominent place in the coming board of trustees, and a

very responsible position as custodians of the funds and property of the institution. These two are Robert Rogers, our Associate Editor, and Prof. Alonzo Hall, our Pacific Coast contributor. To say that we have the utmost confidence in the honor and integrity of these two young men, as well as in their ability to carry forward this educational work after our death, is but a mild expression of our personal preference.

And we add here in conclusion, that in case of our sudden demise, the MICROCOSM, with all the appurtenances thereto belonging, is hereby made the joint personal property, free of all indebtedness, of the young men named, who will be charged with its publication and editorial management thereafter.

THE RANGE OF SUBSTANTIALISM.

BY THOMAS MUNNELL, A. M.

The *Sartor Resartus*—the tailor-patched—of Thomas Carlyle, is a work of singular merit in a certain direction. No ordinary mind could have either conceived or written it. "The world in clothes and the world without clothes" discover a power to look into the substantial, given to but few that have devoted the stylus to things invisible. He sees all the forms of life, all the habits of society and all phenomena as the clothes of invisible forces—as the phenomena of the unphenomenal. As a fish leaps out of the water to return thereto in a moment, so the natural forces throw up all vegetable, animal and human forms to remain their little day and disappear forever. As for man, his form is simply "the Divine essence revealed in the flesh," who, "like a God-created fire-breathing spirit, emerges from the Inane, hastes stormfully across the astonished earth, then plunges again into the Inane." His "earthly vesture falls away," but "the lost friend is still mysteriously here." Time and space, our author considers, merely the unavoidable conditions of terrestrial thought, and that when we shall have passed into the presence of the One who "inhabits eternity" we shall, in a measure at least, lose our need of the *Where* and the *When*, because being lifted to God's Observatory and enabled to look out upon all space, the *Where* will no longer, as a mere locality, claim our attention; and when to some degree we inhabit eternity, the *When* as a mere point in duration will be of but little interest to us.

Reference so far is made to *Sartor Resartus* only because it has, although unwittingly yet definitely, pointed to the interminable range of the all-embracing doctrine of the *Substantial Philosophy*. The forms of Alexander, Sesostris, Cæsar, Napoleon, Wellington are but the "clothes" of the military spirit; Shakespeare of the dramatic; Homer and Milton of the poetic; while the dandy, the tailor and the banker are but projections from the great reservoir of spiritual forces from which all phenomena proceed, and into which all fall back at death. The process somewhat resembles the stormful photosphere of the sun, whose colliding waves are tossed up two hundred miles, and only fall and mingle again with the fiery fury of King Sol. So men, animals, plants and rocks are but bold reliefs of unseen forces and as transient as a vapor, for "what is your life? It is even a vapor that appeareth for a little and then vanisheth away."

This leads us to say that such insight into the invisible was not original with Mr. Carlyle. Paul was seventeen hundred years ahead of him when he said: "The things which are seen are temporal, but the things which are not seen are eternal," which tells of the decay of everything phenomenal—earth, air and sea, with all their varied tenantry, and of the substantial entity of all the invisible. The plant that is supported two hundred feet for two hundred years at last gives back to Nature's unseen reservoir of vegetable life the unseen power that supported it only to be used again a thousand times in expressing other forms of vegetable life, but the invisible power is never lost, wasted nor weakened. The Substantial Philosophy covers all this ground as well as all that is occupied by the natural forces which we call the laws of Nature. While the primary object of this new and triumphing philosophy is not to explore the world of spiritual entities, it has incidentally developed a remarkable parallelism between the two, and brought Nature and Christianity into a joyful proximity before unknown. Substantialism has no sympathy with Pantheism—"Whose body Nature is and God the soul"—but holds that God is in no way mixed up with the composition of matter, but as Creator stands far above all matter animate and inanimate, flesh and spirit. The soul of Nature, if it has a soul, consists in its invisible forces—magnetism, electricity, gravitation, cohesion and all the vital forces—but these do not constitute God. The unintelligent soul of Nature is very different from the intelligent soul of man, and certainly different from God. Substantialism deals chiefly with the former soul, but ran to the rescue of the latter when its very existence was doubted, assailed, and on pretended scientific principles denied.

In spite of Satan's cunning he often defeats himself, as when he worked the wave theory of sound to demonstrate materialism by illustrating the supposed molecular motion of the brain by the supposed undulations of the air. He did not foresee that he was waking up an enemy who would rush "stormfully" through all the materialistic theories of the day, whose "weapons of warfare are not carnal, but mighty through God to the pulling down of strongholds, casting down imaginations and every high thing that exalteth itself against"—the immortality of man. Prof. Hæckel has unconsciously been the cause of the most penetrating and merciless inquests ever held over the dead body of materialism—"the gospel of dirt." In this work the pen of Dr. Hall has been both caustic and kind, both sweeping and incisive; it has ranged the encyclopedias and yet has visited every cuddy in quest of scientific truth, dragging to light many a skulking error and exposing them to the reprobation of all true science. Until fifteen years ago what a chasm was felt to lie between the natural and the spiritual hemispheres, a gulf not only impassable, but without communication, without sympathy, or a connecting link of any kind, for the natural forces of light, heat and sound were mere motions, mere nonentities; but ever since Substantialism erected

them into substantive entities and made them a sort of bridge upon which thought might pass over to the spiritual world, Heaven has seemed not only much nearer, but a great deal surer. Between the great kingdoms of Nature there are no such inhabited chasms. The sponge is a connecting link between the animal and vegetable kingdoms, and the flying squirrel between "the creeping things" and "the flying fowls," and there should be none between the seen and the unseen.

"By faith we understand that the worlds were framed by the word of God, so that the things that are seen were not made of things that do appear."—Heb. xi; 1. In this passage Paul does not discuss the eternity of matter, but shows that matter in its present form is not eternal, for the worlds were "framed" out of invisible substances. That is, water, air, animals and plants were composed or framed by compounding them of their present chemical elements. The all-pervading oxygen has never been decomposed by any chemist, and probably never can be, because it is in all probability a simple element; so with hydrogen, and so far as the argument for a Creator is concerned, it can make no difference if all simple elements were from eternity, for it required a God to put them into their present forms the same as to create the elements themselves. The Atheist is compelled to hold that the present form of all creation is eternal, or else confess to an Omniscient Chemist who was able to compound them as we now find them; and Prof. Hæckel could as scientifically hold that all said elements are modes of motion or some other sort of nonentities as to teach that any of the great natural forces are such. But here comes the Substantial Philosophy to harmonize all parts of the universe, to make it all of a piece, to bring the entitative soul of Nature to the front and introduce it to the scientific world, to prove that thought, mind, spirit are entities that never can be destroyed, and so from a scientific view-point, "bring life and immortality to sight."

DR. GEORGE ASHDOWN AUDSLEY ON THE NEW THEORY OF SOUND.

[We take pleasure in copying the following from the Proceedings of the Musical Association, of London, England, as the commencement of Dr. Audsley's first lecture on the subject before a London audience. These arguments so familiar to readers of the MICROCOSM, must have had a strange ring in the ears of Londoners right at the very door of Prof. Tyndall.—EDITOR.]

What is Sound? The Substantial Theory *versus* The Wave Theory of Acoustics.

BY GEORGE ASHDOWN AUDSLEY, F. R. I. B. A.

It is perhaps a rather startling question to put to the learned and accomplished members of such an Association as this—What is sound? All your lives long you have doubtless held very firm and clear convictions on the subject of Sound; and have trustingly accepted the theory which has obtained, one may almost say, since the time of Pythagoras, and which has, in our day, been fostered by all the great acousticians, and dogmatically taught by Professors Tyndall, in England, Helmholtz, in Germany, and Mayer, in America.

Until I put pen to paper and issued my "Review of the Old and New Theories of Sound" in the pages of the *English Mechanic and World of Science*, it is not too much to say that the existence of a modern theory of acoustics was all but unknown in Europe; it certainly was never openly submitted to the consideration of the English public. I am well aware that its existence has been known for some years to the three great acousticians I have named; and that they have been challenged to refute it, or, in face of it, to substantiate their beloved wave or "undulatory theory" of sound, shaken to its very roots by the results of modern thought and investigation. Notwithstanding this challenge by scientists as worthy of respect as themselves, they have neither admitted their knowledge of the modern theory in any public manner nor have they refuted it or done anything, in the face of its teaching, to fix their own theory on an unassailable basis. Nothing but a curious silence has been observed.

Does any one present remember of ever having heard the professors under whom he has studied, or with whom he has come in contact during the last ten years, mention the fact that the truth of the wave theory was being seriously questioned, or that it stood in the slightest danger of being completely shattered? I have never met with an individual who has answered that question in the affirmative.

Well, I have ventured to come before you to-day, just to tell you something about this new departure in acoustical science, and to briefly argue the case between it and the time-honored and widely accepted Wave Theory of Sound. Let me ask, first of all, your kind and courteous hearing and attention, bearing in mind that such a discussion is nothing, and should be nothing, of a personal nature. I am going to consider simply a matter of science, as viewed under the obvious and natural phenomena of sound creation and propagation, and to endeavor to bring reason and common sense to bear on matters hitherto far too much dependent upon mathematical formula and misdirected and misconstrued experiments for their support.

