THE SCIENTIFIC ARENA.

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THE SCIENTIFIC ARENA

VOLUME I.

Scientific Arena

A MONTHLY JOURNAL

Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

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Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SCIENTIFIC EVIDENCE OF A FUTURE LIFE, No. 1.*

BY THE EDITOR.

PREVIOUS to the inauguration of the Substantial Philosophy, no real *scientific* evidence could be found anywhere on record in support of the doctrine of a future state of existence for man. We go farther, and boldly assert here, that without those fundamental principles, as first promulgated to the world in the "Problem of Human Life," and since then formulated and elaborated in the five volumes of THE MICROCOSM, no unbiblical evidence of human immortality, worthy to be called *scientific*, could possibly have existed.

There has existed and there has often been presented what was called scientific evidence of the immortality of the soul; but such evidence has been so far-fetched and strained that under close and logical analysis it has proved more illusive than real, always lacking the missing links of physical analogy and rational consistency necessary to produce conviction in the mind of an intelligent skeptic. The logical difference between such apparent evidence and the real analogical proofs of human immortality which the Substantial Philosophy first brought to light, it shall be the aim of this series of papers to present and unfold; and if we mistake not, the most confirmed atheistic materialist, who shall carefully and candidly follow these arguments, will be much more apt to doubt his own skepticism than to question either the existence of a personal God or the substantial and enduring nature of his own soul. With an unbiased study of these papers we can safely promise not only new and satisfactory light to the intelligent unbeliever, but confirmed faith and hope to the doubting Christian.

And here, perhaps, better than later on, a word as to what is meant by "Substantialism" or the "Substantial Philosophy," is appropriately in order. This phraseology will frequently be encountered by the reader in the various articles of our contributors, as well as in our own editorials, and without a concise explanation of its meaning at the start, however brief, much misapprehension and confusion of ideas might result.

The name *Substantialism* appropriately signifies, as the *Substantial Philosophy* teaches, that everything in the universe, of which the intellect can form a positive concept, is a real, entitative or substantial existence, whether such entity be material or immaterial—whether it shall be subject directly to sensuous observation, or its existence can only be determined by the mental process of reasoning from cause to effect. Hence, that every form of physical, vital, mental, or spiritual *force* in the universe, whose effect is in any degree the subject of our observation or shall come within the grasp of our reasoning powers, must be substantial; and, not having the recognized properties of matter, and not being subject to material conditions, these forces must, therefore, properly and necessarily, be regarded as *immaterial substances*. Such is a very brief definition of "Substantialism" as more fully elaborated and set forth in the "Substantialist's Creed" found elsewhere in this number.

HENRY A. MOTT, PH. D., F. C. S.

[For Sketch, see page 11.]

Now it is this essential and fundamental characteristic of the new philosophy as deduced from the physical laws, which we and our associates have so earnestly proclaimed under the name of *Substantialism*, and from which, as we affirm, the only real scientific evidence on earth for the immortality of the human race can be adduced. The hitherto supposed analogies of nature in favor of religion, with all their elegance of diction and elaboration of argument, become wholly ineffectual and worthless under the logical and scrutinizing investigation of modern materialistic atheism, simply for lacking the essential physical elements of analogical proof which, at this late day, the Substantial Philosophy has so opportunely supplied.

To attempt a collation of analogical evidence in favor of a future life from the untranslated pages of nature's thesaurus that could be at all satisfying to the mind of an intelligent materialist, while at the same time regarding any one of the physical forces as the mere *motion* of material molecules and in no wise a *substantial* or *objective existence*, is to our mind so puerile and self-nugatory as to entitle its authors to compassion rather than confidence. To assume the life, soul, or spirit of man to be a real substance, as do many learned theologians and religious philosophers, while ignoring the substantial nature of heat, gravitation, magnetism, and electricity in the physical domain, making them only modes of molecular motion, may well and justly call down the bantering sneers of materialists of the Haeckel and Huxley school. And to assume *light* to be constituted of actual material particles, capable of being shot from the sun or other luminous bodies at a velocity of nearly 200,000 miles a second, as was gravely taught by Sir Isaac Newton, while regarding *sound*, its manifest theoretical congener, as no substance at all, but merely the insubstantial motion of the molecules of the air, is to exhibit such a marvelous want of scientific resource and logical perspicacity as to excite one's commiseration, especially as in the case of the greatest philosopher that ever lived.

In subsequent times, after Newton's day, one philosopher would stumble upon the idea that one of the physical forces—heat, perchance, or possibly electricity—was an entity or objective thing, while consigning all the others to the realm of motion, though equally entitled to entitative recognition. Thus by turns, and in accordance with the intellectual fancies of different physicists, all the forms of force or phenomenon-producing causes in nature, with the bare exception of *sound*, were temporarily restored to a substantial existence, to be finally changed and shifted by later investigators back into "modes of motion" analogous to that of sound, apparently to harmonize all under the one uniform law of material phenomena. Clearly, the whole trouble in the premises of making all the forces or forms of energy substantial, and of thus forming a broad, scientific, and consistent basis for man's immortal existence by the evidence of rational analogy, lay in this single problem of the true nature of *sound*. It was the crouched lion lurking in the path of scientific harmony and consistency, and whose menace of defiance ever since Pythagoras to the present time, had turned every physical investigator aside into the wildering mazes of philosophical uncertainty.

It was this same crouching and lurking foe which has given warp and bias to the judgment of all college-taught theologians when attempting to solve the problem of human life here and hereafter, and which, unobserved to them, has vitiated and rendered null and void every attempt at real scientific analogy by which to prove the rational probability of a future life for humanity. Their

* This series of papers will be a continuation of the arguments presented in the editor's four former treatises on "The Immortality of the Soul, Demonstrated by Science," and "Does Death End All?" now published together complete, and offered solely as a premium for two subscriptions ($1) for this journal. It need scarcely be stated that those treatises have proved an invaluable aid to such as have been troubled with doubts concerning a hereafter for humanity. PUBLISHERS.

eyes seem blinded to the most self-evident analogy in nature, namely, that if one single force, whose phenomena appeal to our observation, is but the vibratory motion of material particles and in no sense a substantial entity, *why may not life-force and mind-force, whose observed phenomena are so analogous, be also but different modes of vibratory motion which, like sound-force, will necessarily cease to exist as soon as the vibrating particles cease to move?*

That eminent theological analogists like Butler, for example, should have overlooked this fatal incongruity which, when seized upon by materialists, so conclusively nullified all their evidence drawn from science in favor of the immortality of the soul, is one of the most astounding facts in the history of religio-scientific investigations; and that these critical minds should not have suspected something fundamentally false in the science of the schools which so provokingly rendered nugatory every attempt to prove the substantial and enduring nature of the vital, mental, and spiritual forces in man, upon which alone any conception of human immortality can be predicted, is equally a matter of the most profound astonishment.

Whatever the theological, scientific, and literary culture which those eminent religious philosophers may have brought to bear upon their supposed evidences of immortality drawn from the analogies of nature, this one irresistible fact that *sound*, one of the manifest forces of nature, was but the motion of vibrating material particles, and not a substantial entity, utterly broke the back of all their elegant logic, and left the hapless analogists floundering in the meshes of their own inconsistency, which they no doubt at times keenly felt, but from which their scientific education in the colleges rendered it impossible for them to escape.

It was at this juncture of affairs in the religio-scientific conflict of the ages, with materialism rampant, atheism defiant, and the so-called liberal clubs all over the land blatant and even triumphant over all theological reasoning based on the analogies of nature, and that too by using as a weapon the very science taught in every Christian college throughout the world, that Substantialism came abruptly into the *scientific arena* and called upon the schools and the churches to halt and bear witness that all the forces of nature, physical, vital, mental, and spiritual, including *sound* as well as *soul*, including *light* as well as *life*, including *magnetism* as well as *mentality*, were real, substantial entities, and therefore indestructible in the very nature of things.

This announcement, with the demonstrable proofs accompanying it, rang the death-knell of materialism by thus striking the diapason keynote of human immortality as based on the now consistent and harmonious analogies of nature. For plainly, if sound, the most self-evident "mode of motion" of all the natural forces, demonstrably turns out to be an immaterial substance, a real entity, then no scientist, however materialistic his proclivities, would think for a moment of questioning the substantial nature of the soul, mind, or spirit of man. Whereas, on the other hand, if sound is but the mere motion of air-particles, and is in no sense substantial, then manifestly no Christian philosopher, after his attention has been called to it, can fail to suffer the most painful apprehension as he faces the appalling argument of the materialist which carries the irresistible analogy to the human spirit, thus proving it also to be but the phenomenal effect of material vibration, or but the mere motion of brain and nerve particles.

When materialism, with its brandishing blade of "molecular vibration," backed by all the science of the Christian schools, and with its battle-cry of the annihilation of the human soul at death, had approached the very threshold of the Church and was about calling upon the clergy of the whole land for an unconditional surrender of their hope of immortality, it was at this alarming juncture that the new philosophy of Substantialism came to the rescue and crossed swords with the soulless giant that was so insolently defying the armies of the living God. Like a flash of lightning it struck the minds of thoughtful investigators of all classes that this single physical discovery, concerning sound as a substanial force, had compelled a rally of the enemy's forces upon a new battle-ground for the decisive conflict with materialism, which, if won and held by Substantialism, would inaugurate the mightiest religio-philosophical revolution that had occurred since the day of Pentecost.

Ministers of all denominations, who grasped its real import, hailed it as a new version of the glad tidings of great joy which would extend to all people. Other ministers who failed at the start to comprehend its wide-reaching signification, shook their heads with doubtful hesitation, and appealing to their scientific acquaintances asked quizzingly what sense or meaning there could be in this attack upon the wave-theory of sound. The scientific professor in turn, with his pride touched and his scholastic reputation at stake for having all his life taught that very theory, smiled sarcastically at the preposterous question, and at once denounced the assault upon that well-established and mathematically formulated theory, as the work of a scientific crank, and unworthy of a moment's serious consideration.

Others waited in a non-committal attitude to see what Tyndall, Helmholtz, and Mayer, the representative authorities on sound both in this country and in Europe, would say to this startling assault upon so long established and universally accepted a theory of science. But these great authorities, after having seen and read the book, called it "funny," and forever after held their peace! One thing was manifest, however; namely, the absolute cessation of their great lecturing tours on the wave-theory of sound bears accurate date with the appearance of that book. Their apologists, who tried to console themselves with the idea that those great scientists considered the book unworthy of notice, and therefore had treated it with *silent contempt*, stood dumfounded when this suggestive cessation of sound lectures was thrust into their teeth. The "silent contempt" dodge did not seem to explain so practical a difficulty!

A few, however, of these apologists, who have been teaching the wave-theory in colleges, and "clapping two books together" at the big end of Tyndall's "long tin tube" to show their students how a "*sound-pulse* will *blow out a candle* at the other end," being put upon the rack of cross-examination by the half-suspicious clergyman who had read the book, were at an evil hour unfortunately tempted or provoked to enter this new scientific arena of conflict and thus undertake a defense of that "mathematically formulated theory," and that, too, before they had even read the "Problem of Human Life," in which the assault upon it had first appeared, or even before they had formed any true conception as to the real ground or meaning of the attack.

The result was—and we say it without any boastful intention—that in every instance the misguided professor abruptly quit his self-imposed defense of the wave-theory with unmitigated disgust for his own precipitance, while the friendly minister, who had so unwittingly got him into the scrape, looked on as the gainer by a thorough conviction of the truth of Substantialism. This will be abundantly evident to those who take the trouble to read the five volumes of THE MICROCOSM in which these various tilts are discussed or recorded.

That the arguments in favor of the new theory of sound, as one of the substantial forms of physical force, have conclusively established that proposition, is already conceded by some of the brightest scientific intellects of this country. These same professors of physical science, in several of the colleges, while inculcating Substantialism, have ceased to teach their classes the wave-theory of sound, claiming that it is totally in conflict with many observed sonorous phenomena, while the substantial theory is in perfect harmony with all. They agree that the phenomena of physical force in all its manifestations, such as those of light, heat, gravitation, magnetism, cohesion, and electricity, as well as of sound, are vastly more rational and easily explained to students on the principles of the Substantial Philosophy than on any previous hypothesis known or taught; and while innumerable confused and contradictory views of the various forces had been held by previous learned writers, no conflict or incongruity whatever occurs or can occur in explaining the nature and phenomena of the different forces in relation to each other, or in their effects upon our sensuous observation, according to the principles of Substantialism. This is the admission of all, without exception, who take pains to inform themselves thoroughly upon these matters.

In the direct bearing, however, of this discussion of force upon the scientific evidence of a future life, lies its greatest immediate importance to man. Materialism distinctly teaches, as already shown, and as set forth in the authoritative writings of such renowned scientists as Prof. Haeckel of Germany and Prof. Huxley of England, that there is nothing entitative or substantial about man save his corporeal or material frame, including its various anatomical parts. It further teaches that the soul, life, mind, and spirit are but the complex molecular motions which occur in these parts so interwoven with other motions in the same material organism as to result in what we term sensation, thought, feeling, love, hope, fear, memory, hatred, revenge, courage, veneration, jealousy, grief, imagination, etc. These all stand in relation to *mind* proper as the overtones (which constitute the *timbre*, or quality of musical notes) do to *sound* proper according to materialistic science, both classes of supplementary phenomena being but the superposition of secondary vibrations or waves combined with the fundamental motions constituting *sound* and *mind* respectively. As mere sound is one thing constituted of simple motions of the air, and the quality by which we distinguish the music of any given instrument is another thing, as constituted of superimposed motions, so mere mind is constituted of simple vibrations of the brain-particles, while hatred, love, fear, jealousy, etc., are but the *timbre* of mentality, constituted of the superimposed or supplementary motions of these same brain molecules. Such is the necessary teaching of materialistic science.

But materialism further insists, as a logical necessity from these data, that the soul, life, or mental power of man must necessarily, as mere *motion* of material particles, cease to exist as soon as these moving molecules come to rest at death, since it is well known that motion, *per se*, as a mere phenomena of matter, is a nonentity, having no existence before the body commenced moving, and as a consequence must absolutely cease to exist as soon as the body, let it be large or small, ceases to move. Hence materialists logically conclude from their premises that no future existence for the soul, mind, or spirit of man, beyond this phenomenal life of the body, is possible to humanity, and therefore, that *death must end all.*

They even go farther and do worse than this in their onslaught upon the Christian's hope, namely: they take up the very science of the schools and books as taught in every Christian college in the world, and, as before intimated, prove their materialistic doctrine of human annihilation at death to be true in

the very necessity of scientific analogy, and they defiantly challenge the clergy, who accept these scientific doctrines, to deny or refute their positions. They refer to the teachings of all the text-books in which the manifestations of heat, sound, light, etc., are but the motions of material particles, and in no sense substantial entities; and they insist with the severest logic known to religio-scientific investigation, that if sound-phenomena, as every college-taught clergyman is compelled to believe, are but the vibratory motions of air particles, and if sound absolutely ceases to exist as soon as air-particles come to rest, then by all reason and analogy, vital, mental, and spiritual phenomena, which can be nothing more than the vibratory motion of the brain and nerve particles, must as truly cease to exist at death as does sound when it ceases to affect audition.

A clergyman, who believes in the college views of the forces of nature, and especially of *sound*, the mother of all the so-called "modes of motion," cannot stand one minute in the presence of one of Huxley's weakest followers and defend the immortality of the soul on scientific and philosophical principles. Such a clergyman would be compelled to throw up his hands in mortification and dismay at the first sudden presentation of such an unanswerable argument as above presented, though he might prove to be one of the very men who have sneeringly refused to examine into the principles of Substantialism when urgently requested to do so by some brother minister, thus madly shoving from his reach the only plank that is capable of keeping him afloat in this turbulent materialistic sea.

Joseph Cook, the eminent Boston lecturer, tried to meet this very materialistic argument, as recorded in one of his published lectures, but in accepting the undulatory theories of sound and light, as he was taught in college, he found himself floundering in logical difficulties, and helplessly at the mercy of Haeckel. But this was before he had heard of the Substantial Philosophy, and we have no doubt, if now called upon to meet the same objection of the materialist, he would make a very different showing in his reply. (See remarks on Mr. Cook's Dilemma in "Problem of Human Life," page 71).

Now if Joseph Cook, with his long experience in combating materialism, and with his great intellectual powers, was forced ingloriously to give away his cause to the deductions of Haeckel, just because the present science concerning sound, light, heat, etc., hopelessly blocked his way and proved by the most logical analogy that the soul, life, mind, and spirit were but various forms of *motion* of the brain and nerve particles, how much more helpless must be the average minister of the gospel in the presence of a materialistic scientist without the aid of Substantialism? Thank Heaven, the panacea for all such materialistic complaints, and even worse ones if they are possible, may be found concisely prescribed in the golden principles of this new Philosophy.

One single argument in demonstration of the substantial nature of *sound*, and thus of all the forces, whether vital, mental, or physical, and in absolute opposition to the undulatory or motion theory, should here be referred to, that young investigators, anxious to master these questions, should know how and where to obtain the necessary information. That one argument can be found in Vol. IV. of THE MICROCOSM, pp. 318, 381; Vol. V., p. 88.

We cordially invite any unbiased college professor or scientific clergyman to come forward and answer that one argument in favor of sound as a real substance and as a complete overturn of the wave-theory, and his criticism shall be cheerfully welcomed to these pages and acknowledged. Yet that is but one in a score of similar arguments which have been elaborated in the different volumes of that magazine.

In the next paper we shall enter more into scientific details and will endeavor to present some of the fundamental demonstrations bearing upon this force-evidence as furnished by Substantialism.

THE "VIERTELYAHRSCHRIFT" ON SUBSTANTIALISM.

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

IT is well worthy of note that the Germanic type of thought is second to no other in the modern march of intellect. An impartial glance at the more vigorous scientific literature of the age, is sufficient to fill us with admiration at the manner in which German scholars are grasping the profound and sublime truths of Substantialism. This is good presumptive evidence that the new philosophy contains something worthy of their stalwart consideration. It further serves as a promise that the principles involved in this great revolutionary system will not only be fully discussed and developed, but also carried into every department of science to which they are applicable. What great movement has ever yet been originated or carried to its final perfection without the force of German intellect? It is not claimed that the Teutonic cast of mind is superior to that of the Celt; neither is it admitted that the Anglo-American, or the Anglo-Germanic element in this country is intellectually inferior to the best types of intellectual manhood upon the Continent of Europe. Such claims and concessions are uncalled for. God has called all nations to a mutual co-operation in the study of the great problems which he has submitted to mankind for solution. Whatever of greatness there is in any great man, it belongs to the race. The peculiar traits of intellectuality in any one nation is the common property of the world. God never designed that all nations should be equally rich in all things. If England alone could produce a Shakespeare, no nation but Germany could bless the world with a Luther. Neither did the Creator ever intend that any man's work should constitute a rounded period of completeness in itself. Copernicus continued to live in Galileo; and Kepler grew larger in Sir Isaac Newton. If Bacon, Locke, Sir Wm. Hamilton and Colridge, shine out more brilliantly than Kant, Leibnitz, Hegel, Schelling and Schleiermacher, in the Anglo-American picture gallery of the world's intellectual heroes, may it not be traceable to the fact that they sharpened and brightened their blades on German grindstones? Even Thomas Carlyle appears to best advantage when in comparison with that product of his own creative genius—Prof. Teufelsdrockh, of Weissnichtwo.

There is a peculiar disposition of diligent inquiry in the German mind, and a peculiar law of procedure in the Teutonic mode of thought which, when combined in the same individual, tend to widen the portals of welcome reception to any radical discovery in science. While all nations, tribes and tongues hear Substantialism speak in their own respective languages the wonderful works of God, the long list of those who have embraced and now advocate the new philosophy shows a very fair proportion of German scholars and thinkers. For some time we have observed among our German friends a growing tendency to discuss its claims. The latest review of the Substantial Philosophy which has attracted our attention appeared in the January number of the *Viertelyahrschrift*, an undenominational magazine published in Cleveland, O. The article is an able paper, from the pen of Rev. W. Fotsch, of Nauvoo, Ill. Let not the reader of this allusion to its geography stand aghast at the mention of a place historically associated with Jo. Smith, and the incipient pest of Mormonism. It *is* possible for some good thing to come out of Nauvoo, as well as out of Nazareth.

The paper now under friendly notice is an article of six pages on the *Charakter und Stand der Substantiellen Philosophie*. By the valuable assistance of a friend we have translated it into our own vernacular. Although our author has not yet grasped the subject discussed as to its ultimate and most important bearings, he has performed his task in a manner which does honor both to his head and heart. The body of his paper contains in substance what the reader may have in the English and original form by reference to the August MICROCOSM, 1884, Vol. IV., page 22.* Our friend at Nauvoo has evidently made good and proper use of that very valuable editorial from the pen of Dr. Hall in which, for all time to come, the latter has set forth the Substantial Philosophy as to *Its General Formula and Ground of Belief*. The following two paragraphs is a somewhat defective translation of the introduction and concluding remarks of Dr. Fotsch's paper, and may be received as those portions which express his own original views of the great scientific discussion now coming prominently before the world.

"Wilford Hall has brought a pressure to bear upon the religious philosophers of our land similar to that of Dr. Hahnaman's *Similia Similibus Curantur* upon the medical fraternity. Dr. Liebhart, in 'Home and Hearth' and the *Viertelyahrschrift* of 1883, p. 204, have introduced us to this wonderful man, and his celebrated book, the 'Problem of Human Life.' The principles advanced and illustrated in this book and in the Monatschrift '*Mikrokosmus*' have been rolled like an ocean-wave over these gentlemen of the Evolution theory. Many of them have risen to the surface converted from such nonsense; some fared like Pharaoh in the Red Sea; and others who are now trying to wade through the flood of Evolution and Embryology will sooner or later go down with the mournful cry of 'more light' upon their lips.

"This boastful pretension that man has been evolved from the fish or the animal creation, has had the effect of chaining two great doctors to the triumphal chariot of Darwin and Haeckel. But Joseph Cook and Dr. McCosh claim to have escaped again from the meshes of the Evolution net. The difficulty is that their religion partakes more of false science than true experience of the heart. This is indeed the reason why a good many preachers bow their knees to them and follow in their lead. These doctors profess to follow the flag of *theistic* Evolution, but of what use is their sublime name when the thing remains the same? The Editor of THE MICROCOSM remarked in July, 1884, that McCosh and Cook had probably read his 'Problem,' and that they were thus led to order a halt and call themselves *theistic* Evolutionists. One thing remains for them yet to do, viz: to recall their former false professions and make public amends for the mischief they have done. But will they do it? Darwin, Haeckel, and their followers have their 'if and but' (*Wen und Aber*) from the devil who has always denied the truth. Alas, that celebrated preachers do not understand the difference between Darwinian Monkeyism (Darwinisches Affenthum) and Immanuel. To accept the teaching of Christ, and to walk as he walked, is our practical problem; without this all other knowledge leads to damnation and sorrow. Hence it becomes always more manifest that God and sound science are synonyms. (Gott und

* Copied into the present number of THE ARENA.

gesunde Wissenschaft synonym sind). Would that all students and young preachers might have their thinking sharpened on Dr. Hall's 'Problem.' Those who refuse to be convinced thereby would not believe though one should arise and come to them from the materialistic hell."