To all musicians the subject is one of the deepest interest; and I can assure you all, that if the old wave theory, with all its mechanical impossibilities, is swept away, another will take its place of infinitely greater dignity and simplicity, for the musician will find his glorious art bound up with one of the great forces of nature, and in no way dependent upon a system of mechanically produced *sound-waves*, or a pulsatory motion of the air.

Let me say a few words by way of an apology for my appearing before you in the capacity of a speaker on the subject of acoustics. I am not altogether a stranger in this room, having had, during ths last session, the pleasure of reading a Paper on matters connected with the Organ. Well, my apology is this: For twenty-five years I have studied matters relating to sound and its phenomena, and during that time have read all the leading text-books and treatises on the science of acoustics which seemed to throw any light on the subject of sound. Further than that, I have ventured to close those books and to think for myself—a very sinful thing to do in the eyes of dogmatic teachers—and occasionally have been

rash enough, as some of my future remarks will show, to use the common sense the Creator has given me.

The result of this independent use of thought and common sense was a very strong doubt in the truth of the theory taught by our leading acousticians, and a very decided objection to their one-sided methods of conducting experiments in support of their views. How one-sided some of their experiments are, you shall have an opportunity of judging for yourselves. While in the midst of the fog of doubt and uncertainty raised by the bad habit of using my own judgment, I heard of the new theory of acoustics founded by Dr. A. Wilford Hall, of America. I need not assure you that I lost no time in making myself acquainted with his views, and testing to the fullest extent in my power the truth and reasonableness of the arguments advanced against the wave theory and in favor of his new hypothesis. Just as I had before, by the use of independent thought and common sense, doubted the truth of the wave theory, so did I now, by a similar process, accept the new or Substantial Theory of Sound as in all essentials reasonable, and compatible with the known and observed phenomena of sound. Subsequent study and careful investigation have convinced me that the wave theory is false and insufficient, and that Dr. Hall's theory is true.

This is the only apology I can offer for appearing before you on the present occasion, and for asking your kind and considerate attention to my following remarks. Whatever may be the fate of the theory I advocate, there is just one fact worthy of notice—namely, that you are listening to the *first Paper* on the substantial theory of acoustics ever read before a European audience.

I can not help realizing that I have undertaken a very venturesome task in essaying to prove, in one necessarily brief Paper, the falsity of the wave theory and the truth of the substantial theory of sound; and I need not assure you that I shall have to pass over much on both sides of the question which I should like to submit to your consideration, and which I am certain you would feel an interest in hearing and subsequently thinking out for yourselves. Perhaps, should my subject commend itself to your minds, I may be permitted at some future time to open it up more completely than it will be possible for me to do to-day.

It is advisable, for the sake of some of my hearers, and it is necessary for my present purpose, that I should briefly outline the teaching of the wave or "undulatory theory," as presented in the writings of our greatest authorities, and this I now proceed to do.

I presume no one present will object to my taking Professor Tyndall as the most trustworthy exponent of the science of acoustics as commonly accepted and taught; and I can fancy your saying, not only that he is perfectly trustworthy, but that it is a piece of presumption on the part of any one to call in question his teaching in the matter of sound. I shall have to do so, much to my regret, in a very decided manner, and supported by proofs.

According to this great acoustician, "The sound of an explosion is propagated as a *wave or pulse through the air*. This *wave* impinging upon the tympanic membrane causes it to shiver, its tremors are transmitted through the drum to the auditory nerve, and along the auditory nerve to the brain, where it announces itself as sound.

"A sonorous wave consists of two parts, in one of which the air is *condensed*, and in the other *rarefied*. The motion of the sonorous wave must not be confounded with the motion of the particles which at any moment form the wave. During the passage of the wave every particle concerned in its transmission makes only a small excursion to and fro. The length of this excursion is called the *amplitude* of the vibration."

From this statement it is obvious that the propagation of sound is solely a mechanical matter; whilst from the same teaching it might be argued that sound *per se* has no existence. We are apparently taught that what we know as *sound* is simply a sensation in the brain. We are distinctly told that what we realise as *sound* is caused by *waves* sent through the air by the purely mechanical action of a vibrating or exploding body, and by those waves striking upon our tympanic membrane and setting it into corresponding motion. Up to this point, however, and on this reading of Professor Tyndall's words, sound, as we know it, may be supposed to have no absolute existence; but when the vibrations are set up in the tympanic membrane are communicated to the auditory nerves, and by them conveyed to our brain, we instantly experience the sensation of sound. The definition of sound, as given by our leading acoustician, is certainly ambiguous; and one can almost sympathise with the American scientist, Professor Stahr, who, in criticising Dr. Hall's new theory, made the serious blunder of stating publicly in the columns of the *Reformed Quarterly Review* (July, 1883), that "sound is really a sensation, that is, the impression made through the ear and brain upon the mind."

Now it is quite certain that Professor Tyndall never intended to convey such an idea as this, for in doing so he would be laying an axe at the root of his favorite wave theory. This theory, as universally taught, says that sound is constituted of *air-waves*, each of which is formed of a condensation and a rarefaction of the air, not of a mental "impression" or "sensation" caused by such waves. As Dr. Hall, in replying to Professor Stahr's blundering attack, says: "We could quote a hundred passages from the highest authorities on acoustics to prove that (according to their wave theory) *sound* is that very *wave-motion* which travels through the air from the place of origin, or from the sounding instrument, to the ear and to the brain, where it terminates in producing the *sensation of hearing* as its effect. This *mental impression* is not *sound* at all, but is the final effect of sound upon the brain and mind. If it is ever called *sound* it is by a well-known trope called metonymy of speech, by which the effect is put for the cause. . . If sound is fundamentally but '*the impression made through the ear and brain upon the mind*,' then that which produces such 'impression' by beating against the tympanic membrane and bending it 'in and out,' and which travels several miles from the sounding body through the air in the shape of 'condensations and rarefactions' as the wave theory teaches, is not sound at all."

Professor Tyndall says, in commenting on one of his illustrative experiments: "Thus,

also, we send sound through the air, and shake the drum of a distant ear." He does not say, as Dr. Hall points out, "Thus do we send the *mental impression* through the air, and shake the drum of the distant ear, when the ear has first to be shaken, according to the wave theory, before the *mental impression* can exist!"

It is to be regretted that Professor Helmholtz is not much clearer in his language than our English scientist, for he says: "The motions proceeding from the sounding bodies are usually conducted to our ear by means of the atmosphere. The particles of air must also execute periodically recurrent vibrations, in order to excite the sensation of a musical tone in our ear. This is actually the case, although *in daily experience sound at first seems to be some agent, which is constantly advancing through the air and propagating itself further and further.*" It is a pity, for the sake of science, that this celebrated acoustician did not pay closer attention to the "daily experience" he acknowledges; for had he carried the thought that sound "seems to be some agent which is constantly advancing through the air" to its logical conclusion, little would, in all probability, have been left for Dr. Hall to do in connection with acoustical science; and his great work, "On the Sensations of Tone," as the scientific world knows it, would never have been written.

Professor Helmholtz, alluding to the "propagation of the sonorous tremor, and the "constant attraction of fresh particles into its sphere of tremor," says: "This is a peculiarity of all so-called *undulatory motions*. Suppose a stone to be thrown into a piece of calm water. Round the spot struck there forms a little ring of wave, which advancing equally in all directions, expands to a constantly increasing circle. Corresponding to this ring of wave, sound also proceeds in the air from the excited point and advances in all directions as far as the limits of the mass of air extend. The process in the air is essentially identical with that on the surface of the water. The crests of the waves of water correspond in the waves of sound to spherical shells where the air is condensed, and the troughs to shells of rarefaction."

If time would permit I should like to follow Helmholtz through all his elaborate comparison between the behavior of water-waves and sound-waves; but I must content myself by saying that after years of careful study of his teaching, I most unhesitatingly affirm that no thorough or logical comparison can be instituted between the behavior of *water-waves*, however generated, and the behavior of *sound* as known to us by "daily experience."

Now, by the aid of a simple diagram I have prepared, I shall be able to convey to your minds some idea what sound-waves are supposed to be, according to the teaching of Professors Tyndall and Helmholtz.