So far as we, in our limited knowledge of the German language, are able to judge of Dr. Fotsch's paper, it was written with great care, and contained many excellent points. Like many others, however, he has not yet fully grasped the leading and central question of the controversy. What is that controversy, and what is the history of its misapprehension? A few years ago Dr. Hall appeared before the world in the "Problem of Human Life," and exposed the monstrous heresy of atheistico-materialistic evolution. The peculiarity of the assault was the new basis from which the attack was made. He laid bare its false premises and tore the rotten fibers of its false logic into shreds and tatters. The book was a scientific earthquake. The religious press of the country hailed it with admiration, and in some instances flattered it with extravagant encomiums of praise. Christian men throughout the world rejoiced in the happy day of their deliverance from the coils of the boa constrictor of infidelity, and brought forth their diadems of approbation to crown the hero who had triumphed so gloriously. Yet only a portion of them saw the real issue upon which the wage of war had been staked. And to-day there are thousands of good men in sympathy with the Substantial Philosophy as they apprehend it, who are seemingly unable to comprehend the great fundamental principle that underlies everything belonging properly to the new system. Some of them are destitute of mental perspicacity, while others are afflicted with intellectual indolence mingled with religious utilitarianism. They are like those who profess to love religion, but have no taste for the science which salvation necessarily involves. They admire flowers — think them "perfectly lovely," indeed—and press them to their protuberant olfactories with a sentimental grunt of gratification, but have no relish for the science of botany.

Under this category we place that class of substantialists who follow the great leader in his signal overthrow of Evolution, that they may enjoy the flowers and fruits of the victory in its bearings upon the foundation of their religious hopes, and then turn aside when the battle is renewed and continued in the form of the great *Sound* controversy. They ask: "For what is all this ado about the wave-theory of sound?" Those who grasp the real issue do not ask questions. They see its bearings upon the central scientific conflict of the ages. Neither do intelligent scholars ignore it in all their writings upon the subject of Substantialism. Drs. Hall and Mott can never capture and hold the citadel of true philosophy and leave the wave-theory undemolished. As well might the great captain of our salvation have attempted to pass up, as our forerunner, to heaven with the keys of death and hell in his hand and leave an uncaptured and unconquered grave in the path of his triumphal march to the gates of the celestial city.

The real question at issue is not whether Haeckel is right or wrong, or to what extent McCosh and Cook are correct in their theories of theistic evolution. *The war is against materialism as a general system of heresy in science*, and is waged upon a line of attack entirely new in the history of philosophy. Substantialism not only teaches the existence of immaterial entities, and that these entities are veritable forces in nature, but also that they underlie and manifest themselves through all the diversified phenomena of the material universe. It is laid down as the first and fundamental principle of all science that these force-elements of nature are one in their God-given origin, and manifold in their several and distinct existences. The Substantial Philosophy is set for the advancement and defense of this whole scientific gospel of truth in the sanctuary of nature. If it should fail at any one point within its logical compass, it will ultimately be obliged to surrender all other points in the controversy. It does not, however, follow from the foregoing assertion of truth that the battle must be fought at all points in the same campaign. The false theories of light, heat, magnetism, gravity, life, soul, and spirit, must each abide its time in the wars of the Lord, and take their turn in this the greatest philosophical conflict of all the ages in the world's stormy history. If every point is not eventually carried against materialism, it will matter but little whether Darwin was foaled in a zoological garden or Dr. Hall born by virtue of a generative force that God originally planted in the Garden of Eden. Neither will it matter whether music is made of wind, water, or something more immaterial.

Up to the present time the principal part of the discussion has been over the question of sound. Not that sound is a more essential element than heat or any other force in the economy of nature, but because it was more generally claimed by theorists, and conceded by the masses to consist of something material in motion or vibration. If Substantialists gain the victory in this sound controversy, all is gained. The stronghold will have been battered down. The enemy may insist that the engagement be renewed at other points, but it will be the same battle between the same respective forces, and the final result cannot be considered doubtful by intelligent minds. The same omnipotent artillery of truth will be employed in each successive engagement. There will be a little different training of the guns, but no change in the quality of the powder. Indeed, the victory as to the sound controversy is already gained. The only remaining trouble is that the enemy lacks either sense enough to know, or honesty enough to acknowledge that he has been completely whipped. Possibly he is like the Irishman's turtle—dead, but not conscious of it.

It is now alleged by some that though the old theory has been broken down, nothing complete and entirely satisfactory has yet been substituted in the place thereof. We concede that the charge contains some truth, and yet the expectation which it implies is unreasonable. Patience, gentlemen, mingled with a modicum of reason and common fairness. If it took the world twenty-five centuries to build an air-castle of unscientific frame, is it too much to ask the full limit of one short decade of years to build a scientific citadel of Everlasting truth? But whose business is it to supply the world with such a positively correct theory of sound? Does that duty rest exclusively upon the shoulders of Dr. Hall, Dr. Mott, and their coadjutants in the cause of true science? We dispute the reasonableness of any such assumption. A philanthropist may fire a magazine and blow a pest-house out of the city. Is he therefore bound to build a medical college in its stead? The wave-theory of sound was a pest-house in science; Substantialism has blown it out of existence; and it is now equally the duty of all the intelligent recipients of such preparatory benefaction to step forward and help to build the edifice of truth. Especially are Christian scholars under obligations to move in that direction. If the Substantial Philosophy is true, the wave-theory of sound is false. If Substantialism is not true, Christianity has no durable foundation, and the fondest hopes of the human heart have no anchorage beyond the mutable stuff which materialism worships as the God of its idolatry.

FREMONT, O.

THE LONGEVITY OF VEGETABLE GERMS.

BY COL. JOHN M. PATTON.

MANY years ago, in meditating on the texts, "I am the way, the truth, and *the life*" (John, xiv., 6); "I am the resurrection and *the life*" (Ibid, xi., 25); "With Thee is *the foundation of life*" (Ps., xxxvi., 9); "As the Father hath *life in Himself*, so hath He given to the *Son* to have life in *Himself*" (John, v., 26); and that to be "alienated from the *life of God*" (Ephes., iv., 18) is death; the thought occurred that because God's life is alone *absolute*, and because His life comprehends all other life, therefore all vitality, whether spiritual, animal, or vegetable, is, in truth, *God's* life. If, as one said, it could conceive of a moment's extinction of the Divine life, the silence of death would instantly take place throughout the universe. When, at the request of the editor of a periodical, I received the "Problem of Human Life," soon after it appeared, I was pleased to recognize this thought there.

If this be true, all life, whether spiritual, animal, or vegetable, should be indestructible so long as the objects for which it was originally bestowed should remain the same. Take the case of man, made in the "image of God," endowed with intelligence, conscience, and a "longing after immortality." Reason, no less than scripture, pronounces him immortal. There may be changes in the time and mode of the manifestations of this immortal life, as, for example, when a man dies, as we call it; that is to say, when his flesh—which is only the instrument by which his life, including soul and spirit, is manifested to our gross senses—decays; yet his life remains; it only lacks the means of displaying itself. It is Divine life, destined to immortality, and cannot be extinguished. As to animals, we have no warrant of scripture to speak positively, but many men have thought, and others have hoped, from reasoning on their display of intelligence, affection, conscience, remorse, and other moral qualities, that they also will be immortal. The Indian believes that "his faithful dog will keep him company" in the future life; the poet complains that man denies the dog "in heaven the soul he held on earth," although the great Archbishop Whately would not deny his immortality; and even the scripture, in the original, calls the life of the beast *his soul*. As to the life of vegetation, we have no sure means, either on scripture or reason, of forming any opinion whatever as to the conditions of its bestowal or its withdrawal. But even here we may note a persistence of vitality, which we have called the "longevity of germs," and which has, perhaps, been little thought of, and not much observed.

It has been asserted that wheat taken from the catacombs of Egypt, and 3,000 or 4,000 years old, has germinated and produced a new variety; but this has been equally denied, and the proof of it has been challenged. If it can even be shown that no such wheat has ever germina it would still be no proof that the germ was destroyed, but only that its vitality was suspended. In some other conditions of soil, air, etc., in some other environment, it might yet show life.

Whether so or not, the following instances may possibly throw some light on the persistent vitality of germs. Before giving them, however, let us try to understand, as well as we may, what a vitalized germ is. The naturalists tell us that all animal life comes from the egg, all vegetable life from the seed. The egg consists of an outer shell or skin, of the inner albumen, etc., and of the animal germ. The seed consists of the outer hull, the inner kernel, and the vegetable germ. The microscopists tell us that

if you take an animal *ovum*—say of man or of the elephant—all its contents that are visible to the naked eye will be found to be simply the food of the germ; and that if you examine it more closely by microscopic dissection, all that is visible even to the highest powers of the microscope will still be found to be the infant food of the invisible germ, which eludes to the end the utmost capacity of vision. So it is with the vegetable germ. The germ of the *ovum*, or of the seed, is, therefore, the seat of its vitality, though infinitesimally small. Now to our instances:

1st. All are familiar with the fact that if, for example, an oak forest be cleared, and the land be then cultivated for many years, to exhaustion, and afterward be permitted to lie out as waste land, unvexed by the plow, it often puts up, after some years, in a dense growth of pines. After this forest of pine has been permitted to grow for a number of years, if it be then cleared and the land be again cultivated, and again permitted to lie waste, it often puts up in oak again.

2nd. The Rev. —— —— late of Culpeper County, Va., stated to me that within his parish a gentleman bought a tract of land on which was a poor field, lying waste, and which had been long uncultivated. This gentleman took it up, applied commercial fertilizers, and sowed a crop of grain upon it. After the grain was reaped, then appeared a "fine take" of what is known as Kentucky blue grass. So densely did this grass afterward grow (how long afterward was not stated) that the owner cut from it a fine crop (for such grass) of hay, and then sold the land to his neighbor—the venerable and distinguished —— — ——; who cut from the aftermath another fine crop. It may be stated in connection with this case that the Kentucky blue grass is indigenous to that country, and often puts up there on lands on which it had never been sown, when they had been sufficiently enriched. But whence came the seed?

3d. Dr. —— — —— of Louisa Co., Va., writes to me as follows: "While living in Goochland Co., Va., in 1873, I saw Mr. —— —— clearing a piece of land thickly set in second growth pines. He plowed the land in the fall, as he said, with the intention of seeding it to oats. The next fall *I saw* it *well taken* in clover. He said he had seeded *nothing* on the land, and the clover was a volunteer crop. He as well as others told me that it was a well ascertained fact that the land had been lying out for certainly sixty years. I some time afterward told the above to Dr. ——, of Goochland, and asked if he thought I would be prudent in telling this where I was a stranger. He replied 'certainly,' that precisely the same thing had occurred in the case of his brother, who had a farm in this (Louisa) County, except that it was an established fact that his brother's land had not been seeded in anything for seventy-five years."

4th. My particular friend, the late Powhatan Robertson, Esq., then of Culpeper County, Va., owned a beautiful estate on the banks of the Rapidan River, that paradise of the Piedmont section of Virginia. His low grounds from the river to the high lands were about half a mile wide, and in places were many feet deep with rich black loam. The adjacent high lands were also very rich, and rise to a height of perhaps 100 feet above the river. On this height his dwelling-house was situated. He dug near it an ice-house of some 16 feet deep, and cut a ditch toward the low grounds to drain the bottom of the ice-house. After going a few feet through the surface soil, he struck a stratum of close homogeneous blue clay which continued with him to the bottom, and which was so entirely free from grit that he could cut it into shapes with the sharpest pocket-knife, without in the least dulling its edge. Neither with the eye nor with a magnifying-glass could anything be seen but this smooth, fine-grained, gritless clay. The large mass of it that was thrown out was mounded around the ice-house for several feet in depth, and with the clay alone on top. The ditch was secreted and filled. During the next and second summer he was greatly surprised to find the whole surface of the mound and of the ditch crowded with "Jamestown weed" (or "Jimson weed," as the country people call it). It was far too thick to be accounted for by any translation of the seed by all the birds of the neighborhood, supposing them so inclined. The seed is a little dark shining one too heavy to be carried by winds.

Now, whence came the germs from which all these vegetations sprung? They were there unquestionably, though no seed could be seen, for the plants appeared. There is a theory, that in the beginning when "God spread out the heavens," and "made the dry land appear," he scattered the seed of all vegetations broadcast throughout the world. It may be so—but whether so or not, the seed placed there originally or dropped from ancient plants had all disappeared. In Mr. Robertson's case the germs must have been there before the Pyramids were built, before Babylon was founded, perhaps almost a geological age ago. Now, what is the explanation of it? Whether the seed were sowed by the hand of the Creator, or dropped by ancient plants, it may be said that though the hull and kernel are perishable, the germ seems to be well-nigh imperishable. In point of fact, the hull had decayed, the kernel, intended as the infant food of the plant, and probably its best food, had disappeared; but the long-lived, invisible, and seemingly deathless germ, is thrown from its long, dark imprisonment into light, air, warmth, and other needful conditions, and in spite of the loss of its infant food, flourishes in its new environment. The vegetable germ is evidently far longer lived than organic matter.

I have not desired to prove anything by this paper, but simply to throw out some suggestions, which will not have been made in vain, if, perchance, they may interest any one, or excite some one, better equipped than I am, to closer investigation.

EVOLUTION—EYELESS FISHES AND CAVE-RATS.

BY THE EDITOR.

It is a well-known fact in natural history that fishes found in the rayless recesses of the Mammoth Cave of Kentucky, as also cave-rats, are sightless, having but the mere prints of eyes or the aborted forms of that organ. This has proved a subject of much scientific discussion. The problem, however, would seem quite plain on the well-known principle that the use of any organ within temperate bounds tends to strengthen it and increase its growth, while the disuse of an organ for many generations will sensibly weaken or entirely destroy its function. This is even seen distinctly in the development of the blacksmith's right arm through constant exercise, though but the result of habit for a single lifetime. No doubt can exist that this habit continued through many succeeding generations without the descendants intermarrying with any not of that special calling, the difference between the two arms would become much more conspicuously marked.

It is evident that the original progenitors of these sightless fishes and rats had the organs of sight complete; but being forever shut out from the light by some natural cause, and not being required to use the eyes for many generations, they would naturally try to keep them closed to avoid injury and pain, till finally they would become overgrown by a film, and at last reduced to a state of abortiveness, leaving only the cicatrice of the former eyes remaining, as we now find them.

Evolutionists assume that this fact favors the theory of descent, as taught by Mr. Darwin. Before it can be made to do so, however, it would be important, and an interesting experiment, to find out whether such animals restored to a strong light for many generations, would in any degree redevelop their visual organs. The foundation of the eye—the optic nerve—being already there, it would seem that such species should, in a sufficient number of generations, be restored to sight, if, as evolution teaches, the function of sight was originally developed alone by the action of light on some sensitive portion of our ancient protoplasmal prototype. It is clearly within the reach of naturalists to test this question thoroughly, even within the term of but a few years, by the careful breeding of such fishes, and watching the developmental effect of a bright light upon their now sightless eyes.

If a number of generations of these cave fishes, exposed to the light, showed no tendency toward a restoration of their aborted vision, the eyeless fish, instead of aiding evolution, would prove a swift witness against it, by simply teaching, what the world has been aware of for ages, that the use or disuse of any part or organ, even for a single generation, tends greatly to strengthen or impair its function.

It is also a fact well authenticated that fishes have been found in water forced up from artesian wells, and from the depths of the earth hundreds of feet below the surface; and that such fishes have been found to possess perfectly developed eyes. In the explorations of French geologists, some years ago, in the northern district of the great Sahara Desert, such small fishes were thrown up with the water from wells sunk to a depth of two hundred feet. Although this announcement was at first discredited, yet the report of M. Desor, the eminent Swiss naturalist, confirms the truth of the statement, he having seen these small carp-like fishes as the water rose to the surface.

Such fishes being in all respects perfect in form, health, and activity, and having full possession of their visual organs, it is plain that they had not been confined to this subterranean abode for many generations, like those of the Mammoth Cave, but that the body of water pierced by the artesian tube must have communicated by an underground passage with some open lake through which the young of these species were enabled to make their way.

Analogous to these phenomena is the remarkable discovery made by the recent exploring expedition on the steamer Blake for the purposes of sounding and dredging in the Gulf of Mexico, as described by Prof. Alexander Agassiz in a paper read at Washington before the American Academy of Sciences, at its recent sitting. He related the singular fact that from a great depth the dredge brought up small living fishes; and, what was most surprising was, that while some were sightless, like those of the Mammoth Cave, others could not only see, but had eyes abnormally developed to prodigious size. This was a problem well worth attacking. The Professor, according to the report of his paper in the New York *Tribune*, did not pretend to account for these two directly opposite effects on the sight of fishes by their living and breeding for unknown ages at this almost rayless depth of ocean, merely giving the facts in the case, though certain members of the Academy at once recognized in this wonderful discovery a new class of facts in favor of the modern theory of evolution. Yet, how or in what manner it favored evolution, they were not entirely clear in their statements. Let us

see if a sensible and real solution cannot now be given of this problem.

The truth is, this discovery is in strict harmony with the scientific principle evolved by the use and disuse of organs, and the consequent effect of improvement or deterioration. It is easy to understand that different species of fishes may possess different powers of vision, in their normal state, the same as in the case of mammals. A cat, for example, can see distinctly with a quantity of light which would leave a room in total darkness to man, or to many other animals, such as the sheep, for example. So, when the sinking of this ocean bed took place, at an early epoch of the earth's history, by some natural catastrophe, carrying with it these different species of fishes, it is easily supposable that while one species, by the normal superiority of its vision, could barely see the light at that depth, another species, by possessing a less development of normal sight, would find itself imprisoned in total darkness, just as a *sheep* and a *cat* would be situated if both were thrust into a cave where the latter could barely perceive the light, while the former would be totally blind.

The consequence would be that the one species, by its constant effort to utilize what little light it possessed, would tend abnormally to develop its eyes and to expand them to a more and more prodigious size, while the other species, not being able to see at all, would have no use whatever for its eyes, and hence, as suggested, would tend to keep them closed, till they would finally, by the law of disuse, become overgrown with a film, and at last aborted.

With all deference to these learned Academicians, who can see evolution springing up out of every new discovery in science, we take the liberty of suggesting that this class of facts is directly opposed to the general assumption of the evolution hypothesis. As this sightless species discovered by Prof. Agassiz must have originally possessed perfect visual organs, the theory of Mr. Darwin wholly fails to explain why such organs should not have been developed, like those of their big-eyed neighbors, by utilizing the action of what little light there was, instead of being aborted. If eyes could be originally developed by the action of light on a primordial lump of protoplasm, where not even the rudiment of an eye or of an optic nerve existed, what was the law of natural selection about, that the already developed eyes of these fishes were not improved upon by this law of evolution, in conformity with the new environment, but were rather allowed to become aborted, while there was sufficient light to develop the eyes of their immediate neighbors to enormous proportions? If there is power in light, under the laws of natural selection and survival of the fittest, to evolve a perfect eye out of a lump of pure albumen, without even an optic nerve to start with, it is highly important that our learned naturalists, who can see evolution in everything, should tell us distinctly why it is that these marvelous laws of development allowed perfect eyes to become aborted where there was light enough to make the eyes of another species in the same vicinity double or quadruple their normal size.

SCIENTIFIC CREDULITY.

BY. REV. D. OGLESBY.

PLANTING potatoes in the moon, suspending horseshoes over doors for good luck, or expecting bad luck on one's happening to see the new moon for the first time over the left shoulder, water-witching, spirit rappings, etc., etc., these and all kindred things are set down as but superstition, or credulity of the ignorant.

But what must we think of some of the *basic* theories, as taught and believed by the greatest scientific teachers of our world? Take for instance the doctrine or theory of molecules, or ultimate atoms. We are taught that as matter is divided and subdivided almost infinitely, at last, down at the bottom you come to what they call molecules and atoms. These are of course indivisible, so small that no magnifying glass ever revealed one to the eye of man, yet they are there, and are actually suspended in a little universe of their own, revolving in space, touching nothing, and upon the rapidity of these vibrations, or revolutions, depends the temperature of matter; albeit there can be no friction. Is not this wonderful?

Then again, these great teachers have discovered that there is a material thing called *ether*, an invisible, intangible thing, not discernible to any of the senses, neither primarily nor by its effects, yet it is "a jelly-like substance" they tell us, that exists everywhere, envelops the earth, extends beyond the sun, reaches to the most distant star; in fact it

> "Extends through all extent, spreads undivided,
> And operates unspent."

Still further these solons teach, and we tyros in science are expected to believe, that all the ten thousand colors that beautify the landscape, that "every tint that paints the rose, or decks the lily fair," is but the effect of the vibrations of this imaginary thing called ether. We are expected to believe that four hundred trillion waves or vibrations must enter the eye in one second in order to produce the sensation of light of a *red* color, and the thousand and one tints that we see are produced by an increase of vibrations or waves of ether entering the eye, until seven hundred trillions are reached, when total darkness is produced. Now, is not this *more* wonderful? Any school boy by a little calculation, can ascertain that if a man undertook to count four hundred trillion, counting one every second, he would have to live through a little eternity. It would not do for the unscientific to question the truth of these causes of colors, but we are at a loss to know how they found out the exact number of vibrations—what kind of an instrument would enable the mind to perceive and distinguish in a second as many numbers as it would require thousands of ages to count. Of course these solons know, but it would tend to relieve very much the knotty question of how they found this knowledge, if they would explain the *modus operandi* of an instrument that can actually and acurately count hundreds of trillions in a second.

Then again, we are taught by not a few of the famous scientists, that the myriads of insects, worms, fishes, and animals, up to and including man, were evolved from a little lump of jelly or protoplasm. That every form of life that exists on the earth or in the atmosphere, or under the ocean, was evolved from this little lump of jelly. Here is the great Mastodon weighing a score of tons, and herds of living things revealed by the microscope, feeding on a forest leaf. Here is the tiny worm almost invisible, with a multitude of legs, and there is the serpent a hundred feet long without legs. Here the atmosphere swarms with insects by day and by night, there the dirtiest water is full of armies of living creatures. Here are multitudes of birds with plumage surpassing in beauty Solomon in all his glory; there beneath the waves of old ocean are an innumerable multitude of living creatures, ranging from those invisible to the naked eye, up to the "great whales." All these swarming armies of insects, fishes, fowls, and animals, they tell us, grew from that little lump of jelly. This wonderful theory was adopted, doubtless, to relieve the universe of a Creator, or else to make the work of creation easier on the Creator. But it is about as clear a failure as was that of the Irishman who turned his stocking to hide the hole.

Then lastly for the present, we call attention to the theory so completely refuted by Dr. Hall in the "Problem of Human Life," and since pulverized in THE MICROCOSM, the wave-theory of sound. Although destroyed, the great majority of schools and colleges go right on teaching the old theory, and using the old text books. They teach young America that the little bird in its cage in the telephone room, by its tiny vocal organs, can and does move tons of metallic wire, sending for miles and miles its music. What wonderful power! I will not use Dr. Hall's locust. Poor thing! It has done faithful work and needs a season of rest. It has not been the writer's intention, in writing this short article, to do anything more than indicate a line of thought for the reader to fill out at his leisure. Many learned scientists object to the Bible, that it is unbelievable on account of its teaching the creation direct of all living things, and also that it records miracles. Now I submit to the candid unprejudiced reader, that the man who can and does believe the scientific theories aforesaid, or any one of them, will have no excuse for not believing the Bible, with all its marvels and miracles, except that he *will not*. For whoever believes these theories, can, if he wants to, believe anything. The whale swallowing Jonah, or even Jonah swallowing the whale, bears no comparison to any one of them. They surpass all the leger lemain of all the prestidigitateures of this world of humbugs. Scientific men who hold and believe these theories of ether-waves, protoplasmic creation, ultimate molecules, moving without cause, etc., should not sneer at miracles. Neither should they laugh at the old heathen, who when asked, "On what does the earth stand?" replied, "A great turtle's back." "On what does the turtle stand?" "A pile of rocks." "On what do the rocks stand?" "On other rocks." "On what do these other rocks stand?" "Oh, it is rock all the way down!"

RICHVIEW, ILL.

THE SUBSTANTIALIST'S CREED.

IT would be entirely unfitting, in the initial number of a new journal to be devoted to the principles of the Substantial Philosophy, not to give the reader the benefits of its general formula and grounds of belief. This creed of Substantialism was first framed and presented to the readers of THE MICROCOSM by the editor, in the first number of Volume IV., and we copy it here that all who may have any doubts or prejudice regarding the meaning of *Substantialism* or of the *Substantial Philosophy*, may have their minds disabused by a careful perusal of this our common faith. Let every clergyman, especially, whatever may be his peculiar denominational tenets, not merely read but study this Creed of Substantialism, and then ask himself in the unbiased secrecy of his own heart if the principles and doctrines here set forth do not meet the approval of his reason and his conscience.

THE SUBSTANTIAL PHILOSOPHY.

ITS GENERAL FORMULA AND GROUNDS OF BELIEF.

[*From The Microcosm, Vol. IV, page 22.*]

The many articles which have appeared during the past three volumes of THE MICROCOSM upon the subject of *Substantialism*, from our own pen and from those of our contributors, presenting the New Philosophy in its varied relations to science and religion have caused it to be thought advisable to give

in this first number of Volume IV a brief and condensed epitome of its teaching as at present formulated and as now understood by its founder and its ablest exponents who have written upon the subject. We therefore proceed to do so.

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

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

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

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

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

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

7. Seeing the resistless logic of this terrible argument of the materialist against the very foundation of the Christian hope, and being appalled at the helplessness and apparent unconscious indifference of the learned clergy to the inevitable inroads which such an argument must necessarily make upon all the claims of religion or supernatural revelation, the founder of the Substantial Philosophy resolved to break its force by the only conceivable method—namely, by attacking, and, if possible, overturning this mode-of-motion citadel as universally taught in physical science, and thus demonstrating every force in Nature to be a real substantial entity. As a telling mode of attack that he thought could not be gainsaid or resisted, he selected *sound* as *par excellence* the representative "mode of motion" in physics, so regarded by all science in all ages, and out of which all the other so-called modes of motion had developed; and he reasonably assumed, if it could be broken down as a mode of motion by overturning the wave-theory, there would nothing else be left for *sound* to be but an immaterial, substantial emanation from the sounding body—a substance which travels by a law of conduction through various media analogous to substantial but immaterial currents of electricity. In this way he expected (as has since turned out to be the case) to make the *sound* controversy, including the truth or falsity of the undulatory theory, the real battle-ground of the Substantial Philosophy.

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

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

10. The Substantial Philosophy further teaches that all life, mind, instinct, and spirit-consciousness of the animated creation are but still more refined forms of the force-emanations from out that same universal and substantial fountain of energy, life, mind, and spirit, and that the individual life-germs of all animate beings are but atoms, so to speak, from out the same vital fountain.

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

[TO BE CONCLUDED NEXT MONTH.]

IS OLEOMARGARINE A HEALTHFUL DIETETIC PRODUCT?

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

THE onward march of mind—the advance of physiological science, of sociology, the development of the esthetic instinct—necessarily embraces everything that pertains to the well-being of the physical nature of man. Whatever tends to bring the physical to the purest and highest normalcy; whatever will give that fineness of tone to the organic tissues, and supply the best conditions for the sensorial power of the brain, is worthy of the most profound consideration. In this age of scientific research, the true relation between the mental and physical is becoming more clearly defined, and the absolute necessity of supplying the body with food which is constitutionally adapted to its most healthful growth, is becoming a more and more recognized fact. It is this underlying principle of inquiry that is now agitating the public mind in regard to oleomargarine, and seeking to ascertain what are its true dietic qualities. But in this, as in almost every other department of dietics, the great danger is in deciding upon the revelations of *chemical analysis*. What has been ascertained in regard to food, its healthful adaptations to the body, etc., has been wholly through physiological science and experience. Chemistry, developed to its highest analytical and synthetic power, is utterly incapable of deciding *a priori* whether organic or inorganic elements are best fitted to nourish the animal economy. Because the ultimate elements of substances which afford nourishment to the body are nearly the same, and because the chyle formed from each and all of the different substances is so nearly identical in character, it is therefore claimed that it is not essential what *kind* of food we eat, provided it contains sufficient nutrient material to supply the requirements of the system. But such a conclusion is wholly at variance with the laws of vital action. Vitality can, and does, transmute all nutrient material of whatever grade into living fluid, so similar in its constituent elements that the most careful chemical analysis cannot detect any appreciable difference. Yet physiological science has fully demonstrated that in *vitalizing* quality there is a vast dissimilarity. Blood made from pure, wholesome food, will resist decomposition for a much longer period than that made from an inferior quality.

Scientific experts, who are making strenuous efforts in favor of the manufacture and sale of oleomargarine, proclaim the fact that chemical analysis can detect no difference whatever between the elements which comprise butter, and those which form oleomargarine, and therefore, if it is properly made, it is just as wholesome a dietic product. It is upon this ascertained chemical fact that they base their argument for the use of oleomargarine. But in reasoning from this premise, they lose sight entirely of the distinction between the process of vital formation, and that of inorganic chemistry. While it is true that the *ultimate* elements of all animal and vegetable substances are the same, and are also identical with those of inorganic substances, yet it is utterly impossible to take these elements and by any process of chemical combination or mechanical manipulation, make them subserve the purpose of food to the human system. The vitalizing powers of *organic* nature alone, can take these primordial elements and constitutionally arrange them to meet the wants of the animal economy. The deadliest poison, and the most deliciously wholesome food, may, and do, contain the same ultimate elements, but their *nature* depends upon the laws of constitutional arrangement which vitality has instituted, and *not* upon the *matter* of which they are composed. This is the pivotal point upon which all true scientific deductions in regard to food must turn.

After physiology has determined what substances will, and what will not, nourish the body, chemistry, by resolving these nutrient substances into their *organic elements*, may be able to distinguish between those bodies which contain nourishment, and those which do not, and also, in what proportion nutrient principles exist in particular bodies; but further than this, it cannot aid dietetic science; the moment chemistry goes beyond this, it passes its legitimate boundary.

The fundamental truth that the dietetic nature of a substance depends *not* upon the *matter* of which it is composed, but upon the *constitutional laws of its arrangement of particles*, stands as a Gibraltar against all efforts to prove by chemical analysis what is the proper food of man. That pure oleomargarine contains the same primordial elements as butter, no one will dispute, but in face of this primary law of nature this chemical fact cannot establish its claim in any degree to a pure and wholesome article of food.

The suet or fat, from which oleomargarine is made, cannot, under any circumstance, be a healthful or nourishing product; for its formation depends upon an abnormal or diseased condition of the animal. The process of fattening—of developing this suet—necessitates an unbalanced relation between the assimilating and depurating organs; consequently waste matter, in the form of fat, is retained. Allow an animal that kind and amount of exercise which is essential for its healthful development, and its depurating organs will be excited into a vigorous normal activity—and this excess of fat will soon be eliminated. These well demonstrated facts settle the question that oleomargarine can never be made a healthful dietetic product. No process of chemical combination or mechanical manipulation can ever remedy defects which the laws of vital action and arrangement could not overcome.

OUR ATTITUDE TOWARD RELIGION.

BY THE ASSOCIATE EDITOR.

THAT the friends of the truth revealed in Christ may have no question upon the spirit of this journal, we deem it wise at the outset to state our unreserved belief in the Bible, and in Christ as revealed in the Bible. And we cheerfully confess that our Scientific investigations confirm our faith, as light dispels darkness. It may be true that disreputable science does much to discredit christianity; but disreputable religion has done more; and while the exponent of no sect or creed, it will be the attitude of THE SCIENTIFIC ARENA to set forth the truth—truth as proclaimed in the Word and confirmed by science.

The enemies of Christ have no lack of publications teeming with scientific and philosophical(?) objections to and flings at the established faith. The smart sayings of so-called scientists that are calculated to disparage the existence of God, the truth of the resurrection or the idea of immortality, etc., are proclaimed from pulpit, press and platform with unblushing effrontery, as so many trophies science has won from Christ. The creature is exalted above the Creator. The masses are swayed from all religious moorings, our young men are more and more turned from the highway of truth into the byways of skepticism, infidelity and materialistic atheism; while the friends of religion seem wholly unable to stem the current. There is but one platform set as a bulwark to break by its critical examination and sifting the force of this shower of philosophical errors. But we trust that the success of the Boston Monday Lectureship will stimulate effort in this direction.

We know of but one other periodical besides THE ARENA that seeks to do, by the wider medium of the press, what Joseph Cook is so valiantly doing from the platform. This will be our field, and such will be our aim. And we enter upon this grand field with a cheerfulness born of a love for the truth, and a confidence begotten of an experience with the stone of true science when hurled from the sling of Substantialism. For we honestly believe that Dr. Hall, the eminent editor of this journal, has placed *hors de combat* forever more philosophical and scientific fallacies than any other man who has ever entered the field of original investigation. With the aid of the Substantial Philosophy, of which he was the founder, he has shown many scientific systems that have long been regarded as intact and opaque, to be as full of holes as a skimmer.

When eminent ministers of the gospel were leaving their great work to go down into the plains of Ono, to arrange for a compromise with the Sanballats of Evolution, Dr. Hall nailed the flag of Substantialism to the mast of God's Word, and "moved on the works" of evolution at once with results that silenced and put to flight the armies of the aliens, and put to shame the timid and compromising friends of Christ. The "liberty-of-reason" arguments, so much dreaded by the friends of Faith, are capable of cutting both ways; the location of the cut being determined only by the skill with which the weapon is handled.

Said a young fop, while urging "reason" against faith—"I will not believe in the existence of what has never been seen; we are creatures of reason, you know."

"Did thee ever see France?" queried the old Quaker.

"No, sir, but others have, so my reason allows me to believe in its existence upon their testimony."

"Ah, thou wilt believe only in what thee or another hast seen?"

"That's it; you have my idea exactly."

"Did thee ever see thy brains?"

"No, sir."

"Did thee ever see any one who has seen them?"

"No, sir."

"Does thee believe thee has any?"

The wooden guns of shallow "reason" and false science are too confidently thrust to the front as a menace to the progress of faith. The aim of THE SCIENTIFIC ARENA will be to show the complete harmlessness of this formidable-looking ordnance in the materialistic camp. And we shall note with keen interest the promptness with which the broken ranks of the churches close up and advance to the assault when re-enforced with the clear assurance that truth in science is on the side of the Bible, while the ranks of atheism, skepticism, infidelity and materialism are invariably recruited from the slums of error. We cannot afford to be dazzled by great names, confounded by wide reputation nor halted by cunningly constructed philosophical or scientific systems. If the roots of a theory are only fibers of error, no amount of culture under the rays of a brilliant reputation will ever cause it to produce fruit not tinctured with falsehood.

Every minister of the gospel, and all devout men lovers of the truth, will find THE SCIENTIFIC ARENA an invaluable aid in defense of the faith; a journal that will examine with the most critical care the scientific and philosophical teaching of the day, before passing it into the sanctuary of religion.

THE SCIENTIFIC ARENA.

A. WILFORD HALL, Ph., D., LL. D., Editor.

PASTOR HENRY B. HUDSON, ASSOCIATE EDITOR.
ROBERT ROGERS, - - - OFFICE EDITOR.

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SALUTATORY.

WE do not present this formal salutation to our *new* readers by way of apology for embarking in another monthly journal. *Such* readers will, of course, examine this opening number of THE SCIENTIFIC ARENA for themselves, and thus arrive at their own conclusions concerning its merits or demerits. But in thus introducing ourself as editor to readers with whom we have had no previous journalistic acquaintance, we think we have a right to ask the courtesy of a respectful and careful reading of at least this one number before laying it permanently aside: and if, after having so done, such new readers shall not consider twelve such numbers worth the subscription price, then we shall try to submit to the decision with patient equanimity.

Many, however, who will see this initial number of THE SCIENTIFIC ARENA have been long and faithful readers of THE MICROCOSM, most of them having been subscribers during the five volumes published, and of which we have, from the beginning, been editor. To such readers we have a few special words to say, and even an explanation to make for starting another journal to advocate the Substantial Philosophy.

We therefore say frankly to that class of readers, that on disposing of THE MICROCOSM at the close of Volume IV, chiefly to shift the care and responsibility of its publication on younger shoulders, and thus save our strength for writing, the present "Microcosm Publishing Co." became the sole owners of that magazine, we having given up all business control of, or financial interest in the same, though we volunteered to continue our editorial management as of old, and free of charge, for the good of the cause it represented, so long as our life and strength should permit. This we have so far done faithfully, as both the proprietors and the readers of that journal will admit; and we purpose still to continue to do the same, to the best of our ability, in the future as in the past.

It is but just to the public, however, to say that on commencing Volume V. of that magazine the new owners and publishers deemed it wise, even against our judgment and advice, to raise the subscription price from $1 a year, the old price, to $2, thinking, as they urged, that a magazine of such character and appearance as they purposed to make, would be sought after by all persons interested in the subjects discussed, and besides, that it could not be afforded at a less price. This latter conclusion was unquestionably correct, as every one will acknowledge who has examined copies of the fifth volume, no cheaper or more elegant magazine for the price ever having appeared in this country.

But knowing, as we knew by sad experience, the danger of raising the subscription of a periodical after its readers had for years been in the habit of receiving it at a fixed and low price, we felt fearful that a vast majority of our old readers would fall away owing to the advance, much as they loved and had clung to THE MICROCOSM, and we frankly so warned the new publishers. Suffice it to say, it turned out as we had feared, many thousands of our subscribers depriving themselves of their favorite magazine, not feeling able to renew their subscriptions at this advance. The result was, that since the close of Volume IV. this large class of our old readers have virtually been deprived of the benefits of these discussions in which they had taken so lively an interest for years.

Under these circumstances, and by the advice of many of the oldest substantialists of the country, we have become convinced that for the good of the cause, a cheap journal—the cheapest that could possibly be afforded that would be large enough to contain from month to month a respectable presentation of the new philosophy and collateral investigations—should at once be started, so that the masses of readers interested in the discussions of these subjects, however limited their means, should be enabled to subscribe. Another aim was to reduce the cost to so trifling a sum that well-to-do substantialists who really love the cause and wish to do a little missionary work in spreading it, might be able to take and distribute a number of copies among their friends, should they feel so inclined.

We have therefore felt it our duty to aid and abet the starting of this journal under the appropriate but unique title of "THE SCIENTIFIC ARENA." For the necessary financial assistance to carry out so important an undertaking, we are indebted to those noble and tried substantialists, Rev. Dr. Swander, Col. Patton, Capt. Carter, and Robert Rogers, but especially to the courageous energy and liberality of that enthusiastic substantialist, the Rev. Henry B. Hudson, pastor of the Lewis Avenue Congregational Church, Brooklyn, N. Y., who has cheerfully taken upon himself the chief financial responsibility of the enterprise, and thus become one of the publishers of THE ARENA.*

In adopting our original programme of sending out this journal at the low price of 50 cents a year, which the publishers have cheerfully acquiesced in, they have done, as we believe, the wise thing, thus enabling all classes of readers who are in any way interested in the principles herein discussed to see that their friends, far and near, may share these benefits by sending them specimen copies. We therefore join heartily with all associated in the work, whether as editors, publishers, or contributors, in the most sanguine hopes of a triumphant success to this enterprise.

In thus stating the reasons and circumstances which suggested and led to this journalistic venture, we will only add, for the benefit of our new readers who have had no previous knowledge of the cause for which we labor, that various other portions of this present number of our paper will give them an abundant insight into the nature of that struggle, as well as into the general drift and meaning of this ARENA, in the center of which, in the style of the Roman gladiators, we now make our modest bow, and accept the greeting of the new audience, if they will be so kind as to extend it. And although the combats here to take place will not be of the sanguinary sort, they may nevertheless be expected to prove quite as lively and decisive as were those of the amphitheaters of ancient Greece and Rome.

With these salutatory remarks we now extend the cordial grasp of welcome for all those who shall honor THE SCIENTIFIC ARENA with their presence at this intellectual feast.

* For the name of this journal the reader is indebted to the genius of our office editor, Robert Rogers.

THE STUDY OF PHILOSOPHY.

BY THE OFFICE EDITOR.

IN its general acceptation and use there is not perhaps a single word in the English language so varied in its application as the term *Philosophy*. It has so many and widely different significations that it becomes wholly impossible to define it in any particular place where it may occur, except by careful study of the specific or other branch of knowledge to which the writer may have applied it. It may, as now employed, not only relate to science, but also to religion. It may not only relate to science in general but to every department of science known to human classification, as well as to every specific phase of every such department of scientific research.

The same may be and no doubt is true of religious *philosophy*. The term not only applies to religion in its broad and universal sense, but also to every separate system of religious belief as taught in any portion of the earth. Such philosophies of course involve man's relations to his fellow-man, as well as his relations to the great intelligent First Cause of all things, which include also his relations morally, socially, and spiritually to the hereafer of human existence.

So, too, even the divergent views of the various Christian denominations may be regarded as involving separate systems of *Philosophy* when such minor divisons of the church with their respective creeds have become so well defined as to separate worshipers into distinct communions, such, for example, as the adherents of Calvanism, Arminianism, Arianism, Unitarianism, Trinitarianism, Universalism, Episcopalianism, Presbyterianism, Congregationalism, etc., to say nothing of the more general divisions of Protestantism. Catholicism, and extending to Mohammedanism, Confucianism, Buddhism, Brahmanism, etc., the latter of which involving the great religious philosophies of the present pagan world.

In like manner may we regard the views of different social and political orders and societies, as the particular philosophies of such banded brotherhoods of men; as, for example, Masonry, Oddfellowship, Democracy, Republicanism, Monarchism, Communism, Socialism, Monasticism, etc., each of which is based on such grounds of belief and tenets of doctrine as to constitute what may be termed a limited philosophy by which such bonds of union are maintained.

In fact, any system of ideas by which men associate themselves together, or by which even one man specially marks out a course of life and practice with which to govern himself, or by which to regard the conduct and relations of others, is, to a circumscribed degree, a system of *Philosophy*. In this sense Shakespeare uses the term when he says, "There are more things in heaven and earth, Horatio, than are dreamt of in your *philosophy*."

But this limitless application of the term philosophy to every conceivable collection of human thoughts upon all imaginable themes, though a fact in current literature, is unworthy of so grand a word, and a discredit if not a disgrace to the language which tolerates it. The ancient philosophies were numerous enough but were more restricted in signification than in the endless varieties

of application of the term as illustrated in the foregoing enumerations of subjects. Yet some of the ancient philosophers based their systems on one leading idea no better adapted as a foundation than the naked tenet of the *transmigration of souls*, or the assumption that electricity is all the God there is in the universe, as one modern philosopher (?) insists. If Stoicism, Platonism, or Epicurianism were to be sifted till only its essential grains of belief were eliminated, its basis of philosophical teaching would be narrowed down to a finer point than that of the present philosophy of communism, or that of the sailor's notion of allaying a storm at sea by sprinkling the billows with oil.

The true and appropriate use of the term philosophy, when washed of its thousands of false and perverted applications, would properly confine it to any system of matured doctrines or tenets of belief, in any department of human investigation, where rational and logical conclusions have been so carefully deduced, collated and formulated as to make the whole, at least in reasonable appearance, the basis for human reliance and fraternity. In this correct sense it is properly applicable to the various departments of scientific research, even following out such researches to their correlations with religious beliefs, as they bear upon and culminate in the existence of God, and an immortal life for the human race.

Principally, however, is the application of this much-abused term more correctly confined to the collection and arrangement of scientific facts, and to so harmonize them with observed phenomena as to constitute a system of theoretical and practical belief held together by the cement of reason. Thus we speak of a system of Natural Philosophy which broadly includes nearly all branches of physical science. In this sense the term is most frequently used. To study *philosophy*, therefore, whether in its broad and general sense, or in any of its limited, specific, and diversified applications, is to study principles and doctrines of belief as held in diversified departments of human thought for the purpose of arriving at the truth. To study philosophy is to study facts, principles, hypotheses, and phenomena, with the deductions, theorizings, and reasonings relating thereto; and consequently the study of *philosophy*, while simple enough for a child to profit thereby, is profound and intricate enough to engage the powers of the wisest and profoundest *of men*.

THE DOMAIN OF SUBSTANTIALISM.

BY ELDER THOMAS MUNNELL, A.M.

To mark off the boundaries of Substantialism is something like fixing a limit to space. There is no place to stop, for should you fly decillions of leagues away you would still find room to stretch out your hand beyond. And yet all this is filled up with the substantial presence of God. David said: "If I go up into heaven: if I make my bed in hades; if I fly to the uttermost parts of the earth, behold Thou art there"—everywhere. That God himself is an immaterial *entity* no Christian philosopher will deny; that water, rock, and all earthy matter are substantial material entities no materialist will deny; and that *most* things lying between these extremes are real existences and not "modes of motion" or modes of anything else, is freely admitted by all intelligent people. What debatable ground there was in this middle zone has been so thoroughly canvassed the last few years by Dr. Hall's "Problem" and MICROCOSM that most of what he has claimed as belonging to the Substantial needs no further defense from any quarter. That the question of sound as an entitative something, with all its cognates, has been settled in the interests of Substantialism, is a fact that is fast going to record in the history of scientific polemics. The controversy as to heat and light has just been precipitated by a staggering blow dealt by the editor of THE MICROCOSM showing that the normal heat of the atmosphere after all due allowance is made for friction, increases in exact proportion to the condensations of the atmosphere, which proves to be a real something. And when the power of light in instantaneous photography is considered—how it literally sinks its mysterious little teeth into hard metal as quick as a flash, it, too, will be found to be not a mere mode of motion. Magnetism has already been surrendered to Substantialism, as an illustration of the entitative existence of mind and thought that can never perish; and so with other of the forces of Nature. Materialists will, of course, be slow to yield the point as to gravitation, vital life, thought, and spirit, as indestructible substantial forces, but *force is force* of whatever kind, and they will yet be compelled to admit that every force *is a thing* sent out from God to do a work for Him, either in the production or conservation of all created things.