The diagram, Fig. 1, shows a tuning-fork, A, such as one of the large Kœnig forks on the table; and its prongs are shown advancing —"swiftly advancing," according to the usual expression found in acoustical text-books; how swiftly it will be my duty to state presently—and extending from one of its prongs is delineated a broad-shaped band, intended to convey a graphic idea of the *sound-waves* sent off by the mechanical action of the prong into the surrounding air. How does the tuning-fork produce sound? I shall endeavor to give you the rational explanation shortly; but, in the meantime, let me give you the

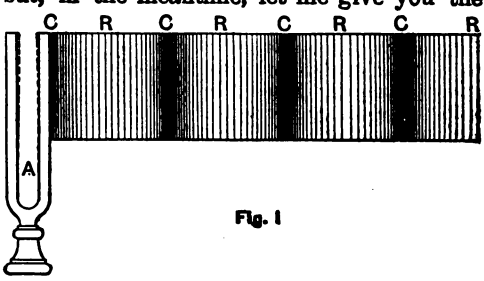

Fig. 1

wave-theorist's version of the matter. We are told by Professor Tyndall, if we want to understand this question and "to picture to ourselves the condition of the air through which this musical sound is passing," we must "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 by every subsequent advance and retreat. The whole function," continues the Professor, "of the tuning-fork is to carve the air into these condensations and rarefactions, and they, as they are formed, propagate themselves in succession through the air. A condensation with its associated rarefaction constitutes a sonorous wave. According to this teaching, and it fortunately is perfectly explicit, the whole function of the tuning-fork, with its prong "swiftly advancing," is to carve the air into condensations and rarefactions. In our diagram, the condensations are indicated by the darker shadings, at C, C, C, C, whilst the lighter portions, at R, R, R, R, represent the rarefactions. The sound-wave is measured from condensation to condensation—from C to C.

To give full weight to what I have to say on the tuning-fork, it is necessary for me to add here a few words by Professor Helmholtz on this important acoustical instrument. He says: "Take a pendulum, which we can at any time construct by attaching a weight to a thread and setting it in motion. The pendulum swings from right to left with a uniform motion uninterrupted by jerks. Near to either end of its path it moves slowly, and in the middle fast. Among sonorous bodies, which move in the same way, only very much faster, we may mention tuning-forks." Now I must ask you to remember the two expressions used by Professors Tyndall and Helmholtz in speaking of the purely mechanical action of the prong of a tuning-fork. One speaks of the prong "swiftly advancing," and the other speaks of its moving "very much faster" than a pendulum. Of course, these scientists well know that the prong of a tuning-fork must advance swiftly and must move very much faster than any pendulum ever constructed, before it can "compress the air immediately in front of it," and "carve the air into condensations and rarefactions," which will create *sound-waves* and send them off in all directions at the velocity of 1,120 feet a second to "shake the drum of a distant ear." But neither of these teachers gives us any idea of what he understands the speed of the vibrating prong to be; and this is just a slight omission, for it is an important matter, as I shall now attempt to show.

In the first place, let me point out to you the clear teaching of the wave theorist with reference to the action of the tuning-fork in producing sound—he distinctly implies, if he does not put it in hard words, that nothing issues from the vibrating steel itself, yet he calmly speaks of it as a "*sonorous body.*" Would not it be more logical to call it simply a *vibrating body*, seeing that it has to do mechanical work in *condensing* and *rarefying* the air and sending off *air-waves* at the velocity of, say, 1,120 feet in a second, before what we know as sound is created? Now let us lay aside these views of others, and do a little calm thinking and testing for ourselves. Here is a tuning-fork yielding the note C of 256 vibrations a second. What does it teach the careful experimenter, the unprejudiced reasoner, and the student given to using his common sense? It teaches him that whilst it pours forth a beautiful sound, it is as incapable of condensing the air in front of it, and of sending off air-waves about 4 feet 4 inches long, at the uniform velocity of 1,120 feet a second, as a morsel of fluttering gold leaf. This statement doubtless surprises you, but what I am now going to add will probably surprise you still more.

This fork when properly bowed will continue to pour forth audible sound for a little over four minutes. The sound, as you know, gradually decreases until it is inaudible to the ear, and this decrease of strength is in accordance with the uniformly diminishing swing of the fork's prongs.

The remarks I am now going to make on the fork's vibrations are based on the experiments carefully conducted by Captain R. Kelso Carter, late Professor of Higher Mathematics at the Pennsylvania Military Academy. Captain Carter used a Kœnig fork precisely similar to the one on the table. To one prong he attached a fine recording point; and then by drawing the fork whilst in vibration over a piece of smoked glass, he secured an accurate register of the swing of the prong during one minute; then, from a number of exceedingly careful measurements made with a powerful microscope, and by the aid of a micrometer showing the 100,000th of an inch, the following results were obtained:

	Amplitude of Swing.
After striking	.... $\frac{1}{20}$ inch.
„ 15 seconds	.... $\frac{1}{100}$ „
„ 30 „	about $\frac{1}{200}$ „
„ 45 „	„ $\frac{1}{400}$ „
„ 60 „	„ $\frac{1}{500}$ „

The greatest care was used to strike the fork each time with the same force; and a number of trials were made, and the lines traced were patiently measured under the microscope.

Describing his experiments, this scientist remarks: "Before closing the experiment I measured a number of traces made when the fork had been sounding for some time, and the vibrations were entirely invisible to the naked eye. The one I will here record was carefully measured under a powerful glass, which plainly showed the waves in the trace. And let it be particularly noted that in this case the fork continued to sound audibly *after* marking the trace upon the glass, though much of its vibration was checked in making it. The amplitude measured was $\frac{1}{17,000}$th of an inch, which is precise to at least $\frac{2}{100,000}$."

Now, accepting this measured amplitude of the fork's prong whilst sounding audibly, we find, as the prong vibrates 256 times in one second, that the entire distance travelled by it in one second is $\frac{256}{17,000}$ths, or, say, $\frac{1}{66}$th of an inch, or $\frac{60}{66}$ths of an inch in a minute of time.

From the general rate of decrease, which may be fairly assumed from the measurements taken during the first minute of the fork's vibration, we may assume that the prong had been vibrating about two minutes when it recorded the complete swing of the $\frac{1}{17,000}$th of an inch. Should we think it necessary to run the calculation down through the full four minutes which the Kœnig fork continues to send forth audible sound, we may reasonably assume that at the end of that time the fork prongs are swinging through a distance of about the $\frac{1}{4,000,000}$th of an inch, or about the $\frac{1}{15,000}$th of an inch in a second of time.

It is quite unnecessary, however, to go one step beyond the measured swing of the $\frac{1}{17,000}$th of an inch, for, surely, there can be found no one with common reasoning powers who will maintain that a fork-prong travelling at the rate of only $\frac{1}{66}$th of an inch in a second can carve the air into sound-waves, or air-waves, formed of condensations and rarefactions; and that in moving at each swing the $\frac{1}{17,000}$th part of an inch in the 256th part of a second can send off such waves, measuring about 4 feet 4 inches from condensation to condensation, at the uniform velocity of 1,120 feet in a second of time.

Now you will remember that Professor Tyndall, in speaking of the action of the tuning-fork, says: we must "imagine one of the prongs of the vibrating fork swiftly advancing;" and then he asserts, "the whole function of the tuning-fork is to carve the air" into sonorous waves, consisting of condensations and rarefactions. Can he, when he put these remarks in his well-known text-book, have been aware of the almost infinitesimal motion of the prongs whilst still sending forth audible sound—motion absolutely incapable of disturbing the air even to the distance of one inch from the prong? Surely not; for had he been aware of the facts of the case he could never have used the words "swiftly advancing" with reference to a body moving almost too slowly to be realized by the mind.

(To be continued.)

THE SOUND CONTROVERSY.

BY REV. J. W. ROBERTS, F. S. SC.

It is natural to presume that every reader of the MICROCOSM has been deeply interested in the discussion of the sound problem on the basis of the squares of distances. Certainly Dr. Hall has ground that theory to powder, and it must be relegated to the garret where antiquated fallacies are collected and laid among the accumulated cobwebs of centuries.

While the theory and the law as laid down by Tyndall are blotted out on their own ground there remains a fact which is to be accounted for, namely, that sound does decrease by some law of ratio as it moves out from its source, or the point where it is set free. This part must be taken into account whether the wave-theory or Substantialism be true. That the theory of the square of the distance being the measure of the ratio of decrease in sound is absurd has been too clearly shown to be

further considered. What, then, is the true theory of decrease?

Possibly it may be difficult to state the fact in words, but leaving out the words "the square of," may we not simply say according to the distance or, for the purpose of distinction only, say in the ratio of the *length* of the distance instead of the *square* of the distance. It was t express this idea that the writers resorted to fractions in the controversy. If Prof. Tyndall should revise his law and place it on this basis, it would seem less ridiculous; and had he done it in the first place, it would have saved him and his theory from the crushing process of going through Dr. Hall's mill.

This suggestion is thrown out for consideration, not as a theory, but as a possible elucidation of the matter.

Oskaloosa, Kansas.

THIS NUMBER CLOSES VOLUME VII.

BY THE EDITOR.

In taking a retrospect of the MICROCOSMIC year now closed, we see much upon which to felicitate both ourself and our readers.

True, the tide of financial prosperity had already set strongly in our favor at the commencement of this volume a year ago, in consequence of the unparalleled business success of our Health-Pamphlet. But favorable as the prospects then seemed as to permanent success in a business way, much of our future hung trembling in a balance of uncertainty, for reasons not necessary here to relate. These reasons have since dissipated; and as the Seventh Volume advanced the hopeful portents of a grand future became assured realities, while the sun of Substantialism has never seemed to shed his rays so effulgently and so lavishly as from that time up to the present.

True, the very prosperity that attended our business efforts, in connection with the extension of the circulation of this journal, was in a reflex sense somewhat against the journal itself as a literary, scientific and philosophical visitor to the homes of its subscribers.