But here we leave debated ground, and pass to what is still more debatable, to see if there are not other territories for future conquest by Substantialism. Not that we expect to occupy such country very soon, since there is so much yet to do to make sure of what we have, but it will do no harm to land our ship, plant our flag, and lay our claims.

Gravitation in Physics bears some resemblance to a Principle in Morals. They are alike invisible, both work noiselessly, work all the time, are never caught asleep, both move material bodies, and both are inherent in the organization of their respective hemispheres. The principles of Good and Evil, like magnets, have their positive and negative poles, their attractions and repulsions. "What communion hath light with darkness?" What fellowship between two repelling poles, or Good with Evil? Goodness of heart moved Cary, Judson, Moffat and Livingstone to spend their best energies and their lives in evangelizing the most degraded heathen nations; while avarice led many a man in their wake, with whisky, firearms and the refined vices of civilization to curse the very men whom the others had sought to save. Here are not only different principles at work, but each had power to do its own *peculiar* work by moving not only the bodies of their respective agents, but large masses of others to support them. Now, while we may not be ready to say that these principles are entitative substances, I think we are prepared to say that they are not mere inanities. They are each *something* or *nothing;* and if the latter they are the most potent *nothings* in the universe. The edge of a sharp razor is about the one-thousandth of an inch in width; too narrow to be seen without lenses, and so the fine distinction necessary to be drawn here may be too much for our blunt capacities, and may deter us from pronouncing the Principle of Good an entitative substantive. We can feel a cable with our hands, but not the strand of a spider's web, and yet the spider's web is there for all that. There are sounds too low to be heard, and objects too far away or too small to be seen; but as these facts furnish no reason for denying their existence, so our inability to clearly differentiate a principle into an entitative existence proves nothing against our claim.

It is useless to say that a Principle is only a quality or property inseparable from mind just as color is inseparable from various objects and is a mere reflection of a certain portion of light, for the prismatic colors are all there is of light, and if green is reflected from a leaf it is the seventh part of sun-light, and if light is a composite something, green is a simple something; and if a pure mind is composed of thought, memory, conscience, honesty, love, imagination, goodness, reason, and other elements—these constitute that mind which could be destroyed were it possible to destroy each one of its elements, so that if the spirit be a composite thing at all, and not a mode of motion, each of its elements is a non composite but none the less a real thing. We see no reason therefore why a mother's love should not be listed with all other substantial existences; nor any reason why honesty, justice, mercy, compassion, and all the virtues of a holy life should not be similarly classified. At any rate we lay claim to this vast domain and in the name of Substantialism hoist our flag over all the territory lying in the middle zone between what is undisputed on the physical and the spiritual poles of the universe. None but atheists deny that God is an incorporeal entity, and no man will deny that the coarser earthy matter is a physical entity; and Substantialism claims not only these extremes but all that lies between, including sound, light, heat, electricity, life, thought, soul, spirit and—all Principles inherent in the nature of things, these emanations from God that are found in the constitutions of men and angels.

All analogy goes to show that when a pure mind has been corrupted, it was accomplished by the introduction of a foreign and corrupting element. Sacharine substances often become sour, but always through the combination of some other substance from the air or elsewhere. But these foreign elements are real things, and the sweetness they turned into acidness was a real thing also. So there may be imported into an honest heart an abnormal desire of gain—a covetousness that has power to corrupt the honest purpose—but the covetousness was a thing and the honesty was a thing also, else the one could have no power to corrupt nor the other any capacity to be corrupted. Such ethical principles are not composed of mere inanity like space. Paul, speaking not as a scientist, but in popular style, says: "Neither height nor depth nor any other creature shall be able to separate us, etc." Now while we may call neither space nor latitude nor longitude entitative substances, we cannot so speak of "anger, wrath, malice," nor of "love, joy, and peace," for all these have a home and headquarters in the soul, and are components in its nature. If we deprive an object of all its properties we destroy the object as such. If we deprive a rock of hardness, of divisibility, of impenetrability, of extension, of ponderability, it is no longer a rock. But a rock cannot be destroyed by subtracting a half dozen such nothings from it. So, if you deprive a soul of its purity, of its honor, of its love, honesty, justice, reason, and conscience, it is no longer what it was; but a soul cannot be changed into something else by depriving it of a multitude of nothings. Therefore reason is a thing and conscience is an entitative substantial reality. A child knows that 2+0 are only 2, and that 2—0 are just the same. So if a mind, plus or minus honesty, is just the same in either case, honesty is a nothing, a mere cypher. But if the subtraction or addition of conscience would make a difference in the soul, it must be a real thing.

From these and many similar facts and reasonings, it seems fair to conclude that not only thought and mind are entities, but that the faculties of conscience, reason, etc., may be found to be an immeasurable extension of the kingdom of Substantialism. This little effort at tunneling through the obscurities of a great question of ever-increasing interest, may aid some one else to drive the shaft still further, and to establish our right to hold the territory we have claimed in the name of Substantialism.

REMARKS BY THE EDITOR.

The mine of truth here pre-empted by Eld Munnell, seems to us to conceal untold

wealth, though, as he admits, it lies within the legitimate territory of Substantialism. The work we have been doing for the past few years in sinking shafts, opening prospect holes, blasting to find the true veins of ore, surveying to discover the trends of the principal lodes, and staking out claims for those who should succeed us in these operations, have not only been outside of the zone of which Eld. Munnell has so thoughtfully taken possession; but all our mining operations have been carried on with tools, materials, and processes which would be wholly out of place in prosecuting successful operations in the newly pre-empted territory. We have had to employ the sharpest and hardest steel picks. and diamond drills, and the most destructive explosives, such as dynamite, giant-powder, gun-cotton, and even nirto-glycerine in order to do the pioneer work in these explorations. But as the precious metallic masses in our mineral zones have been of a very coarse nature—mostly nuggets—we were enabled to collect and save them, notwithstanding the shattering and scattering effects of our blasting material.

But the newly pre-empted mine is of a different character. Its precious deposits are in flour gold, requiring the most delicate processes of disintegration, separation, desulphurizing, amalgamating, retorting and refining in order to let none of it be lost. No chemist or metallurgist we know of is so well calculated to superintend the working of that great ore field as the one who has been so fortunate as to place upon it his pre-emption seal. We therefore move that he at once take charge of the works in the name of the subscribers to this journal, and we hereby issue a *carte blanche* to its pages for that purpose.

SKETCH OF HENRY A. MOTT, Ph. D., F. C. S., etc.

THE subject of this sketch, whose portrait appears on the first page of THE ARENA, was born October 22, 1852, at Clifton, Staten Island, this state, and when three years old he came to this city, where he has lived ever since.

Dr. Mott comes of a very distinguished family, his grandfather, Dr. Valentine Mott, who died in this city some years since, being the most noted surgeon in America, as well as in Europe, he having been employed both by Queen Victoria and Napoleon III.

Young Henry A. Mott, as soon as old enough, began his educational studies in the leading schools of New York, and showed such proficiency in acquiring rudimental knowledge, that no pains were spared by his father in facilities for his mental culture as rapidly as warranted by proper regard for his health.

Before he had reached the age of ten years it became evident that a promise of great usefulness and even distinction lay before the young man in the near future; and so indomitable were his energy, will-power, ambition, and determination to triumph over every difficulty that he might encounter in his studies, that it was plain to those interested in his progress, even at so early an age, that he did not propose waiting to become an old man before he should reap a harvest of scientific renown in some one of the learned professions which he might choose. This resolve which he then made he has well kept, for there is not perhaps to-day a scientific investigator, either in this country or Europe, of his age, so thoroughly conversant with as many different branches in almost every department of scientific research as is Dr. Mott now, at the age of thirty-three years.

From intimate acquaintance with him during the past year, and from being brought together constantly as associate editors, in the most intricate discussions of almost all conceivable questions in science and philosophy, the writer has often been astonished at the wide versatility of his knowledge, and his ready familiarity with scientific literature of every class, a fact of which readers of his many papers in THE MICROCOSM are now well aware.

We became acquainted with the Doctor by the circumstance of his having chanced to pick up a copy of the "Problem of Human Life," after which he came to our office to let us know how glad he was at having received such a scientific revelation, and to congratulate us on the new departures in science which the work contained, especially those portions relating to acoustics. He had been a careful student of this branch of physics for a number of years, and expressed himself as astounded at the vulnerability of the wave-theory of sound, as well as surprised that no previous writer had detected and exposed its weak points.

Soon after this the Doctor prepared and delivered his memorable lecture on Sound before the Academy of Sciences, in this city, of which he is a leading member, and from this time on he publicly and privately made no hesitation in avowing himself an out-and-out convert to the principles of Substantialism as foreshadowed in the "Problem of Human Life," and definitely elaborated in the early volumes of THE MICROCOSM. His lecture on Sound was published in book-form, and has had a large sale.

Soon after this he became managing editor of THE MICROCOSM, and those who have been readers of the fifth volume of that magazine need no comment of ours to assure them of his great versatility and remarkable powers as a scientific writer and reasoner. His latest and one of his best papers is the masterly presentation of the "Substantial Theory of Sound," just printed in the *Scientific American Supplement*, and which, as we are glad to know, has gone forth broadcast before the leading investigators of the world upon that question.

Dr. Mott entered the School of Mines of Columbia College in 1870, and there graduated as Bachelor of Philosophy (Ph. B.), and also as Engineer of Mines (E. M.); and in 1875 he received the degree of Doctor of Philosophy (Ph. D.) from Columbia College for original investigations and an essay on Milk.

For seven years the Doctor was employed as chemist by the great sugar refiners of this city, Havemeyer & Elder, and was elected to the professorship of Chemistry and Toxicology in the New York Medical College, a position which he still holds.

His fame spread rapidly as a chemist all over this country, and extended to Europe. He was elected a member of the American, Berlin and Paris chemical societies, a Life Fellow of the Chemical Society of London, as also of Public Analysts of the same city. He is a member of the American Association for the Advancement of Science, and of many other scientific societies and associations here and abroad.

Dr. Mott has been untiring in his professional labors, making numerous original investigations, and is the author of *many* scientific books and treatises, having prepared and read more than seventy special papers on chemical and other scientific subjects. Among his principal books are his "Chemist's Manual," a large and very able volume, and also his very critical work in favor of evolution entitled "Was Man Created?" It is but proper, however, to state that he has renounced this latter book, with the entire Evolution theory of Darwin and Haeckel, since reading the "Problem of Human Life."

One other fact only we now have room to state. Dr. Mott's world-wide reputation as a chemist caused his services to be sought by the great moneyed interests employed in the manufacture of oleomargarine as a substitute for dairy butter. His investigations, thus made, led him to the conviction that oleomargarine, properly made, was equally wholesome, as food, with butter itself, made wholly from cow's milk, and he so publicly declared, not only in his official reports of analyses, but in an elaborate paper in *Appleton's Encyclopedia*. He has thus become the acknowledged champion of that much-praised and much-abused product.

Next month we will print the Doctor's initial scientific paper for this journal, which will be in reply to the criticisms on oleomargarine found elsewhere from the pen of that close and careful thinker, Mrs. M. S. Organ, M. D. If we mistake not, this opening combat in THE SCIENTIFIC ARENA will lead, before the volume closes, to some lively exhibitions of skill, as the parties to the contest are well worthy of each other's steel.

THE GROWTH OF SUBSTANTIALISM.

THERE is little doubt but that this initial number of THE ARENA will fall into the hands of many persons who had never, previous t its perusal, heard either of "Substantialism" or of the "Substantial Philosophy;" and it is equally possible that some such persons whose minds are thus for the first time introduced to this phraseology will be inclined to confound the new philosophy with some phase of modern spiritualism or materialism, which is equivalent to some phase of modern infidelity. But to any such person, who, for the first time, has his attention called to this subject in the present number of THE ARENA, we would earnestly commend the "Substantialist's Creed" given in another part of this journal.

For the information of such uninitiated searchers after knowledge, we would say, that although this new philosophy has been definitely before the reading public for about half a dozen years, its teachings and confirmatory investigations have nevertheless been necessarily limited to comparatively a small number of persons, namely, those who had chanced to purchase the "Problem of Human Life," and who had thereby been induced to become readers of THE MICROCOSM. Neither the founder of the Substantial Philosophy nor any of its early friends were men of wealth who, however much they might have wished to spread this knowledge, could afford to advance liberal sums to make it known far and wide among the higher and more respectable portions of mankind.

Converts, from among the wealthy and the influential of the people, are not to be looked for at the initial introduction of a new movement either in science, philosophy, or religion, however much valuable and even essential new truth it might disclose. Such classes of the community almost always float with the popular current and intuitively drift into the respectable eddies of established thought. New channels for the stream of truth by which to cross the great obstructing bends of drift which have been accumulating for ages have always to be dug out by those who love to work, rather than by those who live on their money and on the labors of others.

Notwithstanding all these disadvantages bearing against the rapid spread of Substantialism at the start, yet, so forcibly did its revolutionary principles appeal to the judgment of those who chanced to come under their influence, that thousands of the most intelligent persons have already gladly received the word, and have learned to rejoice with joy unspeakable in the consoling and confirming light which these wonderful revelations from physical nature have so opportunely but unexpectedly shed along their pathway. Had we space we could give hundreds of the most enthusiastic letters

from clergymen of the different denominations, thanking God that they had ever lived to know and enjoy the great truths of this new philosophy. These letters all breathe the same general spirit as shown in the following which we copy from the Rev. Mr. McIntyre, a Congregational minister, at Long Ridge, Conn:

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

Most truly and sincerely yours,

REV. A. McINTYRE,

Pastor Cong. Church, Long Ridge, Conn.

And to give an idea of the practical and actual spread of Substantialism, to those who have had no previous reading in this line, we cannot do better than make the following extract from a paper printed in the fourth volume of THE MICROCOSM, page 369, from the pen of Robert Rogers, the office editor of this journal.

"The four volumes of this magazine, now completed, form the epitome of this vast system [Substantialism], though the future volumes will constantly add to its evidences, analogies, and finishing touches for many years to come, as we trust and believe, under the able direction of Dr. Henry A. Mott, the future managing editor, even if its original founder should unfortunately be called hence. Should he die now, however, there would not be the slightest possibility of the Substantial Philosophy lapsing into the forgetfulness of mankind, however important his continued blows may be to its rapid onward progress. Substantialism is already so thoroughly imbedded in the very mental constitutions of its more than 25,000 adherents that no fatality happening to its founder can now stop its onward march. Live it must, and spread it will, till, like the little stone that was cut out of the mountain without hands, it shall fill the whole earth. There is already too much young scientific blood infused into its arteries and veins to allow it either to die or become weak.

"Even though the older elements among our scientific professors and investigators may discard and oppose the new departures involved in Substantialism, which is only what might have been expected, since it was ever thus, it matters little, so far as the general result is concerned, as their places are constantly being vacated to be filled by young aspirants, whose ambition will be for new paths of research unchained to old theories, and with a single eye for the truth as it is in nature. Soon the old prejudiced opposition will have entirely disappeared from the stage, when the great revolution now starting will realize the mighty expectations of its friends—when college after college and university after university will fall in line in such rapid succession that it will be as difficult to keep their record as it is now for astronomers to keep an accurate list of the newly discovered asteroids. It is safe to believe that in one or, at most two generations from now, no college or university in the civilized world will consent to be so far behind the age as not to have incorporated in its curriculum the leading principles of the Substantial Philosophy as now unfolded in these volumes.

"As a basis for hope and a glowing anticipation of the future on the part of every friend of Substantialism, it is surely encouraging to know, as I happen to by actual correspondence, that there are already firm and active converts to this new philosophy in nearly every section of the inhabited globe—South America, Australia, China, Japan, India, South Africa, New Zealand, and nearly every part of Europe! No such showing was ever made by a new and radical departure in science, philosophy, or religion, within the same period of time since the world began; and, as Dr. Swander said in one of his recent masterly papers, neither Christianity nor Mohammedanism had made anything near the number of converts, that the Substantial Philosophy has made, within a corresponding period of time."

And we may justly add, in conclusion, that all this, so graphically set forth by Mr. Rogers, has been accomplished under the most adverse and discouraging financial circumstances, beginning, as we had to, without one penny, and without the acquaintance or credit necessary to get even a prospectus of the "Problem of Human Life" printed, by which to let the public know that such a book was in manuscript. As we once stated in THE MICROCOSM (Vol. II., p. 253), under the head of "Romance of the Problem," it was by the aid obtained from a young *atheist* that we succeeded in raising means by which to set the type and issue the first edition of the "Problem," which proved the "mustard-seed" of Substantialism. Thank Heaven, it is not so now. We do not have to appeal to those who sneer at the idea of a God to help us in crushing materialism. Hundreds of believers in the new philosophy stand ready, no doubt, in different parts of the world, to open their pockets in aid of this cause, if they only knew their aid was actually needed. The starting of this new journal is an ample proof of this fact, as we have taken occasion to state in our Salutatory.

The cause we plead must therefore live and grow, and continue to spread its influence till the rich and respectable and even the aristocratic of this land shall take pride in avowing themselves members of this "Syndicate of Substantialism." Let all everywhere who believe in its principles and who wish to see them cover the earth, speak to their friends about THE SCIENTIFIC ARENA, and urge them to read it.

TO OUR OLD CONTRIBUTORS.

THE SCIENTIFIC ARENA is not started in opposition to THE MICROCOSM, but in perfect harmony and co-operation with it, both being organs of the Substantial Philosophy. We are the editor of both journals, and are equally interested in each, to the extent, at least, of fatherly care and affection. But THE MICROCOSM being a $2 magazine, cannot adapt itself to the masses of the people, who are limited in means, as can a 50-cent journal. We ask and expect our contributors to continue as of old their contributions to THE MICROCOSM, and at the same time to add THE ARENA to their voluntary obligations, for which its readers will heartily thank them. Send all communications for both journals to the editor, and make those specially intended for THE ARENA as short as practicable, say, not to exceed 1500 words, unless the nature of the discussion, when boiled down, really requires more space. Remember this. The following is a list of our old and valued contributors, as printed in THE MICROCOSM, besides many who write occasionally not here given, most of whom will be heard from by readers of THE ARENA during this volume:

Pres. I. L. Kephart, A. M., D. D., Westfield, Ill.; Rev. J. I. Swander, A. M., D. D., Fremont, O.; Capt. R. Kelso Carter, D. D., Chester, Pa.; Rev. L. W. Bates, D. D., Georgetown, D. C.; Eld. Thomas Munnell, A. M., Mt. Sterling, Ky.; Prof. J. W. Lowber, A. M., Ph. D., Paducah, Ky.; Rev. F. Hamlin, D. D., Peekskill, N. Y.; Rev. Joseph S. Van Dyke, A. M., D. D., Cranbury, N. J.; Rev. J. J. Smith, A. M., D. D., Tomkins Cove, N. Y.; J. R. Hoffer, Esq., Mt. Joy, Pa.; Isaac Hoffer, Esq., Lebanon, Pa.; Prof. W. H. Slingerland, A. B., Ph. B., State Centre, Iowa; Prof. G. R. Hand, A. M., Sycamore, Cal.; Mrs. M. S. Organ, M. D., Newburgh, N. Y.; H. F. Hawkins, Esq., New Madrid, Mo.; Rev. M. Stone, D. D., Omaha, Neb.; Prof. H. S. Schell, A. M., New York; Rev. Joseph Smith, Bangor, Me.: Prof. I. N. Vail, Barnesville, Ohio; John C. Duval, El Paso, Texas; Rev. Prof. Stephen Wood, Lost Nation, Iowa; Rev. George Severance, South Royalton, Vt.; Dr. C. H. Balsbaugh, Union Deposit, Pa.; Rev. T. Nield, Greensburg, Ky.; Rev. T. Williston, Ashland, N. Y.; Judge G. C. Lanphere, Galesburg, Ill.; Rev. S. A. Taft, Santa Ana, Cal.; Pres. J. M. Spangler, A. M., San Francisco, Cal.; Rev. G. R. McKnight, D. D., Elmira, N. Y.; Rev. D. Oglesby, Richview, Ill.; Col. J. M. Patton, Bentivoglio, Va.; Prof. J. R. Sutherland, Lovington, Ill.; Prof. E. A. Luster, A. M., Perry, Ga.; Rev. J. J. Billingsley, Minden, La.; Prof. W. H. H. Musick, Vandalia, Mo.; Eld. J. J. Miles, Clinton, Ill.: Reuben Hawkins, Esq., Chillicothe, Mo.; Robert Walters, M. D., Wernersville, Pa.; Rev. T. M. Walker, Elk City, Kansas; Eld. J. G. Burroughs, Rolling Prairie, Ind.; Eld. W. H. Winters, Neb.; Rev. John Collins, Ferry Village, Me.; Prof. Henry A. Mott, Ph. D., F. C. S., New York.

EDUCATION AT HOME.

BY THE ASSOCIATE EDITOR.

ACCURACY, convenience, and expense are the prominent factors to be considered in the attainment of a liberal education. And in this age of home study whereby the advantages of the college and university are brought into our homes, permitting the family circle to pursue the study of the high branches of practical and classical knowledge, the questions of convenience and expense are disposed of.

But when we reflect how generally knowledge in all its departments is assuming a scientific character, and that science aspires to the royal prerogative of arbitrating upon all mental and spiritual attainment—the question of accuracy is seen to be a grave one.

We are told with urgent frequency that the theological thought of the age must have a new dress; that the antiquated fashions of the fathers will not suffice for their progressive sons.

The religious evolutionists insist that it is no change of the *body* of *truth*, but only a change in dress, that is being effected, while the scientific evolutionist is equally vociferous in claiming that the angular old *form*

shall be exchanged for the plump and buxom lass of the nineteenth century, since such a *body* of *truth* will require less faith for padding. The earnest discussion involved in this is being brought before all intelligent minds by pulpit, press, and platform. Now the *educational* value of all this will depend upon the accuracy of the positions taken. If one bad *guess* is to be substituted for another; if old errors are to be touched up and put forth as pegs upon which "new truth" is to be suspended, "confusion will be worse confounded."

We love to *investigate;* often the bottom drops out as we lift some bucket in which has long been stored undisturbed a choice bit of scientific fact (?). But we cannot let go of accuracy to gather up the protoplasm—or capture the monkeys thus let loose.

Nor does the ominous crash of a shelf of theological jars suffice to turn aside the investigation that seeks *accuracy* first, then formulas. Did God make *out of nothing* all things? Was man made from the monkey as a model, or in the image of God himself? Does the grasshopper actually kick the earth out of its orbit as he springs upon a grass blade?