In the midst of so much exciting business, with thousands of letters daily emptied from the mail-bags upon our little office table, and with all the mass of correspondence necessarily involved in such a prodigious mail passing through our hands, it was not otherwise than to be expected that some editorial dereliction must occur from month to month.

Still we fancy, in our hasty retrospect of the year just ended, that the impartial and competent reader will be surprised rather than otherwise, that so much and so varied original discussion could issue from our single pen in the midst of the hurly-burly of such an exciting year. And although the business campaign it has developed is not yet ended by a long ways, nor is the golded harvest it has sown anywhere near garnered, yet we see a glimmering prospect for more rest and a greater chance for editorial work, by which we may hope to enrich the pages of the MICROCOSM, than have fallen to our lot during the past eighteen months.

During these busy months not only have our own hands almost constantly been occupied in manipulating the reins of such a circus-team as never before was driven on this continent, but those of our Associate Editor as our business manager have been even more occupied if possible than our own with the innumerable side-shows that have grown up in all directions in the shape of more than five thousand general and local agencies in every state and territory in the Union.

These agencies and their accessories have so monopolized his time that he has been almost a forced cipher as an associate in the editorial conduct of this paper, though he has given an occasional dash of his genius that shows what may soon be expected when this Health-Pamphlet campaign is over.

Volume VIII. will begin at once, and without any flattering or extravagant promises of wonderful developments to be looked for, we confidentially venture to whisper into the ears of our old friends that the half has not been told them! Let those who want to act on this hint and keep posted in what Vol. VIII. is to unfold, send on their renewals at once, and we plight our faith on a pledge of all the honor we possess that no person can intelligently read through the coming volume without receiving at least the full value of the subscription price—fifty cents.

We will add, that Vol. VII., now closed, will immediately go to press in a large edition to be bound substantially in cloth, uniform with the preceding volumes—price $1 by mail postpaid. As a special inducement for every subscriber to add this bound volume to his library of Substantialism, we now offer to each person who will send $1 for Vol. VII. bound, the next volume (VIII.) free of charge. This offer applies to everybody; so let every subscriber and reader call the attention of his neighbors and friends to the liberal offer.

AN APPEAL TO TEACHERS OF SCIENCE.

BY PROF. ALONZO HALL.

Looking through the "Problem of Human Life" the other day, I was greatly impressed with the nicety of detail shown by Professor Tyndall in his celebrated tin-tube experiment in favor of the wave-theory.

How much valuable time and scientific acumen the great physicist has wasted, by embodying so many experiments which, like the one mentioned, become laughably absurd when subjected even to casual criticism! (See the "Problem of Human Life," page 270.)

I fear it will be a hopeless undertaking to

try to induce a physicist who has ever written concerning sound-phenomena to consent to take part in an impartial analysis of any of the experiments or claimed demonstrations so elaborately illustrated in his published works. Indeed, we have ample proof of this every day, as witness the text-book on "Physical Science," by A. P. Gage, Ph.D., of Boston. It is a late work, published in 1888.

It is unreasonable to suppose that Dr. Gage and his assistants—Dr. Hastings of New Haven, and Professor Holman, of the Mass. Inst. of Technology—had never heard of Wilford Hall or the doubts suggested by him concerning the very demonstrations copied by these scientists from their masters' works. In spite of Dr. Hall's exposure of the tin-tube, clapping books, smoke of brown paper and candle absurdity, in one of Prof. Tyndall's demonstrations, these exact and honest experimenters incorporate this very tube, book, smoke and candle experiment bodily into their text-book for the use of high schools! The engraving is an improvement on the original in Tyndall's book. The tube lays on the table, the large end near one edge and the smaller end projecting beyond the other edge of the table. The accompanying text reads as follows: "May not air and other gases, which are elastic, serve as media for waves?" "Experiment 194.—Place a candle flame at the orifice *a* of the tube (Fig. 215), and strike the table a sharp blow with a book near the orifice *b*. Instantly the candle flame is quenched. The body of air in the tube serves as a medium for transmission of motion to the candle." "Was it the motion of a current of air through the tube, a miniature wind, or was it the transfer of a vibratory motion?" "Burn touch-paper at the orifice *b* so as to fill the end of the tube with smoke, and repeat the experiment. . . The candle is blown out as before, but no smoke issues from the orifice. . . The candle flame was struck by something like a *pulse* of air, not by a wind."

In a foot-note, explicit directions are given for preparing touch-paper, so it is evident that the pupils are required actually to perform the experiment.

The dear children have too much respect for the authority of their masters not to perform the experiment and accept without question a demonstration invented by a Tyndall and transmitted by a ——Gage.

Is it not marvelous that scientists as cultured as Drs. Tyndall and Gage had not suspected that it would require a dozen or more claps of the book at the large end of the tube to force the smoke of the paper its entire length, and cause it to be emitted in puffs from the small end? And is it not equally marvelous that it never occurred to them to remove a section of the small end and insert the smoking paper there? Or did they suspect that their highly scientific experiment would have been exploded by exhibiting to the class of students puffs of smoke emitted from the small orifice every time the book was struck against the table? That such would have been the fact any student trying the experiment can demonstrate.

Had any of these students shown the temerity of suggesting the holding of a tissue paper bag over the small end of the tube to see it swell out with wind as the book was clapped, or that the smoking paper be put in the far end of the tube, or of using a gong instead of the wind-producing book, he would have been subject to severe discipline for attempting to confuse and interrupt the teacher. The knowledge must come to the pupil in a sort of red-rape apostolic succession way, from Tyndall to Gage and Holman, and from them to the licensed teacher, and so down to the pupil.

Teachers who have classes in physics and are readers of the MICROCOSM are sadly handicapped in their calling. One good man told me that so long as there is not a regularly "authorized" text-book on the substantial theory of sound, he is compelled to teach the old theory, though incidentally he gives a synopsis of the substantial view, and tells his pupil to do his own thinking and take his choice.

After the student has received his diploma with such advice, if he be a thinking man, would it be surprising if he should come to doubt the reliability of so-called authority on the physical sciences?

How is it possible ever to induce these great authorities to cease stopping their ears against any objection to or criticism of their method of illustrating a philosophical truth or accounting for observed facts in acoustics, and instead of republishing their careful blunders, to candidly investigate the objections raised, and show them to be untenable, or else, like the honest scientists they claim to be, acknowledge the truth as gracefully as they can?

The substantial theory of sound propagation must surely yield to the wave-theory, if no more than two of the latter's experiments shall prove to be perfect demonstrations.

First, Do two sound waves of the same amplitude of vibration, the same rate and so, of the same length, when in phase of opposition *ever* produce silence?

Second, Can the air-wave generated by an explosion of gun-powder, by any demonstration, be shown to be identical with the sound-pulse incident to the explosion? Will a person remote from the center of explosion feel the shock and hear the sound at the same instant whether near to or distant from the center?

Scientists have *always* failed to answer the first question in the affirmative, and so far as I am aware, have never tried to demonstrate the affirmative of the second question.

Professor Tyndall makes no distinction between the air-wave and sound-pulse in a magazine explosion. In referring to the effect of such an explosion on the church at Erith, in 1864, he says: "Every window in the church, front and back, was bent inwards. In fact, as the *sound-wave* reached the church it separated right and left, and for a moment the edifice was clasped by a girdle of *intensely compressed air.*"—Lectures on Sound, p. 23.

In the "Problem of Human Life," p. 104, the author gives a fine analysis of the philosophy of magazine explosions, and shows clearly and logically that while the sound-pulse travels from the center of explosion at a uniform rate the *air-wave* generated, outstrips the sound-pulse at first and its speed, from the very nature of things must get slower and slower. This is capable of complete demonstration by actual experiment, and if possible, a party of say six scientists, three of the motion school and three friendly to Substantialism should at once arrange the details for the experiment and record the results.

There are, no doubt, towns in the United States, where new systems of sewers are being constructed, and it would be a simple matter to utilize a line of newly laid mains through which to record the velocity of waves caused by explosions at one end. In Los Angeles there are several lines of thirty inch mains made of *terra cotta*, in which a stretch of one and a half miles would be available. If a small quantity of powder should be exploded at one end of such pipe two miles long, would any wave theorist dare predict that a candle flame at the other end would be affected at exactly the same instant that the sound will be heard? Scientists of any school should be only too anxious to give a true explanation of a physical phenomenon.

Tyndall says: "The desire for anything but the truth must be absolutely annihilated; and to attain perfect accuracy no labor must be shirked, no difficulty ignored." "The true *physical philosopher* never rests content with an inference when an experiment to verify or contravene it is possible."

The physical philosophers who are resting so contentedly with these possible demonstrations begging to be investigated, are hardly of the true type.

Substantialists should wait no longer for such men as Professors Gage and Holman to attempt a verification of their theory; for when an author will deliberately republish an illustrated experiment as if no objection had ever been made to it, years after the exposure of its absurdity had been published to the world, little can be expected from him in the way of verification or contravention. The time has come when the true substantial philosopher may come to the front and properly do what the wave-theorist is undoubtedly afraid to undertake.

The wave-theory of acoustics teaches that sound extinguishes a candle, breaks the windows of a church and collapses buildings. As a teacher I protest against such nonsense any longer being taught as science.

Did the Sun and Moon Stand Still at Joshua's Command?

BY THE ASSOCIATE EDITOR.

If we had been asked to name the Scriptural problems which would be deemed most incompatible with our present stage of scientific advancement, we could hardly have mentioned any accounts more thoroughly misunderstood and rejected, even by biblical critics, than Joshua's long day and the turning back of the sun as indicated by the dial of Ahaz in the time of Hezekiah, as recounted in Isaiah xxxviii., as these accounts have always seemed to be in direct antagonism to our universally accepted laws of astronomical science.

But notwithstanding the general timidity with which these subjects are discussed, there is an author, in the person of Lieut. C. A. L. Totten, of Yale University, bold enough to take the matter in hand and claim ability to demonstrate mathematically, astronomically, chronologically and historically that these two mooted occurrences are verified as recorded to their most minute particulars.

We believe that the general doubt with which these records have been assailed, was largely due to the language of the writer who definitely and unequivocally narrates the *standing still* of the sun; this language our author does not pretend to defend, so far as it intimates the motion of the sun relative to the earth, as this would mean a complete overthrow of the present science of astronomy, which is not now disputed by any honest, intelligent man. It was generally understood that the acceptance of the miracle as recorded would require the re-establishment of the Ptolemaic system, and even under this system much would not be gained, as a miracle would just as much have been necessary in the stoppage of the motion of the sun around the earth as in the opposite requirements of the Copernican system, so that even the acceptance of this exploded system would not prove of any more value in a natural explanation of the prolonged day than the modern system, the only advantage being that admitting the manifestation of Divine power in the stoppage of the motion of some body, its system would require the stoppage of the sun, and would thus be more in harmony with the *literal* record. But Lieut. Totten, being thoroughly satisfied of the truth of the present system of astronomical science, and having at the same time implicit faith in the reliability of the Scriptural record notwithstanding their apparent contradiction, sought a novel but perfectly reliable method to prove the accuracy of the Scriptural record and its complete harmony with accepted scientific data. His method of proving the reality of the phenomenon of the prolonged day, which he declares to have lasted just 47⅓ hours, is first from secular history handed down from Greece, China and Egypt, the only nations at that time who made observations or who were capable of preserving a record of extraordinary occurrences, and each of these nations, he claims, has a distinct account of an extended day, and at about the same time as the sacred record preserves it for Joshua's campaign, which he identifies as 2555 A. M. of the Hebrew calendric year.

Astronomically and chronologically he asserts his proof to be irrefutable, as it coincides exactly with all the records and calculations made for eclipses, both solar and lunar, which have occurred since that time to the present day, while he also claims as an astronomer that in all the present calculations of the science which are compared with those of times previous to Joshua's account there is a void of 23⅓ hours, concerning which "astronomy is *dumb* and will be dumb forever," therefore by this virtually proving that there was a stoppage of the motion of the earth and moon for the space of 23⅓ hours some time in the history of the universe, and this time Lieut. Totten very reasonably claims to be satisfied better by the Scriptural account of the occurrence at Beth-Horon than by any other assumption.

The turning back of the shadow of the sun on the dial of Ahaz, he claims has exactly rectified our astronomical day by causing a retardation of the sun's disappearance below the horizon of exactly 40 minutes, which added to the previous retardation of 23⅓ hours, at Joshua's command, makes two complete days, and thus allows our day to begin at the same time as previous to the interference with the ordinary process of motion. It has also added to the disturbance of our astronomical calculations by forty minutes, making the whole discrepancy from the two occurrences just two days, which difficulty our author states is recognized by mathematicians.

It will be seen from this, that no attempt is made to prove the occurrence from an orderly or natural working of physical laws but, on the contrary, that it is regarded as a miracle in the fullest sense of that term, the reality of which the author endeavors to demonstrate by proving its harmony with accepted astronomical calculations, and by showing that in these astronomical mathematics there is a mystery or void which can only be satisfied by some such phenomena as the inspired writers record.

Not having followed out the calculations which the lieutenant claims to have made privately, nor having yet investigated the statement that there is a void or gap in astronomical science of 24 hours, which yet remains to be filled, we are at present not prepared to indorse all that is said on the subject, but the work of Prof. Totten is in the right direction, and he deserves the encouragement of every honest investigator after truth. It is an easy matter to appreciate the value, of an irrefutable demonstration of a positive miracle, to the cause of Christianity; and it is also apparent that the consternation hurled into the kingdom of scientific infallibility would be appalling, should the claims of this assiduous investigator be verified, for if one miracle can positively be proven to have actually occurred, what scientist will have the assurance to deny the possibility or even probability of others.

If Prof. Totten shall succeed in positively proving that in astronomical calculations there is a void of twenty-four hours to be satisfied, and thereby virtually proving the stoppage of planetary motion as well as the action of the force of gravitation for that length of time, he will have made a discovery greater than ever yet recorded by human pen.

His book, however, is not a satisfactory production, either for the ordinary reader or for the critical investigator, and for this the author apologizes, declaring that in his haste to get the facts into the hands of his readers, they received little embellishment from his own. The book and the subject are worthy of a better presentation, and we should be glad to have the author assume the task, and thus do himself justice.

HEAT AND MOTION.

BY REV. J. W. ROBERTS, F. S. SC.

It is certainly time the scientific and philosophical world should cease to teach as truth improved theories which can not possibly have any foundation in the facts of nature. One of these unproven and unprovable propositions is put in terse form in the text-books, and is expected to be accepted as truth by all students, namely: "The essence of heat is motion." Dr. Joule's "mechanical equivalent of heat" is relied upon to prove this proposition. By a series of most careful experiments, varying from zero to 100° Fahrenheit, the writer has demonstrated beyond the possibility of doubt that Joule's equivalent is entirely unreliable and utterly worthless as proof of the identity of heat and motion, or as the exponent of the true relation existing between heat and mechanical effort. In a word that there is no such thing as a "mechanical equivalent of heat," and that Joule's experiments and all others like them fail utterly to establish any such fact, and are valuable only for other purposes. These experiments, running through years, with other most important facts and discoveries, are in course of preparation for the press, and will be given to the world ere long in authentic form. In connection with them stands this logical argument, based on fact, Joule's experiment, and the heat and motion theory.

"The unreliability of this theory of the equivalence of heat and mechanical exertion is clearly manifest from the following considerations:

"It is claimed as demonstrated by the most careful experiments, conducted by the first and foremost scientific investigators of Great Britain, as already shown, that the mechanical equivalent of a degree of heat is 772.43 pounds. In other words that 772.43 pounds of mechanical energy is equal to one degree of heat, and that the two are interchangeable. Now every theory must be consistent with itself and with the facts, and especially the facts which it is intended to explain and elucidate. As Professor Huxley well says: "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 mean merely 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 negativing the hypothesis as five hundred." Now for the test.

"It is known that many other substances require more 'mechanical heat,' to use a term expressive of the theory, to elevate their temperature than does water. Among these are marble and various kinds of stone or rock. But for the present purpose we will take water as the standard of measurement, because more care has been bestowed upon it to secure accurate results than upon any other substance. Leaving off the fraction and taking the whole numbers we have 772 pounds as the mechanical force necessary to raise one pound of water or stone one degree in temperature. By actual experiment we have ascertained that by natural processes only, the temperature of a rock has been raised 50° in twelve hours. What, then, are the facts, if the theory be true and the temperature is raised by motion in the shape of mechanical energy put forth by the molecules of the rock in their assault upon each other? Simply these: Fifty degrees multiplied by 772 gives 38,600. That is we have one pound of rock exerting a mechanical force equal to 38,600 pounds! Does not any person capable of placing two facts or philosophical propositions in consecutive order know that such a result is as impossible as that an idiot shall create a world, or a tortoise carry the earth on its back? The very statement of the case in its barest outlines is its most overwhelming reputation.

"But again: Does not every person who understands the first and rudamental principles of mechanical force know that 38,600 pounds of such force would crush a pound of stone into atoms as fine as the dust of the threshing-floor? Nothing can be more manifest than this.

"Here, then, by two simple and indisputable tests the theory of the equivalence of heat and mechanical energy and the identity of heat and motion is proved to be false, and never should be taught another day in any school on earth.

"There is still another test equally simple,

and entirely conclusive. It is this: If the action of the molecules upon each other produces heat, then the accumulation of material in which this action is proceeding ought to produce an elevation of temperature at the point of accumulation, just as the keeping together of embers augments the heat at the spot where they are brought in contact. But no such result follows. It seems like confessing a piece of folly, but we tried the experiment by collecting into a heap a number of scattered stones. When so collected and placed carefully together as embers would be, there ought to have been a local increase of heat, if the theory be true that these were all creating and sending off heat by the mechanical action of their molecules; and especially if one pound of stone could produce heat equivalent to 38,600 pounds of mechanical force, that this accumulation of a hundred pounds of stone ought to have resulted in the accumulation of 3,860,000 pounds of mechanical force, or 512 degrees of heat enough to cause a conflagration. But not the slightest change in the temperature was perceptible; it remained precisely as when each stone was by itself, scattered rods away from its fellow stones.