Is the mind or soul of man "but the molecular play of the physical cells of protoplasmic albumen placed together in a most varied manner?" Will a pebble thrown into the sea actually raise the whole body of water, millions upon millions of tons?

Does the sound *pulse* caused by striking two books together at one end of a long tube extinguish a candle at the other end without any air passing through the tube?

If the *noise* of an explosion shatters windows and demolishes buildings, why is it that the *greater noise* of heavy *thunder* never has such an effect, etc., etc.

Now, since the whole realm of knowledge is being laid under tribute, fact and fiction, theory and theology, science and speculation are all being heavily taxed for a contribution to the tremendous struggle, we submit whether a journal that shall gather from the *debris* of intellectual strife the constantly accumulating mass of problems and puzzles like those cited above, and offer a clear and consistent explanation of them, will not be a valuable factor as a home educator? And if accuracy is combined with fluency, who that is interested in the conflict of thought can afford to be without the monthly visits of such an instructor? That such may be a leading characteristic of THE SCIENTIFIC ARENA, we invite all its readers to send us any problem of physical science that may attract their attention and baffle their investigation, and we will attempt its solution, and the knowledge we may thereby gain will be clearly and fully set before the many readers of THE SCIENTIFIC ARENA.

HOW SUBSTANTIALISM SOLVES THE PROBLEMS OF SCIENCE.

BY THE EDITOR.

IT is of the utmost importance in the investigation and discussion of scientific subjects that we lay down, as nearly as possible, fixed definitions of the principal words employed to convey our ideas. There is a looseness in the general discussion of scientific subjects, among even the best of writers, that is deplorable in the highest degree. Words of chief importance in such investigations should, as far as possible, have but one literal meaning, and should be employed outside of that meaning as seldom as possible. Besides this, no two words should be employed with precisely the same shade of meaning, if it can be avoided, for in all such cases a confusion of ideas or want of definiteness must result in all labored scientific discussions.

Still, notwithstanding the necessities for such rules of action, we find great difficulty in conforming to them. Words, such as those to be found in this article, have been so long used by different authors with varied significations, as when they are employed in treating on different philosophical subjects, that it seems impossible to settle down upon any uniform definitions that will be apt to be acceptable to all or that will be permanently adopted.

The term *force*, for example, is just now the subject of much discussion, and the definitions given of it are as widely different as daylight and darkness, almost. Prof. Tait, of Edinburgh University, by a recent very forced and inexplicable departure from all accepted usage, makes it neither an entity nor a phenomenon of an entity, but the mere *rate* at which an entity moves or does work, a shadow of an entity's motion, or even less, since a "rate" is neither a thing, nor the motion of a thing, nor the property of a thing, nor the effect of a motion or of a property, but the *rate* at which an effect of a property or of a motion of a thing is accomplished, as, for instance, the bank rate of interest, the birth rate of a city, etc. Such definition is confusing in the highest degree, and makes physical science less understandable than it would be if the word *force* were entirely expunged from the vocabulary of our language.

The Substantial Philosophy has the commendable merit, at least, of steering clear of all such unnecessary confusion by making everything of which the mind can form a positive concept an objective entity, particularly anything that can cause a phenomenon or produce a motion in any other entity.

The two words, *force* and *energy*, come nearer having the same real meaning, as variously used in times past by different writers, than almost any other two words in the English language. The conservation of *force* has been often expressed as the persistence of *energy*, thus making them synonyms. We speak indifferently of the correlation of the *forces* and of the conversion of *energy* from one form to another, thus again using the two words as synonymous. With such constant license among approved writers and scholars, we should, as far as possible, restrain a disposition to jangle over the meaning of any particular word, especially as long as its recognized employment is well understood. Let us try for a moment to see how far we may limit the meaning of these or other words to some restricted use, and thus, if possible, simplify our investigations of science.

All motions or phenomena of substances or entities are the result of force, but are in no sense entitative themselves. Not a thing moves or can move in the universe, except as induced to do so by force of some kind. If gravity pulls a stone to the earth, then gravity is the force which causes such motion, while the motion is simply *position* constantly changing. This definition of *motion as simple space*, or *the position of a body in space constantly changing*, is the best proof of the non-entitative nature of motion that can be desired, since space, or mere position in space, whether changing or unchanging, is absolutely *nothing*. But the force of gravity which causes a change of position in space of a falling body is a real entity or objective thing, according to Substantialism; and hence if this gravital substance moves or stirs, it, too, must be impelled into such motion by a force behind it, and external to it, up to the infinite source or fountain of all force, just as our law requires, namely, that no finite entity can move itself or stir only as compelled to do so by some force above itself.

To illustrate: If the engine moves, we know it must be by the force of the steam behind the piston, but what moves the steam? It, too, must have a force behind it by which it acts, as steam is as much an inert entity as the water from which it has been expanded into vapor. That force which makes steam effective is *heat*. But heat, again, is an entity—a substantial, objective, finite, or limited, thing—and as such can only *act*, and thereby move the water, changing it into vapor, thereby acting on the piston, thereby moving the engine, thereby propelling the train, and, finally, transporting the passengers. What force is it that moves this substantial heat into effective action?

Men and beasts are but living engines, moved by the force of vital steam, generated by the force of vital heat, developed by the vital energy potential in the consumption of material elements, and the whole governed by mental force as the controlling engineer, so that the engine shall not dash itself to pieces by the action of this vital force without a governing power. As the life of every creature is also an entity, according to the Substantial Philosophy, and as no finite entity can move only as it is compelled or allowed to do so by a force behind it, if our law be true, what force, then, is it behind life which causes it to act and thus drive the machinery of our bodies? As finite mind, the governing (not the propelling) force of these vital engines, is also an entity, it, too, cannot move nor act only as caused to do so by a force behind it. What is this force which also moves the substantial mental powers of man and beast, converting them into intelligence?

What a startling class of facts here confronts us as we survey the ground now hurriedly gone over! Electricity, being a substantial entity, cannot move along a wire or flash from a cloud, only as it is driven to do so by a force behind it. Magnetism, also being an entity, cannot reach out its invisible fingers to lift the iron armature at a distance, except it be compelled and moved to this work by some force behind it. Substantial light could not travel a rod from sun or planet, only as a force behind it drives or urges it forward; and substantial sound, even could it be generated, would fall dead where produced, and instead of going through the air 1120 feet a second, and through iron 19,000 feet a second, would not go at all, only as it is coerced to move by a real force behind it.

The mind thus harassed and buffeted at every turn, seeks, like the wearied dove, some solid place on which to rest the soles of its feet. An infinite, substantial, and all-sufficient cause must of necessity exist behind or back of every finite effect observed in nature, whether that effect be among material or immaterial substances. So far as our powers of observation or reason extend, no finite substantial thing can change its position or stir without a force or form of energy to move it; and such force being logically necessary, and inevitably a substance, it also must be induced or coerced to act by a force still back of it. So with all the forces of nature, as we have seen, within the entire range of human observation.

Does not wisdom, then, utter her voice and cry aloud even in the streets, assuring us that there must of necessity be an ultimate, intelligent, self-existent, and unoriginated fountain of force as the moving power of all the forces, and other entities in nature, and as the primordial First Cause of all the minor causes in this universe which come within the observation of sentient beings? To bring up abruptly against the source and cause of every separate force or observed phenomenon as an infinite and incomprehensible mystery, as the atheist is forced to do, and thus fritter away the mind in endless perplexities when the concession of a single almighty mystery would settle the matter with everthing in nature and put the mind at rest, is certainly unwise. It is just as easy, as a simple mental effort or rational conclusion, to accept reverently an infinite, intelli-

gent, and uncreated fountain and source of all finite things—animate or inanimate, material or immaterial—and thus solve all the myriad minor mysteries in nature, as to be compelled to accept the equally mysterious fact that a magnet will lift a piece of iron at a distance by means of something which no scientific test on earth can ever show to have an existence, and that, too, without any source above it from which to derive such power to act unless an infinite fountain of force shall really be postulated.

The substantialist is involved in no such provoking difficulty as the atheist or materialist is compelled to face at every turn of his investigations. Substantialism is a calcium light which shows magnetism to be as really a substantial entity as is the magnet itself from which it emanates and by the same light the intelligent substantialist sees these immaterial magnetic threads going out from the steel magnet to the piece of iron, as we may express it in common parlance, but really sent out, or carried out, by the fingers of an infinite, immaterial, and intelligent manipulator back of the magnet and directly correlated with this invisible force, through which alone it derives all its power to act.

Hence, all the forces of nature, vital, mental, or physical, as real substantial entities, can only act under the correlation of the forces as the power is given to them to move, and communicated to them from the primordial and intelligent force-fountain of the universe—God himself. Hence, the term *energy* might easily have a shade of meaning slightly varying from that of *force* in classifying and arranging such terms for the best possible use in our scientific discussions, by making it signify the *power* or *ability* of any substance or body to accept of, or move under the action of, applied *force*. Thus. for example, the *energy* of an engine is its ability or power to move by the application of the *force* of steam; and the *energy* of steam is its ability to move, and thus act on the piston by the *force* of heat; and the *energy* of heat is its ability to act on water under the primordial *force* communicated to it from the force-element of nature, where all force or energy is correlated to the intelligent fountain, as embodied in the infinite *ego*.

[CONTINUED NEXT MONTH.]

TEMPTING OFFERS TO THE EDITOR.

THE FORTHCOMING UNIVERSITY OF SUBSTANTIALISM.

To prove that Substantialism has come to stay, and that it is only a question of time when it shall assert itself as a power in the earth, we are pleased to record the fact that we have now lying before us two offers of the Professorship of Substantialism in two different colleges in the South, and at a fair salary. Both of these positions we are urged to accept, and one or the other of which we might accept the coming fall, but for our present responsible editorial engagements. A consoling thought in the midst of such offers is the conviction that we are now teaching Substantialism from the point of our pen with more effectiveness than it would be possible for us to accomplish personally and by word of mouth in the classroom of any one college in America.

Still it does not follow that we might not edit this and our other journal, and teach a class in a college at the same time. Why not? But when we do conclude to take upon ourself such triple work, it will be, if possible, in an institution devoted chiefly to the cause of the renovation of science and philosophy to which we have consecrated the remainder of our days.

We are, and for some time have been, anxiously anticipating the time soon to come when the "University of Substantialism," of which so much has been written in THE MICROCOSM, or at least a preliminary college for inculcating those principles, shall be permanently established somewhere in this country. Already the grounds for such a college, with suitable buildings to start with, have been purchased by a noble-hearted and public-spirited friend of the cause at Tallahassee, Fla., and offered free of charge, if we will come down, take possession and rally a few of our leading educators to join us in inaugurating this new dispensation of scientific progress. We had expected to do this without delay, and also to continue our editorial work from that base; but from causes beyond human control, not necessary here to state, the anticipated commencement of such a work has been unexpectedly delayed. While this necessitates a temporary derangement of the plans of those who had given themselves to this work, it is, as we trust, but a temporary postponement, and we still look forward to see in the near future the much-needed educational center of Substantialism doing its work, and letting its substantial light shine.

In the meantime, while we wait for the university, we purpose not to be idle. Life is too short, and there must be no standing still while false science is struggling to intrench itself more securely behind the ramparts of materialism. When Moses told the frightened Israelites to "Stand still and see the salvation of God," a countermanding voice from the cloud interposed—"Say unto my people that they go forward!" So it is now. While we appear to wait for the permanent home of the new philosophy, an unmistakable voice commands us to go forward with THE SCIENTIFIC ARENA as the pillar of cloud by day, and Substantialism as the pillar of fire by night, while the God of Truth is cutting for us a dry path through the Red Sea of agnostic uncertainty and unscientific darkness. Thus is he disciplining the Substantial hosts for a grand jubilee when they shall have gone over and taken full possession of the promised land. Let all stragglers, therefore, from the Substantial camp hurry into the ranks before the waters shall close.

The Keely Motor.

WE have a special invitation to go to Philadelphia in a few days to witness a private exhibition of Mr. Keely's wonderful invention in the use of what he calls "etheric force." With the whole scientific world, we have hitherto inclined to the conviction that the claimed discovery of Mr. Keely was a well-contrived and ingeniously operated mechanical deception. We are, however, at present disposed to look more favorably upon the possibilities involved, from investigations of our own which will appear in due time in this journal. At all events, next month's ARENA will contain the dispassionate result of our visit to Mr. Keely.

Articles Crowded Over.

MANY short but telling articles were intended for this issue of THE ARENA, but owing to important introductory matter for an initial number they will have to appear next month. Among these papers are one by President Kephart on "Materialism, Soul Culture," etc.; one by Rev. T. Nield on "The Nature of Odor," with editorial reply; one from Prof. Lowber on "Modern Philosophy and Substantialism;" one (being the first of a series of articles) from Prof. Hand on "What is Man?" a Syllogism by Mr. Hawkins on "Something Made out of Nothing," etc. We anticipate no lack of the most interesting communications during the volume, the way our excellent contributors begin to respond to the first hint that THE SCIENTIFIC ARENA was to make its *debut*. Send all such communications to the editor.

OUR BOOK SHELF.

DEATH OF DEATH.—There are a few copies left of this beautifully-written volume by our good friend and able contributor, Col. J. M Patton, of Bentivoglio, Va. The spirit of this book is so sweet and candid in every sentence and paragraph, that none who believe in the divine paternity can fail to recognize its author as a man who follows the golden rule of doing to others as he would have others do to him. Should any, however, be inclined to regard the book as a trifle more liberal in tone and spirit than the average orthodox treatment of the same subject, he can charge it to the intrinsic goodness of the author's heart.

Send to him or to Hall & Co. for a copy. Price, in cloth, $1.

VICK'S FLORAL GUIDE AND MAGAZINE.—We have received a copy of this unique and most elaborate description of flowers, vegetables, bulbs, and in fact everything that can be grown in a well-appointed garden. These various ornamental and useful productions of nature's handiwork, to the amount of more than a thousand choice varieties, are beautifully illustrated, many of them with elegantly colored plates, and form a very tempting collection. Ladies interested in this department of the art-science of nature would never tire examining this guide. It costs but 10 cents, and will put it in the reach of all lovers of flowers and fancy garden vegetables to buy for a few dimes enough seeds to make any country, village, and even city house, happy, with a little spot of ground and a little labor. Address James Vick, Rochester, N. Y.

THEISM AND EVOLUTION.—Just as we go to press with the first number of THE ARENA, we find on our table a book with the above title, from the able and logical pen of Rev. Joseph S. Van Dyke, A. M., D. D., one of our oldest contributors to THE MICROCOSM. He is also the author of "Through the Prison to the Throne," an intensely interesting book, which we noticed in that magazine some two or three years ago.

His "Theism and Evolution" is a beautifully printed and bound volume of nearly 500 pages, and contains "an examination of modern speculative theories as relate to theistic conceptions of the universe."

We believe in advance of reading it that it is sound and able. After taking time to read it we will notice it further in a future number of this journal. We have not been informed of the price, but suppose it to be $2 by mail. It is published by A. C. Armstrong & Sons, New York.

THE STORY OF THE ROCKS.—This book of 400 pages by Prof. Isaac N. Vail, of Barnesville, Ohio, just from the press, is without question one of the most original and remarkable scientific treatises of the present age, so prolific in wonderful productions of the human intellect. The work unfolds the Professor's recently discovered annular system of the world, gives the scientific and scriptural reasons for believing the same, and the discussion of which, in a series of critical papers in the early volumes of THE MICROCOSM, created such a profound sensation among its readers. Prof. Vail is a master workman in theological investigations, and no mistake. His explanation of the *flood* of Genesis on scientific and philosophical principles, and at the same time bringing it in harmony with the biblical account, is a most ingenious and masterly commentary on that part of the Sacred Scriptures. Whether or not it will entirely satisfy the orthodox interpretation of the deluge and its accompanying circumstances as narrated by Moses, remains for the various readers of this startling work to determine. But its ingenuity and singular consistency

must, all the same, strike every attentive reader as among the most surprisingly harmonious interpretations on record.

This book sells for $1, by mail, postpaid, and can be had by addressing the author as above.

THE PHRENOLOGICAL JOURNAL.—This popular periodical for May is on our table, and is full of valuable information as usual. Among its interesting contents is an excellent portrait, with sketch, of Robert Graham, the eminent President of the "College of the Bible," Kentucky University. We are reminded to refer to this item in the journal by the fact that we were personally acquainted with President Graham when we were young men together.

Debatable Ground.

WE urge every reader who has accepted the Substantial Philosophy to study Eld. Munnell's "Domain of Substantialism" on another page. Since that beautifully written paper, with our allegorical remarks, was in type, we have seriously questioned whether or not, by any refinement of mental analysis, an attribute of the substantial mind, such as love, hate, envy, jealousy, fear, etc., can be in a true sense an *entity*, or anything more than a *property* of the mind, as elasticity or transparency is a property of a material body. That a property, whether of mind or matter, is a *reality*, cannot be questioned, and it is equally true that no property of any substantial thing can exist or come into existence except by the action of force in some form. The only question is, whether any property of a substance, either physical, vital, mental, or spiritual, can or cannot in strictness be called an entity. This, surely, is very refined debatable ground, and we hope to hear from Eld. Munnell again upon this very point, when both ourself and our associate, Mr. Hudson, may have some thoughts to present.

PUBLISHERS' DEPARTMENT.

Portraits and Sketches of our Contributors.

As we have begun in this initial number of THE SCIENTIFIC ARENA, so we expect to continue during the year, and to print in each number if possible a portrait and sketch of the life of some one of our prominent contributors. We have many able writers, and some of them unsurpassed in this or any other country as contributors to high-class periodical literature. To prove this, we need only refer to the years of service of many of them on the contributorial staff of THE MICROCOSM. Many of our readers have no doubt been long anxious to see in print the portraits and sketches of these men. We begin the list, therefore, with the distinguished scientist, Dr. Mott, as the readers of this journal will have already observed. Next month we will present the portrait and sketch of the Rev. John I. Swander, A. M., D. D., of Fremont, Ohio; and the following month we propose to print the sketch (with portrait) of the editor, as prepared by Eld. Thomas Munnell, A.M., for the *Cosmopolitan Magazine*. Others of our prominent writers will be announced from month to month in advance of their appearance. See list of contributors elsewhere.

To Ministers and Teachers.

WE have taken the liberty of sending a few specimen copies of this, the first number of THE ARENA, to ministers, as well as to prominent men of science in and out of the church. We do not hesitate to believe and predict that any such persons who will examine this journal, before laying it aside or allowing it to slip their minds, will thank us heartily more than once for ever having sent them the copy. We purpose to furnish all such persons, during this journalistic year, if they shall so desire, a class of scientfic and general information so novel and useful as to be of the greatest value to educated and thinking men, compared to which 50 cents should be regarded as the most diminutive bagatelle imaginable. Read the principal articles in this number and then judge whether or not we speak advisedly.

The Price of Our Journal.

THE low price of 50 cents a year for a journal containing as much original reading matter as does this, must appeal to the masses who wish something solid, novel, and useful, and who have become tired of the trashy literature now going the rounds, and so generally sought. This number is sent out as a specimen of what may be looked for in each of the twelve issues constituting the volume; and if those who will carefully read the regular papers in this one number do not find some one article alone worth to them the 50 cents charged, then we shall confess ourselves entirely mistaken in the estimate we have placed upon those to whom we have sent copies.

Binding the Arena.

THE size and form of our journal have been determined upon after much deliberation, considering cost of presswork, quantity of printed matter contained therein, convenience for binding, preservation, etc. We believe that the present size and form of THE ARENA, all things considered, give more actual reading matter, with other advantages, than has ever before been printed for 50 cents a year.

AGENTS WANTED at once for THE SCIENTIFIC ARENA. 100,000 copies issued with the first number. The most popular journal of its kind in the world. Read by thousands of clergymen of all denominations. Teachers and thinking people of all classes will want it. This is the only periodical in the world that invites its readers to send any problem in physical science or current scientific teaching, they may not understand, and a solution will be attempted. Only 50 cts. per year. See terms above, and write us at once.

Our Only Premium for Subscriptions—Terms to Agents.

WE offer but one premium to subscribers for THE ARENA, and that is the four former treatises of the editor on the "Immortality of the Soul Proved by Science" and "Does Death End All?" These important papers are now published by us under one cover, and will be sent free as a premium to any one who will send us two subscribers with the money ($1).

We will, however, allow persons who devote some time to canvassing for this journal to retain 10 cents out of each subscription obtained, sending us 40 cents. A club of five subscribers at one time will thus be supplied with THE ARENA one year for $2. Our aim is to send this journal as an effective missionary worker into every county, town, and village in the United States, if possible, and we shall spare no pains to do so.

We cannot supply any of Dr. Hall's other works as premiums for subscriptions, as they are sold exclusively for his benefit. Agents, however, could do well by combining those books (advertised on last page) with a general canvass for THE SCIENTIFIC ARENA. Hall & Co. will send terms to agents on application.

☞ Persons wishing to act as agents for THE ARENA, and who might desire a descriptive poster to post in some conspicuous place, will be supplied free of cost by addressing the publishers,

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Scientific Arena

A MONTHLY JOURNAL

Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph. D., LL. D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SCIENTIFIC EVIDENCE OF A FUTURE LIFE, No. 2.

THE SUBSTANTIAL NATURE OF ALL FORCE.

BY THE EDITOR.

IN our first paper on the Scientific Evidence of a Future Life, as printed in last month's ARENA, we laid the foundation of our argument in the clearly defined analogies of nature. If the principles of Substantialism be true, then, as there shown, every force or form of energy known to science must be a substantial entity. We further endeavored to show that if one form of force were conclusively demonstrated to be a substantial or objective existence, it would be a clear departure from reason and consistency not to assume all the forces or phenomena-producing causes in nature also to be substantial entities. But if one form of physical force, or one single phenomenon-producing cause, such as heat, light, or sound, could be clearly shown to be the mere *motion* of material particles, and not a substantial entity or thing, then by rational analogy and the harmonious uniformity of nature's laws, all the other forces or phenomena-producing causes, whether physical, vital, mental, or spiritual, must come within the same category as nonentitative *modes of motion* of material particles. Hence it would follow in such case, that the soul, life, mind, or spirit, so far from being a substantial entity which can form the basis of a hope for an immortal existence beyond the present life, must, according to materialism, and as the mere *motion* of brain and nerve particles, cease to exist whenever such physical particles shall cease to move at death.

From the foregoing statement of the salient positions of materialistic science, as they bear against the existence of the soul after death, we drew the logical conclusion that no Christian philosopher who accepts the current doctrines of sound, light, and heat as but *modes of molecular motion*, can ever answer the analogical reasoning of the materialist against the immortality of man. No possible view, as we have so often insisted, can make the least headway against such materialistic reasoning or frame any reply to this great argument of Haeckel and Huxley against the soul as an entity and its possible existence separate from the body, save the teaching of Substantialism which so consistently maintains that the soul, life, mind, and spirit are necessarily substantial forces or entities from the analogies of physical science, namely, *the substantial nature of all the physical forces, including gravity, electricity, magnetism, cohesion, sound, light, heat, etc.*

This impregnable position of the Substantialist from logical analogy, based on the harmonious uniformity of nature's laws and forces, forms the bulwark of the Substantial Philosophy, and must in the nature of things forever constitute the strong tower of that system of teaching. If the edifice of Substantialism, thus founded and fortified, can be taken and sacked by the forces of materialism, then our labors for so many years have manifestly come to naught. Say, if you please, that the armies of Substantialism are thus burning the bridges behind them. So be it. We prefer death to either surrender or retreat: for if this fundamental position cannot be maintained against the combined forces of the enemy, then all is lost, materialism has gained the day, and death is an eternal annihilation to the human race. Within this central citadel of principles, therefore, we have intrenched ourselves to survive or perish, and here, encircled by this wall of adamant, we have stored all our treasures and munitions of war, and if the agnostic hordes of materialistic science wish to possess them, let them train upon it their heaviest artillery, and thus end the campaign by taking our stronghold or else acknowledge their own cause as forever lost.

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

[For Sketch, see page 28.]

To admit for one moment that a single force of nature, such as *sound, light*, or *heat*, is but the vibratory motion of matter, whether that material body be highly attenuated as in the case of the supposed *ether*, less attenuated as in the case of air, or solid as in the case of a heated bar of iron, is to give away to the rank claims of materialism the entire analogy of nature and science in favor of a future life for humanity. And well do the materialistic scientists of this country and Europe know it. And to the same extent do they fear the spread and general acceptance of the Substantial Philosophy, knowing full well that the moment the forces of nature shall be recognized and taught by the schools of this land as real substantial entities, and as soon as the mode-of-motion doctrines of sound, light, heat, etc., shall be abandoned, that soon will their materialistic occupation have gone forever.

How strange, then, when materialists themselves recognize the desperateness of their situation, and so readily grasp the true bearing of this analogical argument based on the substantial nature of the physical forces, that we should be obliged to reason with professed substantialists, giving them argument upon argument in order to prove to them that they are no substantialists at all, in the true sense of that term, so long as they leave one single force of nature, or one single phenomenon-producing cause in nature, out of the category of substantial entities!

One minister of our acquaintance speaks glowingly of the ultimate success of the Substantial Philosophy, and proudly calls himself a substantialist, but refuses to include sound among the substantial forces and entities, thus virtually accepting the wave-theory! In the name of all logical consistency, what could that minister say in reply to another "substantialist" who would insist upon the beauty and truth of Substantialism, but who could not include *light*? And then another who could not include *heat*, or *electricity*, or *magnetism*, or *gravity*? Yet all of them good "substantialists" on the very same principle as is the one who leaves *sound* out of the substantial category, while still claiming to be an orthodox substantialist! Why should they not leave *life*-force and *mind*-force and spirit-force out of the list of entities, thus making them, like sound-force (as materialists insist), but the vibration of material particles, and still claim the right to call themselves good substantialists? Haeckel and Huxley would then be duly qualified candidates for baptism into the church of Substantialism.

The truth is, the minister who can admit for one moment that *sound* consists of but the motion of air-particles, and thus, that it is not a substantial entity, is a materialist at bottom, though he may not be conscious of the logical maelstrom that is whirling him to scientific destruction. We have all heard of the play of "Hamlet," with the Prince of Denmark left out. Such would be the scientific play of Substantialism with the sound question ignored, and the theory of acoustics handed over to materialism! (See our editorial on "The Meaning of the Sound Discussion," THE MICROCOSM, Vol. V., page 197.)

Hence, it is the aim of this present paper, after thus reiterating and enforcing the general scope of the argument as presented last month, to demonstrate force, *per se*, to be an immaterial substance, and in no sense a motion of material particles. In this way we purpose to show the absolute necessity for Christian scientists everywhere adopting the

broad principles of the Substantial Philosophy, and doing it at once, if they hope to break down materialistic atheism in this land or logically to defend religion by scientific analogy, and thus prove the substantial existence of God as well as the probable substantial existence of the human soul after death. This they now have the privilege of doing successfully, and of thus triumphantly re-enforcing their scriptural arguments by the concurrent testimony of nature herself.

We could select any one of several of the physical forms of force as the crucial test of the new philosophy, or as the touch-stone of Substantialism. But to save circumlocution and detail of unnecessary explanation as much as possible, in this leading and paramount demonstration, we select what no scientist on earth will question as a representative natural force or so-called form of energy — namely, *magnetism*. This force, from the very simple and direct manifestation of its phenomena in displacing ponderable bodies at a distance from the magnet, and without having any tangible substance connecting the magnet therewith, is selected for our purpose, since it has well proved the champion physical puzzle to modern mode-of-motion philosophers, both in this country and in Europe.

Even to the greatest living physicists, such as Helmholtz, Tyndall, Sir William Thomson, and others, the mysterious action of magnetism, under any light which modern science can shed upon it, admittedly affords a problem which has proved to be completely bewildering to their intellects, simply because they have unfortunately never caught a glimpse of the basic principles of the Substantial Philosophy which so clearly unravels the mystery. In the light of these principles such a thinker as Sir William Thomson, instead of teaching, as he did in his opening address on the five senses before the Midland Institute, at Birmingham, England, that magnetism was but the molecular motion, or as he expressed it, but the "quality of matter" or the "rotation of the molecules" of the magnet, would have seen at a glance the utter want of any relation, as cause to effect, between such moving molecules in the magnet (provided they do move), and the lifting of the mass of iron at a distance.

* It is passing strange that men so intelligent as Sir William Thomson and Prof. Tyndall had not long ago reached the conclusion that magnetism must of necessity be a substantial thing, however invisible or intangible, when it thus stretches out its mechanical but invisible fingers to a distance from the magnet and pulls or pushes an inert piece of metal! That they have not seen the absolute necessity for such a conclusion, as the only conceivable explanation of the mechanical effects produced, and the manifest inconsistency of any other supposition, is one of the astounding results of the confusing and blinding influence of the present false theories of science upon otherwise logical and profound intellects. And that such men could be satisfied in supposing that the minute and local vibrations of the molecules and atoms of the magnet (necessarily limited to the dimensions of the steel itself) could by any possibility reach out to a distance beyond it and thus pull or push a bar of metal, overcoming its inertia, tempts one to lose all respect for the sagacity and profundity of the intellects of these great names in science. At all events, such manifest want of perspicacity in modern physicists appeals in a warning voice of thunder tones to rising young men of this country and Europe to think for themselves in matters pertaining to science and philosophy, and to accept nothing on trust simply because it happens to be set forth or approved by some great name.

Another most remarkable anomaly in the case of the physicists to whom we have here referred is this: while failing to see the unavoidable necessity of an actual substance of some kind going forth from the poles of the magnet and connecting with the piece of iron by which to lift it and thus accomplish a physical result, that could have been effected in no other way, they are quick to accept the agency of an all-pervading *ether* (a substance not needed at all in nature) by which to produce *light* on this earth as mere *motion*, and thus make it conform to the supposed sound-waves in the air! In this way, by the sheer invention of a not-needed material substance, they have sought to convert not only light, heat, and magnetism, but all the other forces of nature into modes of motion, *and for no reason except that sound had been mistaken as a mode of motion by previous scientists.* And strange to state, notwithstanding this supposed *ether* is as intangible to any of our senses, and just as unrecognizable by any process known to chemistry or mechanics as is the substance which of necessity must pass out from the poles of the magnet to seize and lift the bar of iron, yet physicists cheerfully accept the former, for which no scientific necessity on earth or in heaven exists, while they stolidly refuse to recognize the latter, though absolutely needed to accomplish the results observed! Was ever such inconsistency before witnessed in a scientific theory?

Let us scrutinize this matter a little further before leaving it. If the mere "rotation of molecules" in the steel magnet can produce a mechanical effect on a piece of iron at a distance, even through a vacuum, as Sir William Thomson asserts, why may not the rotation of the molecules of the sun cause light at a distance without the intervening space being filled up with a jelly-like material substance of "enormous rigidity," to be thrown into waves? It must strike every mind capable of thinking scientifically that the original invention of an all-pervading "material," "rigid" and "inert" ether, as the essential cause of light at a distance from a luminous body, was one of the most useless expenditures of mechanical ingenuity which the human brain ever perpetrated—that is, if there is the slightest truth in the teaching of Sir William Thomson that the mere "rotation of molecules" in the magnet will lift a distant bar of iron. Why cannot the rotation of the sun's molecules just as easily produce light at a distance?

Should it be assumed in sheer desperation by the mode-of-motion philosophers that it is the *ether*, filling the space between the magnet and the piece of iron, which is thrown into vibration by the rotating molecules of the steel, and which thus lifts the distant iron, it would only be to make bad worse. If material vibration in the steel magnet, which is wholly unobservable, is communicated to the distant bar through a material substance and its vibratory motions, which are equally unobservable, is it not plain that their effects on the distant bar should be of the same mechanical character, namely, unobservable? Instead of this the iron is lifted bodily and seen plainly, and that without any observed tremor, as if done by a vibrating "jelly" such as ether is claimed to be! Besides, such bodily lifting of a ponderable mass is utterly incongruous with mere tremor, however powerful and observable such tremor or vibration might be, according to every principle known to mechanics. Common sense ought to assure any man that mere vibration or tremor, however powerful and sensible, can pull or push nothing. It is impossible to conceive of the accomplishment of such a result except by some substantial agent reaching out from the magnet, seizing the iron, and forcibly pulling and thus displacing it. As well talk of pulling a boat to the shore without some rope or other substantial thing connecting you with the boat. Even Sir William Thomson would not claim that the boat could be pulled by getting up a molecular vibration of the shore, or even by producing a visible tremor in the water, as Dr. Hamlin so logically showed in his recent masterly paper on *Force*. (See MICROCOSM, Vol. V., p. 98.)

It is well known that a magnet will lift a piece of iron at the same distance precisely through sheets of glass as if no glass intervened. The confirmed atheist Mr. Smith, of Cincinnati, Ohio, to whom we referred in our papers on Substantialism, in THE MICROCOSM (Vol. III., pages 278, 311), was utterly confounded by this exhibition of the substantial force of magnetism acting at a distance through impervious plates of glass. When we placed a quantity of needles and tacks on the plate and passed the poles of the magnet beneath it, causing them to move with the magnet, he saw for the first time in his life the operation of a real substance, exerting a mechanical effect in displacing ponderable bodies of metal in defiance of all material conditions, and with no possible material connection or free passage between the source and termination of such substantial agency. And he asked in exclamation, if this be so, may there not be a substantial, intelligent, and immaterial God, and may I not have a substantial but immaterial soul which can live separately from my body after it is dead?

He then raised the query, asking if we were certain that it was not the invisible pores of the glass plate through which the magnetic force found its way, and therefore whether this force might not be a refined form of matter after all? He even assisted us in filling the plate with boiled water, on which to float a card with needles placed thereon, thus to interpose between them and the magnet the most imporous of all known bodies. But it made not the slightest difference, the card with its cargo of needles moving hither and thither as the magnet was moved beneath both plate and water. This was sufficient even for that most critical but candid materialist, and he confessed that there were substantial but immaterial entities in heaven and earth never dreamt of in his atheistic philosophy.

Here, then, is the conclusive argument by which we demonstrate that magnetism, one of the forces of nature, and a fair representative of all the natural forces, is not only a real, *substantial* entity, but an absolutely *immaterial* substance; thus justifying our original classification of the entities of the universe into material and immaterial substances.

1. If magnetism were not a real *substance*, it could not lift a piece of metal bodily at a distance from the magnet, any more than our hand could lift a weight from the floor without some substantial connection between the two. It is a self-evident truism as an axiom in mechanics, that no body can move or displace another body at a distance without a real, substantial medium connecting the two through which the result is accomplished, otherwise it would be a mechanical effect without a cause—a self-evident absurdity in philosophy. Hence, the force of magnetism is a real, substantial entity.

2. If magnetism were not an *immaterial* substance, then any practically imporous body intervening between the magnet and the attracted object would, to some extent at least, impede the passage of the magnetic current, which it does not do. If magnetism were a very refined or attenuated form of matter, and if it thus depended for its passage through other material bodies upon their imperceptible pores, then, manifestly, some difference in the freedom of its passage, and in the consequent attractive force of the distant magnet should result by great difference in the porosity of the different bodies tested, as would be the case, for example, in forcing wind through wire-netting having larger or smaller interstices, and consequently offering greater or less resistance. Whereas, in the case of this magnetic substance, no difference whatever results in the energy of its mechanical pull on a distant piece of iron,

however many or few of the practically imporous sheets of glass, rubber, or whatever other material body be made to intervene, or if no substance whatever but the air is interposed, or if the test be made in a perfect vacuum. The pull is always with precisely the same force, and will move the suspended piece of iron at the same distance away from it in each and every case, however refined and delicate may be the instruments by which the tests are measured.

[TO BE CONTINUED NEXT MONTH.]

MATERIALISM, SUBSTANTIALISM, AND SOUL-CULTURE.

BY PRES. I. L. KEPHART, D. D., OF WESTFIELD COLLEGE.

In all ages and among all the races of mankind, observing minds have recognized in man the existence of both a natural and a spiritual instinct. By the former, aided by reason and the perceptive faculties, he grasps the material facts and forces of nature; by the latter, aided by faith, he recognizes and becomes assured of the reality of *spiritual* existence and human immortality. That the natural and the spiritual both exist, and that these, *taken together*, constitute the universe, is becoming more and more universally recognized, just as man advances in the scale of intellectual development.

There are material and there are immaterial existences. The material is inferior to, and cannot exist without, the immaterial. The material will perish. Common consent, founded upon observation, affirms this. Beauty and squalor, huts and palaces, mushrooms and pyramids all tend toward dust.

The immaterial is superior to, and can exist independent of, the material. Humanity, as a whole, consents to and believes in the existence of a spiritual realm. As certain as there is a world of earth and water, of trees and clouds, of minerals and gases, of animate and of inanimate material bodies, so certain is there a higher realm of friendship and charity, of love and benevolence, of truth and righteousness, of immaterial thought and indestructible existence.

Materialists deny the existence of the immaterial, consequently deny its superiority over the material, as well as the dependence of the material upon it. Their boasted assertion is, "Without phosphorus there is no thought." But phosphorus is a material substance. Hence, without material substance there is no thought. This makes thought the product of matter, *and dependent upon it.*

But the materialistic philosophy recognizes as true the axiom that like begets like; hence materialists necessarily claim, as a result of their refusing to recognize the existence of the immaterial, that even thought is only a mode of motion—motion, with them, being a property of matter.

Thus, recognizing only the existence of the material, they have ever been wont to turn aside from the consideration of all questions upon which the analyzing and generalizing faculties of the mind cannot be exercised, as unknowable and unworthy of their attention. Their business, they say, is with only "solvable problems." All these, they claim, the analytic, discursive, generalizing intellect can solve—that *it* is the only *reliable* means of arriving at positive knowledge, and that all questions upon which the analytic, discursive, generalizing powers of the mind cannot pronounce are to be relegated to the abyss of the "unknowable."

With this school a blind, automatic force, acting *in* and *by* and *through* matter, is the controlling, forming, changing power by which the present condition of the material universe has been established—that it performs its work in a manner which, to the *unenlightened* mind, indicates intelligence—that it is a mere *semblance* of intelligence, however, which has led unscientific theologians to conclude that there is a God—and that from it has sprung what they are pleased to denominate anthropomorphic theism. *See Buckner's Kraft and Staff, chap. 9.*

With them the soul and immortality are theological myths, and thought is but the motion of the molecules of the brain. Their conclusions are but so many materialistic deductions drawn, not from the *facts* of science, but from the field of wide metaphysical speculation—sequences drawn, not from a logical train of reasoning in which *all* the facts have been duly recognized, but in which only *one side* of man's nature has been considered. The error has its origin in that philosophy that teaches that sound, light and heat are but modes of motion; for from these false premises it is but an easy step to the conclusion that thought is but a mode of motion, and that the soul and human immortality are but mythical creations of the brain.

But let the central truth of the Substantial Philosophy be recognized—let the metaphysician and the logician recognize heat, light, gravity, electricity, *soul* and *thought* as substantial entities, and instead of the unsatisfactory, mind-beclouding, soul-benumbing theories of materialism we have a clear, logical, rational, hope-inspiring, soul-satisfying system that lifts our thoughts right up through nature's grand system to nature's God and a blissful human immortality.

From the above it will be seen that, while the blighting defect of materialism is its failure to recognize the existence of the spiritual, the crowning excellence of Substantialism is its placing the Supreme Spirit at the head of all existence. In their practical effects upon man the difference between these two philosophies cannot be overestimated. Materialism, by recognizing only man's material, sentient nature, dwarfs his being and hopelessly chains him to a perishable, material existence whose short round is run in threescore years and ten, and whose only inspiration is: "Eat, drink, and be merry, for to-morrow ye die."

But Substantialism, by recognizing the duality of man's being—by recognizing the existence of his spiritual, immortal nature—the existence of the human soul with all its infinite superiority over the material, its vast susceptibilities for culture and development, its possibilities in the direction of becoming the fit companion of angels and of God, and of dwelling with them forever in a state of infinite bliss, furnishes man with hopes and aspirations commensurate with his soul's longings, and with those higher incentives to effort in the direction of intellectual and moral development, without which he can never rise to that cultured nobleness of nature that is his crowning excellence.

And right here human nature comes forward to aid Substantialism in declaring its fundamental truth. Self-consciousness asserts the duality of our being. With Descartes, "*Cogito, ergo sum*," was conclusive, because it was nature's instinctive declaration in his own soul; and from his day on, that declaration or intuition has been recognized as a settlement of the question as to personal existence. But none the less conclusively does the universal spiritual instinct of humanity declare the existence of man's spiritual nature, and of a spiritual realm adequate to satisfy all the capabilities and longings of that nature.

This spiritual instinct convincingly declares to the human mind that there is a positive and a negative, an active and a passive side to the genus *homo*. Talent and genius are separate and distinct attributes of the human mind. Talent enables the mind to demonstrate its individuality, and to test and give practicableness to its knowledge. Genius takes hold of the outer world, receives and feasts upon impressions made by it—recognizes the reality of these impressions, and of the existence of the Great Spirit to whose manifestations his own spirit spontaneously responds. Materialism recognizes the existence of talent, but ignores the existence of genius, while Substantialism recognizes the existence of both. But self-consciousness testifies that the reality of the existence of this spiritual side of our nature is no more to be questioned than is the reality of the existence of the intellectual side. Just as, "*cogito, ergo sum*" is satisfactorily conclusive to thinking minds as to the reality of personal existence, so is, "το Πνευμα εστι το μαρτυρουν, ὁτι το Πνευμα ἐστιν ἡ ἀληθεια," satisfactorily conclusive as to the reality of soul life to those who lay aside prejudice, and recognize and analyze the promptings and voicings of their own inner being.

But as the immaterial, spiritual nature is superior to, and can exist without the material, and will exist forever, its culture and welfare are infinitely more important than is that of the material, perishable. And this being so, any system of human culture that ignores, neglects, or stupefies this superior side of man's being is grossly, vitally defective. And right here is not only where the materialistic philosophy is most seriously deficient, but where many of the most noted institutions of learning throughout the world have been sadly at fault. The susceptibilities, the needs, and in many instances the very existence of the superior half of man's being have been ignored. The result has been by far too much in the direction of the development of giant intellects, while the soul has been left to shrivel and starve for want of being properly nurtured. In our leading institutions of learning, little or no effort has been put forth in the direction of "awakening the interior divinity" in the minds of those who have, from time to time, drunk at those fountains of knowledge. The development of the spiritual instincts and intuitions should be as much the aim of education as the exercise and development of the mere intellectual faculties.

The fact should be recognized that faith in spiritual things is not a mere matter of blind belief, of slavish assent and acceptance, as many no-faith scientists seem to regard it. It is "a passionate intuition," and springs out of a quickened and refined sentiment—out of inborn instincts which are as susceptible of cultivation as are any other elements of our complex nature, and which, too, may be blunted beyond the consciousness of their possession. It springs out of an assimilation of the spirit of man with the Divine Spirit, as was manifested to the world in the life and teachings of Him in whom dwelt all the fullness of the Godhead bodily.

But this needed spiritual, religious culture does not imply or necessitate the inculcation of sectarianism or special forms of religious belief. The question should not be as to forms and creeds, not as to modes of faith, not as to "the letter which killeth," but as to "the spirit which giveth life." The *fact* of man's religious nature must be recognized, the susceptibilities of that nature properly cultivated, and those provisions which the test of the centuries has proved to be the best for meeting and satisfying the demands of that nature must be pointed out and impressed upon the youthful mind. At some future time, with the editor's permission, something may be said respecting those provisions which are best adapted to the proper culture of the human soul.

WESTFIELD, Ill.

WHAT IS MAN?—IN THE LIGHT OF SUBSTANTIALISM VERSUS MATERIALISM.

BY PROF. G. R. HAND.

The question announcing the theme for this paper, was thrown before the world, a

decade of centuries before the Christian era, by the poet-laureate of Israel, in clothing with expressive language his sublime appreciation of the teleology of the sidereal heavens, so vividly impressed upon his mind by the star-lit diadem of night, as erst he gazed into its opening vistas, from the vigils of his flock, on the plains of Bethlehem. After a flight of twenty-nine centuries, the question assumes renewed importance, in the light of modern scientific discoveries, merging into antagonistic philosophies.

Let Substantialism and materialism find a verdict, as witnesses are interviewed in the laboratory of nature, the machine shop of creation.

1. With the chemist on the witness stand, I inquire: What is man? And from retort and crucible and well-appointed laboratory an answer is extorted meager as Pharaoh's lean kine, containing naught but the analysis and combination of a few elementary fluids and solids. Pass in your verdict.

Materialism, with only the dim light from the volume of nature, perhaps sees nothing but matter; though with the aid of strong glasses, among the atoms of carbon, etc., a vision of potencies and possibilities of life, in nebulous outline, seems faintly visible.

Substantialism, with the combined light from the volumes of revelation and nature, sees the material substance, which an immaterial substance, an entitative intelligence, the spirit, had, through the aid of its attentive bioplasts, drawn around it in organic architectural form, for a living residence and conscious possession.

2. With the physiologist on the witness-stand, I ask the question: "What is man?" And from the dissecting-room, with knife and scalpel, and other anatomical and physiological appliances, the answer comes, in a package of organic matter, where flesh and bones, muscles, tendons, veins and arteries, sinews, joints and ligaments, blood, brains and nerves, cellular and fibrous membranes, with organs vital and locomotive, are wrapped in an envelope of cuticle and epidermis, with an ornamental inscription of nails and hair. What is the verdict?