"Here we have these facts, either one of which is conclusive, that the theory of the equivalence of heat is motion, or that 'the essence of heat is motion' is not true. As Huxley says, any one of these would disprove the hypothesis as definitely as five hundred, yet cumulative testimony is sometimes required, and is always desirable where it adds strength to the cause of truth.

"These logical results, taken in connection with the experimental demonstrations which accompany them, put the question at rest beyond reasonable doubt or equivocation."

Oskaloosa, Kansas.

THE ANNULAR THEORY.

BY PROF. I. N. VAIL.

No. 10.

The fact that we have here in these ancient records the assurance that a change in climatic conditions in the very cradle-time of the human race had taken place, is highly significant, though it has scarcely claimed a moment's thought from the ablest critics and commentators. We can not avoid the conclusion that if naked man began to wear clothing, of even the rudest description, it was to protect himself from invading cold. But why should a rainless, green-house world grow cold? Simply because it was a physical necessity, just as it was through all the geologic ages! The very canopy that insured a world of perpetual summer, while it existed, necessarily produced refrigeration as it declined. Why have we here this remarkable dove-tailing and harmony of evidence?

While, as I claim, it would be impossible for the infant race to dwell naked on the earth, unless it were protected by annular vapors, it would be likewise impossible for those arching vapors not to fall and send their chilling influence over the earth. But this they could not do without depriving man of his Eden home; and when I now turn again to this remarkable narrative and am told so positively that *man* was now thus deprived, I am again forced to admit the influence of annular conditions, the very same changes, produced by the very same causes, as obtained all through the carboniferous, cretacous and tertiary ages. Now, it is plain to be seen that all these circumstances are mutually co-linked and dependent, and thus emphatically self-corroborative; and under the wing of the annular they acquire invincible force. Was it happy chance-work that told us there were "waters above the firmament," so that all these varied and intricate changes should harmoniously occur? Those waters, thus located, necessarily produced an Eden world, necessarily fell and chilled the same, necessarily banished man from Eden; and if even one of these changes had not occurred, the whole of Eden's narrative would have been vitiated and worthless.

Let us pause and for a moment survey the ground we have passed over. What would have been the fate of the annular theory if these several conditions and phenomena had been reversed? Suppose the sun had been mentioned as a conspicuous object in the "*beginning*?" In that case not one of the succeeding conditions could have existed. Neither the firmament-waters, nor the subsequent sideral, solar and lunar lights, nor the Eden clime, nor naked man, nor his expulsion could have occurred. Suppose that on the "*fourth day*" the *sun* and the *moon* came into view instead of the "lights," and the narrator had so recorded it, what meaning could there be to the rest of the narrative? The rainless earth would then have been a physical impossibility, and all the conditions and changes in Eden would be relegated to the realm of fable.

With the earth's annular waters, visible on high, as the foundation stone of the narrative before us, I defy any man to find one particle of inharmony or false philosophy in it.

Now let us look a little more critically into this climatic change and Eden's expulsion. If my theory be true (which this harmony of facts proves to be the case), it is plain that Eden was produced by a tholoform expanse of vapors that shut out the *direct* light and heat of the sun. But this forces us to the conclusion that these Edenic conditions could not retire only as the sun's direct light and heat, as at the close of every former ring-fall, began to return. If the sun's absence made Eden, its *return unmade it!* In other words, it was the returning sun's fiery light which was made the *physical* cause of man's expulsion; consequently, the presence of his fires is the only possible *physical cause* that can prevent him from *going back into Eden*. If the sun of this age should again go back behind a tholoform arch-way of vapors, Eden with all its accompaniments would return, and man would go into it again.

But the narrative states that man was prevented from going back into Eden by a fiery or "flaming sword." Then Eden's flaming sword was the returning sun, beaming through the *thinning* vapors. But if the world had grown cold from falling vapors, the canopy *had become thinner*. Consequently, the *sun was* returning, and his fires becoming more dominant. In other words, the climatic change links in eternal harmony with Eden's guarding sword. We can not reject these *physical* causes, that made a *physical* Eden, and expelled man therefrom, and kept him out of it. If there be even a lingering doubt of the legitimacy of this conclusion, we will

expel it by a more rigid examination of the account.

In the first place that sword was held over Eden by *cherub* hands. But modern researches have put it beyond dispute that the Hebrew cherub was the same as the Egyptian and Assyrian *mythological Genii of the solar flames!* The same as the Kerubi of the ancient Assyrian records, so intimately associated with heliolotry. In order to represent them their worshippers painted them, and sculptured them on temples, monuments and doorways of tombs, *as the sun with wings!* So that from the fruitful realm of mythology, the Cherubim of Eden are shown to be solari-annular phenomenæ. As the canopy grew thinner the veil-piercing beams were veritable flames amid the glowing vapors, more and more imposing and threatening, and coming, too, at the very time that Eden was seceding from the grasp of man, how could he otherwise look upon it than as a "flaming sword," wielded by the agents of Deity, to drive him from his Eden home and guard its gates?

The fact that this sword was a "flaming one" must settle this question! Day after day and year after year this agent of Deity came from the "East" in its diurnal beat, guarding the life-giving tree—the environment of Eden. It guards it to-day, as it did then, and so long as it treads the skies, and turns "*every way*" over the heavens, man can not approach it.

Again, that new-born sun, veiled in the shining vapors, was attended by a flaming halo, that is, a "sword that turned every way," and when we are told that the sword of the cherubim turned every way, we are told that it was *circular like the halo.* And if it was both "flaming" and "turned every way," what else could it be?

Thus, viewing this remarkable narrative from any side, we are continually made to face the most positive annular features. If I desired to invent cosmological ideas in harmony with the annular theory, I could scarcely produce anything more complete and satisfactory than that found all through the first eight chapters of Genesis. It is a record of truths that no man can begin to shake.

Elsinore, California.

OUR SCIENTIFIC LIBRARY.

Since the "Problem of Human Life," our first scientific book, was issued, we have published nine other volumes, making ten in all, bound substantially in cloth, namely:

1. Problem of Human Life	$2.00
2. Six volumes of MICROCOSM	8.00
3. Two volumes of Scientific Arena	2.00
4. Text-book on Sound	50
Total	$12.50
All these volumes will be sent by express for	6.00
Or by mail, prepaid, for	7.50

We make this offer at actual cost for the purpose of spreading a knowledge of the Substantial Philosophy. Vol. VIII., MICROCOSM, now completed and bound, will be added to the above library for $1 extra.

☞ Since the notice, a few months ago, that the editor's large photograph would be sent at cost (25 cents) to those desiring it, several thousand copies have been ordered. It is quite natural that persons sending for the Health-Pamphlet should wish to inspect the present appearance of the man who forty-one years ago made the discovery of the treatment and who has steadily practiced it upon himself ever since. As a further encouragement to this wish on the part of purchasers, the doctor now proposes to send a copy of this photograph free to every person who shall hereafter send the $4 for the Health-Pamphlet provided the desire for it be expressed in the same letter with the remittance.

SQUARED DISTANCE INVERSE.

We are no little vexed in being compelled to say that Prof. Alonzo Hall, our Pacific coast contributor, has succeeded in convincing us, notwithstanding our confident belief to the contrary, that our article on "Squared Distance Inverse" last month, contains serious mathematical errors in calculation. The details of these errors would be unintelligible to a majority of our readers, and would be uninteresting as well.

Suffice it to say, it is the professor's opinion, expressed as kindly as possible so as not to ruffle our equanimity, that mathematics is not our "best hold," and we are half inclined to concede to him the honor of having convinced us of that fact.

But while our contributor gently points out these intricate errors in calculation he frankly admits that our two articles in the July MICROCOSM, present volume, headed "One More Gun for England," and "Prof. Tyndall's Mistake" utterly demolished that law of "Inverse Squares" as applied to sound decrease, and at the same time as completely wiped out the wave-theory based upon it. As such, he thinks, we should have let well enough alone, and we begin to suspect he is right.

A VALUABLE INDORSEMENT.

The following earnest appeal from Mrs. W. S. Turner, wife of the Rev. Mr. Turner, of Spokane Falls, Wash., appeared in a late number of the Methodist *Christian Advocate*, of Portland, Oregon. It gives an impression as to how this remedy strikes a candid person who tests it without prejudice, while it exactly corresponds with thousands upon thousands of similar volunteer testimonials. And this, reader, explains why the demand for the Health-Pamphlet is still on the increase:

DR. HALL'S HEALTH-PAMPHLET.

EDITOR *Advocate:*

I write to ask you if Dr. A. Wilford Hall's Health-Pamphlet is generally known.

During these hot summer days when so many are suffering from burning fevers, cholera infantum, etc., and so many deaths occurring from week to week, it seems as if I *must* help to publish it.

Dr. A. Wilford Hall, the inventor of this treatment, without drugs or medicine of any kind, forty years ago was a confirmed consumptive—one lung gone and the other nearly so—and was given up by his physician to die, as his brother a short time before had preceded him. Being a young man of twenty-nine, he felt that he could not give up the possibilities that life had in store for him. He commenced experimenting upon himself and seemed almost reckless as he says, of his own poor body, provided he could make the discovery he was in search of. He at last succeeded, and after forty years of faithful trial of his own treatment, has given it to the public, for a mere pittance. I consider it one of the greatest boons of the nineteenth century.