The materialistic answer contains visions of inorganic matter leaping up to the superior plane of organism. I ask, did you ever see matter take that leap? You say, no; but I find it in that higher plane, and conclude that it made the leap. But science has never known matter, by any inherent potency, to make a leap into a higher plane. You say it utilizes material forces, such as gravitation, cohesion, molecular attraction, electricity, magnetism, light, heat, etc., which you call modes of motion. But if these are modes of motion, and if nothing but matter originally existed, it is clear that matter is the object moved. Then what moved it? Did it move itself? When you admit, with science, that matter is essentially inert, you deny to matter the power to originate motion. Then, as clear as logic, if matter cannot originate motion, neither can it originate "modes of motion." So these transforming potencies must be sought in a higher plane than the materialistic.

The substantial verdict recognizes these potencies as immaterial substances, or substantial entities, that take hold of matter and bring it up to a higher plane, where vitality and spirit dwell in the organized being, man. And the "Problem of Human Life" here points significantly to its hereafter.

3. With the naturalist on the witness stand, the answer comes: Man is an animal. True, but not sufficiently exclusive and elevating. We then eliminate the quadrupeds and multipeds in general, and leave man among the bipeds. But this includes the fowls. Eliminate the feathers, and find Plato's man. "A two-legged animal without feathers." And still the wings are not eliminated, though featherless.

But Substantialism, with the recognized aid of revelation, lifts man above the plane of the mere animal, and sees him invested with an intelligent, reasoning, and inventive spirit, in a material organism.

4. At this point, suggested by the inventive genius of man, I step aside to call the telephone to the witness stand. Distinguishing man from the lower animals, is the power of speech.

For decades of centuries man had clothed his thoughts in words, and dispatched them through the air to his fellow man. Materialistic philosophy said this was done by disturbing the equilibrium of the atmosphere, and sending material air pulses, to bombard and shake physically the tympanum of the hearer's auditorium. And for centuries the too passive and credulous philosophers have swallowed the nostrum without stopping to analyze its ingredients, till the champion of Substantialism steps to the front, and hurls, in the face of received science, a defiant challenge for an original investigation of its claims. Opportunely and in the nick of time, there comes man's late invention, the telephone, to testify in the case.

Now interview the telephone. Place the transmitter near your mouth, and apply the receiver to your ear, and your "Hello" to your friend some miles away, is promptly returned, with the additional "What's wanting," and you are at once in close communication with your distant friend. Now in this case, is it true that waves of air, set in motion by your voice, dart with lightning speed along that wire, bearing messages of "thoughts that breathe in words that burn" to the far distant terminus, and there dash physically against the ear drum of your friend, and make it vibrate bodily, at the rate of a few hundred times per second, to reproduce your words in his auditorium? If it is really air in motion, and making greater speed than air in a tornado or cyclone, what protects the ear drum from physical destruction? Do you say it is not the air in this case that moves, but molecular motion in the metallic wire? Well, it is a good thing that it is not the wire itself that moves with such velocity to pierce the listening membrane. But what about the contemplated submarine telephone? Do air waves cling to the outside of a protected, or submarine wire, where no room is left for such external physical incumbrance? If not, is the mode of transmission changed at every station, like passengers changing from stage to railroad, and *vice versa*, a few times on a journey? In other words, do air waves convey the messages from your mouth to the transmitter, then the diaphragm of the transmitter transfer them to the wire, which, in turn, transfers them to the receiver, to be again transferred to the air, and finally to the ear drum? Is there not danger of damage to delicate messages, in so many changes of conveyances and transfers of freight?

Surely a better mode of conveyance should be sought. Now here comes Substantialism and proposes a surer passage, and a safer delivery, in recognizing sound as an immaterial substantial entity, that can be trusted with our messages, and be conveyed, like electricity, through any conducting substance, with speed and certainty.

Limited space suggests an adjournment of the court for one month, when other witnesses will be examined.

A DECIMAL POINT AT ISSUE.

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

THE pages of the *Intelligence*, published from Chicago, and the *Educational Monthly*, from Akron, Ohio, have recently been illumined into a state of opacity by a most remarkable discussion. Not since the age of scholastic reasoning, when giants met in battle-array upon the field of pure metaphysics and profound abstractions, has there been such a hurling of lances, and such a harmlessness of results in the province of polemical pugilism. As it belongs to the mission of THE SCIENTIFIC ARENA to keep its readers informed of all the vital and important movements in the domain of progressive and combative intellect, the writer of this paper believes himself in the plain path of duty while reporting the great controversy now under review.

The contestants in this interesting set-to are far from being youths to fortune and to fame unknown. They are men of high standing in the educational centers and circles of the Buckeye Commonwealth. Their characters as gentlemen, Christians, and scholars, and their reputations for being good authority in the camps and councils of our leading educators, are in themselves sufficient to give respectable tone and dignity to the present discussion, even in the absence of some elements essential to the constitution of a question worthy of the progressive intelligence of the nineteenth century.

Dr. E. E. White of Cincinnati, is generally acknowledged to be one of the leading educators upon the American continent. He is referred to as of very high authority in disputed points, even down to a decimal fraction. Living as he does in the warm bosom of popular pedagogic confidence, any failure to carry his *point* in the present controversy would fill his many friends with sentiments of consternation and sorrow. Why not? He is the author of a work on arithmetic, and is presumed to know all about the essential elements of a decimal point. His opponent in the controversy is our mutual friend, Prof. W. W. Ross of Fremont, Ohio, and for many years the popular and successful superintendent of the public schools in our thriving city. In Prof. Ross, Pres. White has found a foeman worthy of his steel. It is not astonishing, therefore, that the controversy has been one of unusual interest, filling the crowded galleries of the amphitheater with floods of amusement and thrills of delight. The most of the spectators believe that there is nothing in the point at issue; nevertheless they are almost wild with admiration as they see the sparks of genius fly, like heavenly meteors, from the clashing sabers and poniard points of superior intellectuality. Since the days of Anselm and Abelard, the world has not been so marvelously illumined with the cold flames of dialectic subtleties. What may the philosophic world not hope for in view of the recently actualized possibility of striking fire from a decimal point? Possibility? It is now a fully demonstrated practicability. The thing has been done; and the most marvelous part of the achievement consists in the fact that the feat was accomplished while one party in the dispute claimed that the decimal point was a thing of no existence until it had appeared in the form of its expression on paper, slate or black-board.

Dr. White, in one of his initiatory papers, affirms that "a common error in elementary instruction in arithmetic" is the failure to make clear *the distinction* between *numbers* and their *expressions*. He also declares that "if there is such a number as a decimal fraction, *it must exist independent of its expression*." To this Prof. Ross replies that "the expression is the very gist of the decimal," and in a subsequent article he contends that "the form of expression is the *essential* part of the idea of a decimal." Then Pres. White sends in his rejoinder, with such declarations as the following: "Figures indicate numbers, but are not such in fact." "Figures are not entities." "*A fraction may exist independent of any form of expression.*" "*Its entire essence is non-sensible.*" He then dives deeper into the world of abstract objectivity, and claims that though a mental picture be

associated with a decimal in the form of a concept, it is no essential part of the decimal. Then, growing warm over the decimal point at issue, the great arithmetician declares that "a decimal fraction is not material substance, or phenomena, but an *entity*."

In our opinion, Dr. White has the better side of the controversy. He is no materialist in the realm of the abstract. In his view, numbers were before the invention of the Arabic method of numeration by figures, or any other system of computation in the use of characters. He would have his pupils add together numbers, not figures. In this he is correct; but is he consistent when he brings his method of reasoning out of the sphere of metaphysical abstractions into the concrete domain of physics and veritable substance? We think that he is not consistent. In the great Substantial controversy now shaking the very heavens of advanced and progressive thought in philosophy Dr. White has remained silent. It is therefore fair to assume that he still adheres to and teaches the undulatory theory of sound, and holds that heat is mere phenomena rather than force. At least, we have not heard that he has ever denounced those popular heresies in physical science, which, to say the least, are as far from the truth of God, as it is to claim that figures are numbers. Is it not true, indeed, that the author of White's Arithmetic when teaching physics is piping and dancing with the music of a popular and false theory concerning the real and abiding substance of all being? If so, he had better emancipate himself from the thralldom of "the common error" in the realm of concrete existence before he further continues his excellent course of lectures to Brother Ross upon the "*entity*" of an abstraction.

Prof. Ross is more consistent. His whole past record as an apt student and able educator, is in harmony with current theories in the general domain of physics. In common with many other great minds still wasting their sweetness on the desert air of undulatory scholasticism, he holds and teaches the wave-theory of sound. Materialism is the masterwheel of his philosophy, and yet, as a Christian man and a firm believer in the soul's immortality, he would reject the conclusions of his own logic when applied to the higher realms of being. With him, force is no more of a substance than an unexpressed decimal fraction is an "entity." He will not admit the logical deductions of his own sickly system of natural philosophy; neither will he accept the legitimate conclusions of its false syllogisms, by conceding that the soul is but the molecular motion produced by a favorable combination of the particles in a quart of pulpy matter called brains. And yet this is the only port into which his rickety old craft can sail to cast an anchor or find a landing. Prof. Ross is consistent. He will not attempt to cross the river, for fear of being obliged to swap horses in the middle of the stream. This, however, is wisdom, rather than consistency; and even here the question may properly be raised as to whether wisdom can be sundered from truth.

And yet Prof. Ross, in a latitudinarian sense, is consistent, even down to a very fine decimal point. He affirms that "the *expression* is the very gist of the decimal." The decimal has its essential being in chalk. So with numbers and diagrams. If the crayon should blush in its attempted act of creation (which would seem probable), the product might be a crimson character, or peradventure a purple parallelogram. With him, by a parity of his reasoning, the shortest distance between two points would be a straight chalk line, or something of material character to give it "expression." And in this entire line of holdings, Prof. Ross is consistent. In each part he is in harmony with every other part of himself. In fact, he and his philosophy are in harmony with everything except the truth as it is in the ordained constitution of being. Not so with Dr. White. He is in harmony with the truth as he holds it in the discussion now under review, but fearfully at variance with his own concessions and teachings elsewhere. In the name of consistency we ask how one of the leading educators of our country can hold a decimal point to be an "entity" without "expression," and yet deny entitative existence to the various forms of force, by which, under God, the universe is moving forward in the accomplishment of its mighty mission? Perhaps we are misrepresenting the great arithmetician of Cincinnati. Does he hold to the Substantial Philosophy? If so, we have not seen his name announced as among the rising, swelling hosts of its advocates. But it is not too late for him to join our number. What telling blows his mighty pen might wield for scientific truth when moved beyond that entitative decimal point into the realm of immaterial substance! He and Prof. Ross are the two who could put ten thousand heretics to flight, and help us carry the banner of scientific truth to the already visible summit of the delectable mountain where God and his whole creation may be seen in their true characters, and where Fame's temple shines afar. Come, gentlemen, throw aside your mint, and anise and cummin, and help us contend for weightier matters of the law. Come and assist us in the general assault which is soon to be made upon the hitherto formidable citadel of popular error.

FREMONT, O.

THE SUBSTANTIALIST'S CREED.

BY THE EDITOR.

[Concluded from last month, p. 8.]

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

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

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

15. This new Philosophy further teaches that man, being at the head of the animal kingdom, and endowed with a rational, moral, and spiritual nature, and with the power of inquiring into the cause of his own origin as well as of the origin of Nature herself, and with the faculty of contemplating this present existence as but the ephemeral prelude to the real life to which the present prophetically points; in a word, having the seeds of immortality and perpetual consciousness sown in his nature, and the idea of a personal God as the Creator of the universe ineradically constituting a part of his own *ego*, he must have been originally designed by the intelligent First Cause for another and a higher sphere of being for which the present life, as a mere schooling, was intended to prepare him; and that death, to such a being, is but the exchange of earthly and material environments and conditions of existence for those which are immaterial, spiritual, and eternal. Hence the Substantial Philosophy assures us that not only will man, in the coming state, possess a real, substantial body, but that his entire immaterial environments, including clothing, residence, etc., will be as substantial and real as they are here, though there will be no use for gross materiality.

16. But it is as clearly taught by the same Philosophy that the lower orders of animate being, though endowed with wondrous mental and instinctive powers, yet, since they can have no thought concerning their origin nor any conception of a life beyond the present, and having no idea of a God, of spiritual existence, of perpetual being, or of the signification of death, of life, or even of self-contemplation, the present sphere of existence, in the wise economy of Nature, would therefore seem to be all that either wisdom or goodness would demand for such creatures. Hence the Substantial Philosophy tells us

that the vital and mental powers of all animate creation below the human plane serve their intended uses during the brief lifetime of their recipients, and that when one of the lower animals dies, the substantial forces, vital and mental, which constituted its immaterial being here, pass out into the universal fountain of vitality and mentality whence they came, as already explained, without an atom of such animate force being lost or annihilated. The lower animal, therefore, unlike man, simply parts with its individual identity, because, unlike man, it had never conceived of it, nor of its own existence as an *ego*, and therefore, having no desire for its perpetuation, the being would not be wronged or in any way the loser by the termination of such an individual entity.

17. Finally Substantialism teaches, as a part of its new philosophy, that all these substantial forces in Nature, as well as the force-element out of which they are variously transformed, have necessarily existed with God in some form from eternity, as a portion of His exterior nature or being, not only as the instrumentality with which He as an infinite Spiritual Personality operates and creates, but as constituting the substantial element out of which He spoke the Universe into existence. Our Philosophy teaches that it no more detracts from the glory, dignity, or perfection of Deity as a personal and infinite Creator, to suppose the immaterial physical force-element to constitute a part of His essential being from eternity, and out of which all physical bodies were created, than to assume, as we must do in reason, that the substantial, vital and mental force-element was with God from eternity as a portion of His own essential being, and out of which all mind and life and spirit of the animate universe were originally transformed. This is taught, therefore, in the Substantial Philosophy as a rational and consistent basis for belief in creation out of *something* that had an existence from eternity, and consequently, that such a substantial entity, as a part of God's essential being, must have been also self-existent. This view is accepted by the adherents of the new philosophy as preferable to the inconceivable supposition that God created all things out of *nothing*, which was formerly believed and taught by eminent divines, as the best conception they could then form of creation in harmony with the glory and dignity of infinite wisdom and power, and without being compelled to accept the eternity of matter. But those eminent men had not then the data to aid their conceptions which the Substantial Philosophy has since brought to light, and which now clearly shows that a real omnipresent and substantial *something* may have existed with God from eternity, out of which to create *matter* and all material as well as immaterial forms of being. Thus we have a thinkable rather than an unthinkable basis for our conception, and which we may safely hold as an article of our philosophical and religious faith, while neither involving pantheism on the one hand nor the eternity of matter on the other, neither in any way conflicting with any theological tenet that is plainly taught in the scriptures of truth.

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

As proof of its effective adaptedness to this pressing need, we know positively of many who had become confirmed in their doubts of a hereafter for humanity who have, with joy inexpressible, accepted the Substantial Philosophy as a sufficient solution of this essential phase of the problem: while hundreds, yes, thousands, of the more intelligent and earnest clergymen, of all shades of theological belief, have embraced the fundamental principles of the Substantial Philosophy as the long-prayed-for panacea that would cause the scales of materialistic darkness to fall from the eyes of scientific investigators, and thereby let in such light as these benighted wayfarers could at last comprehend. We firmly believe that the Substantial Philosophy, while harmonizing the apparently conflicting phenomena of nature, and thereby totally setting aside the materialistic and atheistic objections to a future existence for humanity, will form a consistent philosophical bond of social, intellectual, and spiritual union, which, by calling a truce to sectarian controversies and hostilities, may ultimately lead to that true Christian union of the Churches which will substantially fulfill the prayer of Christ, that His people might be one even as He and His Father were one. Is not such a consummation, or any step toward it, involving the evolution of religious and scientific truth, a result devoutly to be wished? Plainly, scriptural exegesis, as held in the various religious denominations, and as so persistently adhered to and insisted upon by each, can never yield to that prayer of the Saviour, nor to the acknowledged desirability of the union of all Christians. Something must form an initial basis which is entirely unobjectionable, and one that all can accept without a religious scruple. Without such an initial stepping-stone to oneness of spirit, the long and difficult stride to the vestibule of the temple of unity can never be taken in the present weak, dwarfed, and crippled condition of humanity. Who knows, then, but that the stone of Substantialism, which the master builders of the present generation have so far disallowed, may yet form that very stepping-stone to the outer court of the temple that will ultimately lead the Church and the world into the holy of holies?

MODERN PHILOSOPHY AND SUBSTANTIALISM.

BY J. W. LOWBER, PH. D.

DESCARTES attempted to find a medium position between the extreme tendencies of his age, with regard to the relation of mind to matter. His followers sought a more satisfactory mediation than the position of their master; but the absurdities of the theories to which they were driven only vindicated the fact that their positions must be given up. Some took position on the material side and some on the ideal: those on the material side endeavored to explain mind under the material, and those on the ideal side tried to comprehend matter under the ideal. Thus modern materialism and modern idealism took their origin about the same time. The Substantial Philosophy occupies the golden mean between the philosophical extremes which have agitated the speculative world from the days of Thales down to the latest productions of Prof. Tyndall.

John Locke, the wisest of Englishmen, born in 1632, is regarded by the Germans as the father of modern materialism. We do not believe that philosophers are just to the speculations of Locke. He did not consider himself a materialist, nor did he believe that all ideas are of a material origin: but he evidently included intuitive ideas in reflection. David Hume took advantage of the inconsistencies of Locke, and pushed his philosophy into skepticism. It was, however, Condillac, a Frenchman, born in 1715, who carried the philosophy of Locke into sensualism and materialism. The two sources of knowledge, sensation and reflection, to which Locke held, he united in one, and reflection he reduced to sensation. For a time the French materialists were satisfied with English deism, which had, by Voltaire, been transplanted to French soil; but the extreme tendency of their speculations would not be satisfied with even this, and they went into the most reckless and daring atheism. Diderot, d'Alembert, and La Mettrie declared that spirit is only refined matter, nature is God, and immortality a dream. The ultimate consequence of their philosophy was a bath of blood for the beautiful soil of France. The Substantial Philosophy is a complete antidote for materialism; for it recognizes the *substantial* character of immaterial as well as of material forces. No believer in Substantialism can ever go into materialism.

English deism was carried to Germany as well as to France; but it would not grow on German soil. It is true that it had for a time some able advocates, but it was not long in finding an eternal grave. It did not at all suit the mental character of the Germans. English deism, however, did not die without leaving effects in Germany.

From the time of Leibnitz, who was born in 1646, and was the founder of German philosophy, there has been an idealistic tendency among the Germans. Kant endeavored to mediate between the ideal and the real, but his followers clung to the ideal and excluded the real. Hegel tried to unite philosophy and religion, but he only touched religion to corrupt it. Strauss, who represented the left wing of Hegelianism, carried it to its legitimate consequences. He endeavors to eliminate from the Bible the miraculous; his God dwells not beyond the human mind, and his Christology is entirely developed from human consciousness. The Germans have tried to supersede revelation with philosophy; but they have taught us that every such attempt is a failure. The Bible contains the true basis of all sound thinking on all the great themes pertaining to man's well-being and destiny.

The plain teaching of the word of God is so much more valuable than those dreamy statements about the non-ego, the ideal, and selfhood. When reason divorces itself from revelation, it is like the lovely ship upon the raging sea without a compass to guide it. It is claimed that speculative philosophy sharpens the intellect, so that it is able to look with a clearer ken upon the truths of Scripture. A Christian philosophy can accomplish this much better than one independent of religion. The field of thought in the word of God is ample and safe; and the revelation of God in the Bible is the only true chart to be found on the troubled sea of metaphysical discussion. In a previous volume of THE MICROCOSM, we have shown the perfect har-

mony of the Substantial Philosophy with the teaching of the Bible.

Paul, the great apostle, was a substantialist. He taught the substantial character of the unseen world; and that the things unseen were more durable than the things seen. The Substantial Philosophy is, therefore, a Christian philosophy, and of divine origin. We recognize the providence of God in its application in the nineteenth century to all the forces of nature. In the eighteenth century the philosophy of common sense did much to stay the tide of skepticism, which was deluging the greater part of philosophical Europe. But in the nineteenth century the tendency to materialism became so fearful that nothing less than a philosophy, which was able to take all its fortifications and turn its own batteries against it, was sufficient.

This the Substantial Philosophy has done, and the wave-theory of sound, the last fortified stronghold of modern materialistic speculators, has been entirely overthrown. All forms of skepticism have originated in either the materialistic or the idealistic philosophy. Substantialism condemns materialism by recognizing reality in spiritual forces, and at the same time it condemns idealism, for it teaches the substantial character of all the unseen forces of nature. A true philosophy and a pure religion always harmonize. May the true Substantial Philosophy and the pure religion of the Bible continue their progress, until they remove everything that is in the way of an advancing civilization.

OLEOMARGARINE.

BY HENRY A. MOTT PH. D., ETC.

In the year 1870 Hippolyte Mege, of Paris, France, was commissioned by the French Government to investigate several questions of domestic economy, and while improving the manufacture of bread, he was invited to make some researches with a view to obtain, for the use of the navy and poorer classes a product suited to take the place of ordinary butter, which would be cheaper and capable of being kept without becoming rancid.

Mege placed several cows on a restricted diet, which soon decreased in weight and furnished a proportionately less amount of milk; but the milk always contained butter-fat, and this he found to be the case even when the cows were wholly deprived of food. He naturally asked where the butter-fat came from. The answer was from the fat of the animal.

Mege next tried to produce butter-fat from the fat of the cow by artificial processes, and it was not long before he separated from the fountain head of butter-fat a pure and sweet fat, which by simply churning with milk was readily converted into excellent butter.

The operation or process for the manufacture of oleomargarine butter is very simple, and can be described as follows: The fresh *caul* fat from cattle is thoroughly washed in tepid water, then cut up in small pieces and introduced into a hashing machine, which thoroughly disintegrates the same, when it is ready to be melted in large water-jacketed kettles, at a low temperature. The object of melting the fat is to separate it from the membrane, which subsides to the bottom of the kettle, the clear, refined fat being drawn off through fine sieves and allowed to slowly crystallize in large cans. The crystallized fat is next packed in bags and subjected to pressure, when the pure *oleomargarine* separates out, leaving a cake of stearine behind. To manufacture *oleomargarine butter*, the oleomargarine thus obtained is churned or agitated with milk, and then thrown on broken ice, to solidify the same and prevent crystallization. After the ice is separated, the product is salted, worked and packed, as is customary with ordinary butter. There surely can be nothing objectionable in such a process as above described, and certainly none but a pure, wholesome product could be expected.

The churning of oleomargarine with milk is essential, for the reason that butter is not fat alone, but is a solidified emulsion.

If cream butter be melted, butter-fat separates and floats on the surface of the water it contains. This fat could be compared with oleomargarine, but is not butter as we know it in commerce.