It cures fevers, dyspepsia, rheumatism, kidney troubles, headache, catarrh, and many other diseases, beside refreshing one when weary. When you read his "Health-Pamphlet," it seems like one of the most rational and common sense treatments in the world, and you wonder why it was never before discovered. It also promotes longevity. I know what I am writing of. Facts, they say, are stubborn things.

My husband had a severe attack of bronchial trouble last spring, and came very near death's door, being reduced almost to a skeleton, when he accidentally heard of Dr. A. Wilford Hall's "Health-Pamphlet," and knowing him well, as an author and scientific man, it immediately inspired his confidence in the pamphlet and he sent for it about the first of April and has been using it since, regularly. He was soon able to recommence his duties as a minister, and has gained over thirty pounds in about five months, and bids fair for a long life yet. From the facts and testimonials published on one page of the MICROCOSM, a monthly, edited by A. Wilford Hall

in the interests of the Substantial Philosophy, there is to be organized a new Life Insurance Company on very liberal terms. It is stated that not one person has died since the advent of this little pamphlet, who has carried out the directions given in the use of the treatment.

If you want to know what it is, send to Dr. A. Wilford Hall, 23 Park Row, New York.

You will need to read the pamphlet three or four times, to get *all* the good from it, and then use the treatment faithfully, and you will find it *the* greatest investment you ever made, as far as your health is concerned. A LOVER OF HUMANITY.

Spokane Falls, August 23, 1890.

NEWS FROM DR. AUDSLEY.

As we go to press with this closing number of Vol. VII., we have before us a most encouraging letter from Dr. Audsley, the invincible champion of our cause in England. His letter is too long to copy, besides it contains some personal matters not yet due the public.

From this letter we learn that the campaign for the coming winter is portentous of many exciting events all along the line of battle. Dr. Audsley has been invited by the Musical Association before which his first lecture was delivered, to present at another meeting in January, a paper giving a continuation of the same subject, which he has gladly accepted. He has also accepted a pressing invitation to lecture in November, present month, on the Substantial Theory of Acoustics before the National Society of Professional Musicians, at Burlington Hall, London.

He tells us that the *Musical World* of London is taking hold of the new theory, and that in consequence of the lectures delivered by himself and Dr. Pearce, *all wave-theory questions have this year been struck out of the examination papers of the English College of Organists!*

We give this prodigious straw which will show our substantial friends the direction of the English acoustical wind. This wind will assume the proportions of a gale very soon, and let no American acoustician forget it.

INDUCEMENTS TO CLUBS.

Old subscribers should commence renewing now, by sending in the 50 cents. But (which is better) if they will send in the names of *two new subscribers* with $1, their own subscription for Vol. VIII. shall be marked paid.

Remember, these two names must be new subscribers, not renewals, as we expect every old subscriber to renew by sending 50 cents for the next volume unless he can secure two new names.

A club of 10 new names will be supplied with Vol. VIII. at 30 cents each ($3), while a club of 20 at one time with $5 will be marked paid for the next volume, with any additional names at 25 cents.

BOOK NOTICES.

PRINCIPLES OF SCIENCE. By W. W. Felts. Published by The Bancroft Co., San Francisco.

This book, although small, would require much more time and space than we can at present spare for its thorough review. The author claims originality and certainly verifies his claim, but we are inclined to think at the expense of scientific accuracy. He seems to be affected with the electric fever which has smitten so many people within the last few years, due to the wonderful mechanical control and practical application to which this force has been subjected.

Instead of considering electricity as simply one of the many physical forces or one of the many manifestations of the force element of Nature, he believes this force to be all in all and at the foundation of all other natural forces which to him are but the direct products of this primal electric power.

An *original* position of our author and upon which he admits all his theories are based, is the recognition of *motion* as a "*fixed and ruling principle of the universe,*" which has existed forever and independently of the action of any force; this may seem a ridiculous statement to make concerning any writer who essays to produce a book on the *Principles of Science,* so we will quote "in the universe we see striking evidences of *motion without force.*"

This position hardly needs commenting on, and especially in the light of Dr. Hall's definition of motion; that it is simply an expression used to define the movement of a body under the action of a force; motion does not in any correct sense of the term express a principle or a potency, it being purely a relative term applied to matter changing position under the influence of FORCE.

Another *original* "principle of science" laid down by the book is the circularity of motion in opposition to Newton's First Law, and his strongest proof of the position is his declaration that all natural products, such as trunks of trees, eggs, etc., are circular in form, he evidently forgets the countless grasses and leaves and rocks and hundreds of other phenomena which exhibit elongated and ragged forms, and which are entirely due to natural action.

There are many other positions in the book which we have no time now to consider, but which led us to the conclusion that originality is not always compatible with philosophical accuracy. R.

PATMOS. The History of the Kingdom of Heaven. By Rev. E. R. McGregor. Published by John Burns Book Co., St. Louis, Mo.

This work was commented on by the editor of this paper in the January, 1889, No. of the MICROCOSM, and the review there given has been copied by Mr. McGregor as an introduction to the book.

The intent of the author is to give a reasonable and satisfactory interpretation of the figurative and symbolical language of Revelations, and the reader will be forced to admit that there is shown in the work a remarkable acquaintance with secular as well as sacred history. The manner in which these historical data are identified and made to harmonize and dovetail with Scriptural prophecy, will surprise the most credulous.

A special importance is attached to the work when we remember that the subject it discusses is one that is avoided by the Christian pulpit as dealing with matters which are generally considered to be too vague, and misunderstood to be of practical and homiletical value; for this reason the care and intellectual power which is brought by this author into the work, ought to be received with merited favor. We do not know the age of Mr. McGregor, but should judge that he is already well advanced in life, and has spent the greater part of it in the study and development of this exegesis. We would refer all who are further interested, to Dr. Hall's review of the book as printed in the January MICROCOSM, Vol. VI. R.

REV. DR. BUCKLEY STILL SMARTS.

We have been informed by a prominent Methodist minister who recently called at the MICROCOSM office on his way home from one of the regular Monday meetings of preachers, that the Rev. J. M. Buckley, of the *New York Christian Advocate*, deliberately went out of his way to refer to our name contemptuously as an illustration of what he was then saying.

It seems he was discussing the woman question, and without the least relevant provocation said that it (something he was referring to) reminded him of "A. Wilford Hall's claim that numerous scientists had accepted his theory of sound, but that when investigated these so-called scientists were found to be of no prominence whatever."

Our informant declared that this whole reference to our name was so deliberately lugged into his speech for the purpose of gratifying his old-time grudge against the editor of the MICROCOSM, that there were not one dozen ministers in the room who did not see the animus of the man, many of whom smiled in evident derision at the smouldering embers of his wrath. This, however, is only one out of numerous instances in which Dr. Buckley has gone out of his way in a similar manner to give the MICROCOSM a vengeful slap for the castigation it gave him about ten years ago in reply to a malicious attack he printed in the *Christian Advocate* upon the "Problem of Human Life." (See First Volume of MICROCOSM, page 23.)

The doctor has ever since that unfortunate misadventure seemed to think that somehow or other the MICROCOSM has stood in the way of his ambition, though it is very seldom it has referred either to him or his pet aspiration to foist himself upon the M. E. Church as one of its bishops. We have known for years, and so has Dr. Buckley, that the scathing reply of the MICROCOSM on that occasion, circulated as it was widely among the clergy of that church, has been one of the chief causes of showing his unfitness for that exalted office, as we have often been informed by ministers of that church who are permanent subscribers to the MICROCOSM.

Our informant remarked to our associate editor that Dr. Buckley did not show the least business wit or policy in thus contemptuously lugging in our name in the presence of that great assembly of Methodist preachers, scores of whom read our journal and hundreds of whom regard our "Health-Pamphlet" as the household idol of their families. He added that if the doctor ever hoped to reach the acme of his ambition, he must learn to exercise the business sense to quit referring to A. Wilford Hall.

THE FRENCH ACADEMY.

The forty immortals constituting the French Academy were originally elected or rather self-selected for life, and it was agreed at the organization of that, the most select association in existence, not only that the society should never contain more than the forty members, but that new members should only be chosen to fill vacancies caused by death.

Of course, the selection and admission of a new member is comparatively a rare occurence, and is an event of no ordinary excitement among the elité circles of French society, following as it does the solemn and sincere obsequies of the departed member.

The French Academy of Science was first organized in 1666, and was originally intended to take charge of the French language and the dictionary of the same, revising it from time to time as the progress of the French nation might demand. But the range of its usefulness has gradually widened until it now includes the discussion of all subjects relating to science, philosophy, literature, etc., insomuch that its deliberative decisions, concerning nearly all subjects upon which it may take action, have become almost the settled authority of the world.

Long as that society has been in existence and impressive as its transactions have always been regarded among all the enlightened nations of the earth it has never, we believe, been imitated in any other country, particularly in the select and exclusive character as also the numerical limit of its membership.

A prominent writer connected with one of the leading daily journals of this city, is just now at work organizing an association for the United States similar in its select and exclusive character to that of the French Academy, but to contain double the number of permanent life-members, on account of the larger population of this country.

This association, its originator informs us, will be constituted of men well-known for having achieved prominence in some branch of science, philosophy, art, letters or other departments of human progress, and he desires all persons interested in the building up and permanent establishment of such a monumental association, to suggest freely the names of any and all persons they may have in mind whom they may consider worthy to be ranked among the original eighty immortals to constitute the *United States Academy*.

These names can be forwarded to the editor of the MICROCOSM, with any comments as to their fitness for membership, and we will see that they are given over to the gentleman having charge of the undertaking.

Extracts from the Health-Pamphlet.

Next month, beginning with the new volume, we shall commence making brief extracts from our "Health-Pamphlet" which has caused such a wide-spread interest throughout the world. These excerpts will embrace the historical and philosophical portions of the treatise, which in the estimation of thousands of purchasers, unfold a knowledge of the physiological cause of disease, worth to the student vastly more than the price of the pamphlet.

A gentleman in this city who is informed concerning the marvelous demand for our Health-Pamphlet, pronounces its sale to be the "business-miracle of the nineteenth century." Still there seems no let up to the demand. Another page only can we spare to the volunteer testimonials which we are receiving by every mail. Here are a few:

"My Dear Dr. Hall,—* * * Oct. 17, 1890. The case of my wife is a marvel to all who see her. For nearly fifteen years she has been a hopeless and almost helpless invalid. She has had the best medical treatment the country afforded, such men as the late Dr. Kelley, of Worcester, Dr. Burnham, of Lowell, and Dr. Greene, of Boston, with nearly a score of the very best of others. They could only relieve for the time, but could not cure. These, with constant domestic help, have cost me *many thousands* of dollars. The first night of good rest she had for fifteen years, was the night after the first use of your treatment. To-day she is free from doctors and servants, and is doing her work except washing and ironing. Her dreadful dropsical condition, accompanied by the most distressing action of heart, liver and lungs, has been almost entirely removed. For nearly three years she could not sit at the table and eat with us. Her friends are amazed when they call and see her tripping around the house. In her dreadful bloated condition, which the doctors could not remove, she measured fifty inches around her body—she now measures about thirty-two or three inches around. Both sleep and food are a luxury and labor is a pleasure. She is a standing witness unto the safety and certainty of that treatment in the most extreme cases of physical ailment. Our doctor (the Health-Pamphlet) is now always at home, and when the end of the year comes around there is presented no bill for 'medical attendance,' for two or three hundred, or even fifty or five dollars. Would that all might receive the blessing that God is conveying to the suffering at your hands. Hoping that your 'reaping' day may yet continue for a long season.

"I remain, yours truly, C. L. Thompson.
"Middleboro, Mass., Box, 632.

"P. S. As soon as I can get the means I intend to procure some of your valuable works."

Horace L. Stows, Lebanon, N. H., writes:

"Dr. A. Wilford Hall, Dear Sir,—I have for years been in bad health, unable to do many things for myself and friends which I should have done had my health been better, but now that I have been greatly improved by the use of your treatment, I will go to work for the sale of your Health-Pamphlet, which I can now conscientiously recommend. I have been troubled nearly all my life with *Scrofula*, so that at times I had no strength to do even ordinary work, but under your treatment I have removed it almost entirely from my blood. * * *
"Truly yours, H. L. Stows."

E. C. Smith, Agent for the Union Central Life Insurance Company, at Marion, Ohio, writes:

"Dear Sir,—I have used your Health Treatment in my family for the past six months and will say that Vanderbilt, with all his millions, could not buy my little pamphlet if I were to be deprived of using the knowledge which it has imparted to me. My father had been so poorly he could not get around at all for months, and had been drugging himself all the time, but with about four weeks' treatment with your remedy he is able to be out, and the other day took a ten mile drive, and everybody says, 'Why, you look the best you have for six months.' Respectfully, E. C. Smith."

Geo. Barnes, Esq., 808 James St., Syracuse, N. Y., writes:

"Dr. Hall, Dear Sir,—After six weeks' use of your extraordinary discovery I am perfectly amazed at the benefits I have received. I am in my sixty-third year, and ever since the Philadelphia Centennial have suffered from ataxia pains in my legs, which always were worse at night. For the last month I haven't had a pain night or day. I want to make a few inquiries which you will oblige me by answering. Yours truly, Geo. Barnes."

J. M. Whitney, M. D., D. D. S., Honolulu, H. I., writes:

"My Dear Doctor,—Enclosed you will find five more pledges for your life-giving pamphlet. I wish your ears could hear some of the warm and hearty testimonials that greet me nearly every day, and your eyes could see the former victims of disease now in rapidly improving health. I am sure you would be happy that you were, in the hands of God, permitted to bring such a blessing to suffering humanity. * * * Yours truly,
"J. M. Whitney."

Rev. A. L. Cole, Santa Ana, Cal., writes:

"Dear Dr. Hall,—* * * It is common to hear of the splendid results of your treatment. Everybody is pleased with it. In my own case I think vastly more of it after using it fourteen months. It is simply a *wonderful blessing*. I am delighted to see your progress continue in your several departments of work. May God continue to bless you in your noble efforts.
"Fraternally as ever, A. L. Cole."

Rev. R. R. Whatley, Lower Peachtree, Ala., writes:

"Dear Dr.,—Having obtained your new Hygienic Treatment from one of your agents, I have treated myself and wife but ten days, and in so short a time I am improving and feel better than I have felt for several years. Will write you in full by and by.
"Yours respectfully, Rev. R. R. Whatley."

Israel Fought, Helena, Ohio, writes:

"Dr. Hall, Dear Sir,—* * * I received your Health-Pamphlet about three weeks ago, being nearer dead than alive with lung trouble, but to-day am a great deal better, with bright hopes of getting well. My neighbors wonder what I am taking, and one seeing such a change immediately signed the pledge and I gave him my pamphlet. I am well-known through the county and my condition also, for I have been ailing for the last ten years, and deriving no benefit from the best doctors, and intimating that my time on earth was short. I shall not be satisfied till every afflicted friend is in possession of your pamphlet. I would like to write more but you want short letters, therefore I will close. May God bless you for such a discovery. Yours truly,
"Israel Fought."

Wm. Traverse, Esq., Niota, Ill., writes:

"Dear Sir,—I purchased one of your pamphlets some time ago from an agent in Iowa. I have been troubled with catarrh and bronchitis for twenty-five years and never found any relief until commencing your treatment, and I believe by continuing it a few months I will be thoroughly cured. * * * Respectfully yours.
"Wm. Traverse."

J. M. Blackesby, M. D., Germantown, Ky., writes:

Dr. Hall, Dear Friend,—Inclosed please find $4 and pledge for which send your book "Self-Cure and Preservation of Health" to the gentleman who signs. I prescribed your treatment for his daughter, sorely afflicted for years and for whom all her physicians are at a loss to find a satisfactory remedy. Well, doctor, my wife and I have used your treatment since first of May and have received the greatest benefit. My wife, who has been the greatest sufferer since girlhood with nervous sick headache has not had an attack since using treatment. As for myself and my afflictions I will some day soon write you a history. The treatment has been very happy in my practice and, when I select my cases, proves all I could desire and wonderfully successful, have not had a failure when directions are strictly followed. It is the thing doctors want, but they are slow to take hold of it intelligently. May you prosper in all your grand work. Your friend and patron.
"J. M. Blackesby, M. D."

Rev. E. E. Day, Pastor Congregational Church, Lone Rock, Wis., writes:

Dr. A. W. Hall, Dear Sir,—* * * I take great pleasure in recommending your treatment whenever opportunity offers. An old gentleman living out in the country was in a deplorable state from a complication of disorders, but habitual constipation was the original trouble. The day I called upon him, he told me he had then in his system 130 pills of one sort or another. He was really dying a torturing death. I recommended the treatment to him and it has worked wonders. When I called the other day he was like another man and was able to walk out in the garden. You have made a great discovery. God bless you. Yours cordially, E. E. Day."

H. H. Sheldon, Esq., Sutro, Lyon Co., Nevada, writes:

"Dr. A. Wilford Hall, Dear Sir,—Your publication, the 'Microcosm,' by mere chance fell under my notice, from it I learned of your great common sense remedy, and having read many of your articles on health I had faith in you and at once ordered your Health-Pamphlet for my wife, who has been afflicted for some years with constipation, kidney and liver troubles, terrible headaches, tiger claw cramps and rheumatism. Six weeks' treatment has apparently cured her of all the above named except rheumatism, and that disease is gradually yielding to your treatment. It is years since she has been so free from pain and in the enjoyment of such good health, and we both bless the day your Health-Pamphlet came into our possession. The $4 I sent you I regard as a mere trifle for the benefits received, and could I not replace it, money would be no consideration.
"Truly yours, H. H. Sheldon."

☞ Don't fail to send for our "Extra" Microcosm. Copies sent FREE.

Press of H. B. Elkins, 13 and 15 Vandewater Street, New York.