To ascertain the comparative composition of cream butter and oleomargarine butter, I have submitted the same to chemical analysis with the following results:

Constituents.		Cream Butter.	Oleomargarine Butter.
Water		11.968	11.203
Butter Solids		88.032	88.797
	Total,	100.000	100.000
Insoluble Fats.	Oleine, Palmitine, Stearine, Arachine, Neyrestine	23.894	24.898
		51.422	56.298
Soluble Fats.	Butyrine, Caprine, Caproine, Capryline	7.432	1.823
Caseine		0.192	0.621
Salts		5.162	5.162
Coloring matter		Trace	Trace
	Total,	88.032	88.797

From the above analyses it is clear that exactly the same constituents which compose cream butter are present in oleomargarine butter, and that the latter product does not contain any constituent whatever foreign to cream butter, the only difference between the two products being in the proportion of volatile fats, which give the aroma and flavor to butter, and at the same time decompose and render the product rancid. The amount of these volatile fats in oleomargarine butter is sufficient to give to the product the so much prized odor and flavor, but not sufficient when decomposed to make the product rancid: and for this reason, oleomargarine butter keeps sweet and pure for a much longer period than dairy butter. The question as to the wholesomeness of oleomargarine butter has been passed upon by the best chemists in this country, namely, Chandler, Barker, Morton, Caldwell, Goessman, Atwater, Johnson, Arnold, Williams, and others, who have pronounced the product of the Mege discovery as a pure and wholesome article of food, essentially identical to butter made from cream, and of great value to commerce.

With the full knowledge of these facts I must confess some surprise at a recent attack against the healthfulness of this product by so able a writer and thinker as Mrs. M. S. Organ, M. D. Dr. Organ holds that chemistry is utterly incapable of deciding *a priori* whether organic or inorganic elements are best fitted to nourish the animal economy, and that what has been ascertained in regard to food, its healthful adaptation to the body, etc., has been wholly through physiological science and experience. To my mind the discussion as to what chemistry can decide from an *a priori* standpoint, when considering the wholesomeness of oleomargarine butter, is not the question at issue—for the reason that we know that cream butter is wholesome, we know its chemical composition and therefore we can decide theoretically in advance of trial that if a manufactured product contains the same constituents in approximately the same proportions as cream butter, it must also be a wholesome product. Dr. Organ speaks of the ultimate elements, and states that it is utterly impossible to take these elements and by any process of chemical combination or mechanical manipulation, make them subserve the purpose of food to the human system. While this statement is not strictly correct, still there is some truth in it, but at the same time in the analysis of oleomargarine it is totally foreign to the question. No chemist would make an ultimate analysis of oleomargarine, to ascertain how much carbon, hydrogen and oxygen it contains, for such an analysis would mean nothing; it would, however, be an ultimate analysis and would give the ultimate elements; this, however, is not what the chemist endeavors to ascertain. It is the percentage of the constituents that occupies his attention, and when I say constituents I mean the oleine, palmitine, stearine, butyrine, etc., present, so that he can compare his analysis with cream butter.

Dr. Organ very correctly states that the deadliest poison and the most deliciously wholesome food may and do contain the same ultimate elements (and I may add also in some cases in exactly the same proportions), but their nature depends upon the laws of constitutional arrangement which vitality has instituted, and *not* upon the *matter* of which they are composed, and that *the constitutional laws of the arrangement of the particles* of a dietetic product stand as a Gibraltar against all efforts to prove by chemical analysis what is the proper food of man. This argument would possess some force provided, when considering the wholesomeness of oleomargarine, the chemist had to deal with its ultimate elements alone: but the fact is, as already stated, the chemist deals with its constituents, *each one of which has different chemical reactions and properties, and which can be readily separated and determined.* These very constituents are compounds of the ultimate elements, and the particles of which they are composed are most certainly governed by fixed laws, which accounts for their constitutional difference.

If I were to separate oleine from the fat of milk, and again from the fat of the animal where the fat of milk came from, would the learned doctor say that they were different? If not, then no objection can be made to separating just those constituents from the fat of the animal as are found in the fat of milk; surely one would be as wholesome as the other.

The doctor seems to think that the suet or fat from which oleomargarine is made depends for its formation upon an abnormal or diseased condition of the animal, and therefore cannot be healthful or nourishing. I must confess some surprise at such a statement, for if an animal did not have any fat, the animal would certainly be diseased. It is because an animal has fat, that there is fat in the milk from which butter is made, no fat, necessarily no butter. The doctor seems to think that animals are purposely fattened, and abnormally so, to secure fat for the manufacturers of oleomargarine. This is not the case at all; the manufacturers take the fat from the cattle just as they arrive, and never even stall-feed them. I would, however, with all due respect to the doctor, advise the stall-feeding of cattle, not only for the purpose of getting a larger yield of fat, but a superior quality of meat. One of the worst impositions on the public perpetrated to-day is the killing of cattle as soon as they arrive, after a long journey—they are more or less in a fevered condition, and their meat is tough and stringy. All cattle should be stall-fed, therefore, before killing to improve the quality of the meat.

Without elaborating any further, I feel satisfied that I have answered the objections made to oleomargarine by Dr. Organ. One thing I would like to say, however, and that is, just as there is a temptation to adulterate cream butter with stearine, lard, etc., and which is done every day, so there is a temptation to adulterate oleomargarine, which is also done every day, the principal substances used being cotton seed oil, almond oil, peanut oil, etc.

I do not for one minute indorse adulterations of anything, no matter whether the adulterants used are wholesome or not, if the product is to be sold under a name which gives no indication of the composition of the substance. I believe in giving every product, manufactured or otherwise, a distinct name and let it stand upon its merits for favor or disfavor, and if any foreign constituent is added to it, the name of such constituent should be made known to the purchasers.

I consider the discovery of Hippolyte Mege of great value to the public, for when his process is adopted to manufacture oleomargarine butter, a pure and wholesome substitute for cream butter is placed before the poorer classes at a price far below what is charged for rancid dairy butter.

DOMAIN OF SUBSTANTIALISM.

BY THOMAS MUNNELL, A. M.

My article in the June number of THE SCIENTIFIC ARENA with the above heading started the question whether the principles of good and evil, like gravitation and other noiseless forces of nature, are real entities or mere properties or transient states of the mind. If said principles are entities they will always exist whether finite mind exists or not. If they are only states of the mind, like hope and fear, they will pass away when that which now calls them forth has ceased to be. Joy, jealousy, hate or repose as mental states may utterly perish without destroying any part of the mind that experienced them; but if moral principle is a constituent of mind, it is as indestructible as mind. Said principle is neither a constituent nor a property of brute mind, but is here held to be inseparable from the human mind. If this differentiation be found tenable, the entitative existence of good and evil will follow, unless mind itself is destructible.

This, I admit, is a little more careful thinking than was in the former article, and to make the meaning somewhat plainer, we remark that the constituent gases that compose water being material entities do not prove that the different *states* of the water, as cold, warm, or lukewarm, are also entities, for no one of said states is essential to the existence of water: nor does the fact that there are seven primary colors in white light imply that the different states or conditions of light are also entities. Even so, this paper holds that, while the various states of mind, such as hope, fear, love, joy and sorrow, cannot be ranked as components of the mind itself, there are such components that we have a right to claim as entities, by which the domain of Substantialism is some day to be greatly enlarged. No human mind can exist without the elements of immortality, moral principle, conscience, ratiocination, and perhaps other constituents, the absence of any one of which would throw our whole spiritual nature into utter confusion, just as the absence of one of the primary colors would throw white light into any kind of brindle that might chance to appear. Therefore, as all the components of real entities are entities also, the moral elements that distinguish the good from the evil are entities, and emphasize our claim to an enlarged domain for Substantialism.

WHAT IS THE TRUE PHILOSOPHY OF COLOR?

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

Philip Gilbert Hamerton, the gifted and graceful English writer, in his recent work, "Landscape," gives the following as his philosophical deduction in regard to color:

"Color, like sound, is a sensation caused by vibrations, the most obvious difference being that vibrations producing color are in thin ether, and those conveying sound in heavier and denser media, as air, water, or aqueous vapors. Where there is no eye there is no color, and in the absence of an ear there cannot be what we call sound. With the decline of light color changes, hues take different relative values, and in the absence of light they altogether cease to exist. The farmer fancies that a carrot retains its carroty hues in the dark, only that he is unable to see them for want of light; but in reality the carrot is colorless in the dark, and even in the light it has only the property of exciting in certain eyes, not in all, the chromatic sensations of red and yellow."

We first observe that he starts out with the premise that color is caused by vibrations, and by vibrations simply and solely in *ether*. Even if the first proposition were correct, the latter is demonstrably false. The most common observation indubitably proves that color is conveyed through air, aqueous vapor, and even denser media.

The next point, to which I wish to call attention, is the illogical admission that he makes. He starts out with the premise that color is simply a *sensation caused by vibrations*, and then concludes by saying that a substance (a carrot) has "the *property* of exciting in certain eyes, but not in all, the sensations of red and yellow." Surely such a conclusion is in direct antithesis with the premise.

From the position that color is a sensation, caused by vibration, it is an inevitably logical conclusion, that it is *not* an *intrinsic property* of any substance; and therefore the mental cognition of color as a real or specific quality is simply an optical illusion. We antagonize his premise, by the proposition that color is a *positive* and *specific property*—an *immaterial substance*—and is, therefore, just as real, just as definite, in its effect as any tangible or material substance.

If no substance or object in nature possesses any intrinsic property of color, if it is merely a sensation, entirely contingent upon light, why does not everything appear of the same color or hue? Place different substances successively in the same light, in precisely the same angle of incidence, and instead of presenting the same color, there will be as many different colors as there are different objects. This could not possibly be the case if color were entirely dependent upon light. There must be some other cause for the mental perception of color.

Color is something more than a mere vibration or sensation dependent upon light; it is a *substantial force—an entity.*

We can, with just as much truth and reason, assert that no substance possesses any inherent gustatory property, or any olfactory property—that taste and odor are simply sensations caused by vibrations; and hence mere illusions of animal perception.

Every substance usable as food, possesses certain specific properties or forces, and these properties have a determinate constitutional relation to the gustatory nerves of animal life. The peculiar sensibility of these nerves perceives these properties as sweet, sour, bitter, pungent, etc., etc., and this is the perception of taste. Substances also possess peculiar olfactory properties which are directly related to the olfactory nerves: these nerves, in connection with those of animal perception, *feel* these properties as stimuli, and this recognition we denominate as the perception of odor. Different organic and inorganic forms of matter possess a specific property or substantial force which is constitutionally adapted to stimulate the auditory nerves, and the recognition of this stimulating property by these nerves is the perception of sound. In like manner every object in the universe possesses inherent visual properties—a substantial, or entitative force—which by a determinate law of nature are normally related to the optic nerve: this nerve takes cognizance of these properties or forces, and this is *visual perception.*

There must be positive, entitative properties inherent in objects which have a constitutional relation to the nerves of animal sensation or there can be no perception. No impression of any kind can be made upon nerve, brain, or mind—no stimulus to action—unless there is an actual and direct communication of a substantial force. That force may be the most refined and sublimated immaterial entity, yet it must exist; for no sense, element, or faculty of the human being can have a perception, or be stimulated into action, without some substantial force coming in direct contact with it. This is the fundamental law pervading the whole inorganic, organic and mental world. In a true philosophical sense there is no such thing as independent action; for every force or substance is correlated to some other force or substance. It is this grand concatenation of force which weaves and interweaves the inorganic, vital, and mental world into one stupendous whole.

Thus the science of to-day is developing the beautiful and sublime truth which the heaven-born seers and singers of all ages have intuitively recognized and proclaimed, that God in all His powers—in all His manifestations—is *love;* and that this love is the actuating law—the impelling force which creates, moves and directs the whole universe of matter, of vitality, and of mind.

"That delicate forest-flower
With scented breath, and look so like a smile,
Seems, as it issues from the shapeless mold,
An emanation of the indwelling life,
A visible token of the upholding love,
That are the soul of this vast universe."

Properties, entities or forces which are normally related to other forces or entities that possess power to excite them into action, are so through a constitutional affinity—through an all-pervading, impelling power of love. Every force or substance has in itself the element of attraction for some other force or substance; and the true signification of this attraction is simply *love.* Therefore we can affirm from a true scientific stand-point, as well as from a poetic—that love is the life, the soul of the vast universe of matter and mind.

The scientific fact that every impression which is made in the realm of mind or matter is through the interaction of forces which have a constitutional attraction, or *love*, explains how we have the perception, or mental consciousness of color. Color being a property—an immaterial force—which inheres in every substance, has a determinate relativity to the nerves of vision, and hence the power to excite them into action; and through the medium of these nerves the mentality takes cognizance of these properties, and assimilates the nutrient force they supply.

Thus the mind receives a food—an esthetic enjoyment which tends to lift it nearer and nearer to the Infinite.

The perception of delicate colors and hues depends upon the fineness of the individual's temperament, and also upon the degree of culture. An individual may develop the faculty to perceive color to such an intensity that its perception of delicate tints will cause the pulses of his soul to throb in an ecstasy of joy.

The lessons drawn from the history of civilization, as well as from the deductions of physiological and psychological science, point to the fact that, with the advancement in physical and mental culture, such a refinement of visual perception will be developed that hues and tints will be discerned, of which we to-day have no cognizance whatever. And what is true of the visual powers will also be true of those of hearing, of feeling, of taste, and even of smell.

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THE SCIENTIFIC ARENA.

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ROBERT ROGERS, - - - OFFICE EDITOR.

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A VISIT TO MR. KEELY.

ASTOUNDING PERFORMANCE OF THE KEELY-MOTOR.

BY THE EDITOR.

As we intimated in last month's ARENA, we went to Philadelphia by special invitation in order to witness a private exhibition of Mr. Keely's renowned motor. We were cordially received both by Mr. Keely and by his able attorney, Charles B. Collier, Esq., and had every facility afforded us for witnessing the various operations and tests of the machinery, as well as the fullest opportunity for a personal inspection of the apparatus which produces the force, consistent with the success of the exhibition itself.

There were some thirty or more invited guests present, including three ladies, all of whom took a deep interest in what they saw, the only drawback being the crowded condition of the room in which the exhibition took place. The experiments passed off pleasantly and without accident, lasting about four hours, when we returned to New York with our polite escort, Mr. Craighead, of the *Tribune* Building.

Among the distinguished gentlemen present, and who manifested a special interest in the new motor, were Judge L. Hill, of Chicago, chief counsel in the great Drawbaugh telephone suit; Albert R. Edey, James Buchanan, Superintendent of the Motive Power of the N. Y. C. & H. R. R.; F. A. Haskell, of the N. Y. Central R. R.; Charles B. Collier, Patent Attorney and Counsel for Mr. Keely Geo. B. Collier, Wm. Caldwell, and Edwin Lord, bankers, of New York; Drs. C. M. Richmond and R. G. Bonwill, the eminent inventors; Dr. George Strawbridge and Dr. D. H. Agnew, Surgeon to President Garfield during his last illness; Dr. D. F. Woods and C. W. Schuelermaun, J. P. Craighead, of New York; Mr. Bissell, Superintendent of the N. Y. & N. H. R. R., and several other prominent lawyers, capitalists, scientific mechanics and business men, showing a more widely-prevailing interest in Mr. Keely's claimed discoveries than we had previously been aware of.

In pursuance of our promise last month we will proceed to give the readers of THE ARENA an unprejudiced account of the exhibition, with a description of the motor and its methods of operation, as they impressed our mind under the most careful scrutiny we were enabled to bestow, first presenting the facts as they occurred during the exhibition, and closing with our general conclusions as regards the character and probable value of Mr. Keely's claimed discoveries.

First, a word as to Mr. Keely himself, who has become about as much of an object of curiosity and wonder to newspaper readers generally as are the peculiar mechanical discoveries and devices by which he purposes to revolutionize the commercial world. At least, such was our own feeling of curiosity as we entered his unpretentious workshop in North Twentieth Street, Philadelphia.

Mr. Keely is above the ordinary height—about six feet—strongly built, and very muscular in form; of dark complexion, very thoughtful expression, and apparently absorbed wholly in the one single project of his life, and to which he is said to have devoted thirty years of incessant thought and labor. He appears to be about fifty-five years old, and shows the evident marks of machine-shop casualties, especially in the distorted condition of the knuckles of his left hand. Otherwise he seems well preserved, and looks the very personification of encouragement to the stockholders of his motor company, many of whom have staked their financial all upon his continued longevity till such time as his great 250 horse-power engine, now building, shall be completed and his patents issued.

Mr. Keely's face is a study for an artist, and it will no doubt live in canvas and marble and bronze in the coming ages, if he shall only succeed finally in accomplishing the work of his life, and thus revolutionizing the motive power of the world, consigning steam and water-power to the crude makeshifts of the past, which his motor will most certainly do if it is only one half what he claims for it.

The exhibition was commenced by an explanation from Mr. Collier of the various experiments to be exhibited and hints as to the parts of the machinery to be employed in them, while Mr. Keely and his assistant were busy putting the apparatus together in the presence of the assembly, and which had purposely been dismantled, and separated for that object.

That part of the apparatus which is of chief importance to Mr. Keely's discoveries is called the "liberator," in and by which the new "etheric vapor" or "interatomic force" is liberated, vitalized, and stored for use, the entire apparatus being about three feet high and weighing about 150 pounds.

This singular apparatus stands on a movable wooden pedestal, between two and three feet high, and which is entirely disconnected from the floor, wall, or ceiling by any rods, pipes or wires through which power from a distance could, by any possibility, be conveyed into the apparatus. This much is positively certain to begin with, as we saw it moved about the room.

On the top of this pedestal are piled the various circular frames and other parts of the generating or liberating machinery in symmetrical order, consisting of scores of steel-wire rods about three inches long, secured at one end and free to vibrate when struck or snapped, somewhat resembling the tongues of a musical-box. Radiating from these metallic frames are also numerous tubes screwed into their sides, one set standing out like miniature cannon from the port-holes of a circular fort.

Over this fortification is another similar structure surrounded with two score (more or less) of resonant tubes six or eight inches in length, secured perpendicularly, resembling a colonnade surrounding some miniature ancient Grecian palace. Surmounting these singular parts is a small metal box, called the liberator proper, of very singular form, and which would seem to hold about a pint or so of gas, water, or other material, if it were not for the resonators it is said to contain.

Underneath the various parts thus described is a large Chladni plate of steel about twenty inches in diameter, and secured horizontally fast at the center by a metal post running up through it. This plate seems to play an important part in the generation or liberation of the etheric force.

Around and above this plate are arranged a number of tuning forks firmly secured by their stems to the framework of the apparatus, and below this frame, and at one side of the pedestal, is supended horizontally an oblong hollow cylinder of metal called the receiver, where the etheric force, after being "vitalized," is stored for use, as it passes from the liberating dome through a connecting copper tube or pipe about three-eighths of an inch thick, and with a bore about one-eighth of an inch in diameter. This pipe is flexible, and can be bent in any direction to suit convenience in forming the connections of different parts of the apparatus.

In making the first test (soon to be described) for exhibiting the great pressure of this inter-molecular vapor, the first thing Mr. Keely did was of course to generate the gas in the liberating apparatus, and then to charge the receiver with it by turning a small valve wheel at the lower end of the flexible tube. This result he accomplished by drawing a fiddle-bow across three of the tuning-forks, causing them to sound, one being placed on its resonant case some distance away, and entirely disconnected from the various nests of resonant and vibratory generators constituting the liberator. As these forks continued to sound in what he calls an "etheric chord," and by which the etheric force of the air in the apparatus is claimed to be liberated, he gently tapped the great Chladni disk with a tiny hammer and thus added its vibratory effects to those of the forks, and in less time than we are telling it Mr. Keely announced that the etheric force had been duly liberated, the tubes vitalized, and that the receiver was now charged with at least 10,000 pounds of pressure to the square inch, and that it would soon increase to not less than 25,000 pounds, as he would endeavor to convince us.

The first experiment exhibited was the testing of this power thus liberated and stored up in the receiver. This was done, to the satisfaction of all present, by passing the confined vapor through one of the small flexible tubes named to a steel cylinder on a distant table, in which a vertical piston was fitted so that its upper end bore against the under side of a powerful weighted lever. The superficial area of this piston was equal to one half of a square inch, and it acted as a movable fulcrum placed close to the hinged end of the short arm of this lever, whose weight alone required a pressure of 1500 pounds to the square inch against the piston to lift it.

After testing the pressure by several small weights, added to that of the lever itself, in order to determine how much power had already been accumulated in the receiver, the maximum test was made by placing an iron weight of 580 pounds, by means of a differential pully, on the extreme end of the long arm of the lever. To lift this weight, without that of the lever supporting it, would require a pressure against the piston of 18,900 pounds to the square inch, counting the difference in the length of the two arms and the area of the piston, which we, as well as several others present, accurately calculated. When all was ready, and the crowded gathering had formed as well as possible to see the test, Mr. Keely turned the valve-wheel, leading from the receiver to the flexible tube and through it into the steel cylinder beneath the piston, and simultaneously with the motion of his hand the weighted lever shot up against its stop, a distance of several inches as if the great mass of iron had been only cork. Then, in order to assure ourselves of the full 25,000 pounds to the square inch claimed, we added most of our

own weight to the arm of the lever without forcing the piston back again.

After repeating this experiment till all expressed themselves satisfied, Mr. Keely diverted his etheric gas to the exciting work of firing a cannon into which he placed a leaden bullet about an inch in diameter. He conveyed the force from the receiver by the same kind of flexible copper tube, attaching one end of it to the breech of the gun. When all was again in readiness he gave a quick turn to the inlet valve, and a report like that of a small cannon followed, the ball passing through an inch board and flattening itself out to about an eighth of an inch in thickness against an iron target. We brought with us, and now have on our table, one of these flattened missiles spread out by the concussion to about three inches in diameter, showing the marvelous power and instantaneous action of this strange vapor, apparently equal to that of gunpowder itself.

These experiments having been continued till satisfactory all round, and until many present had been supplied with flattened bullets, the final and most important demonstration of all was given in the actual running of the "Keely Motor" itself, of which the world has heard so much, and which consisted in a 25-horse-power rotary engine actuated alone by this so-called etheric vapor. And here we approach the description of a performance in very simple machinery for which our readers will need to summon all their resources of credulity in order not to suspect us of deliberate fabrication. But we declare in advance that what we are about to state are facts of which we are as positively certain as we are that we were personally then and there present.

The "engine," if it may thus be designated, consists of a smooth hollow sphere of metal about two feet in diameter. At one end or pole of the sphere is fitted a fixed trunnion, around which it revolves, and at the other pole a rotating trunnion made fast to the sphere, and thus intended to revolve with it. On this revolving trunnion, which extends as a shaft beyond the frame which supports the sphere, was secured a common pulley of a foot or so in diameter and of about six inches face, from which a belt of leather led to a saw, turning-lathe, etc., in the room overhead. A valve-pipe leads into the interior of the sphere through an opening made in that trunnion, which remains stationary with the iron frame supporting the sphere. To the inner end of this fixed trunnion (as was shown by a similar sphere which was left open for inspection) are secured numerous resonating tubes and other vibratory devices, but which also remain stationary or fast to the inner end of the trunnion without touching the revolving sphere.

Now comes the mystery of mysteries in mechanical contrivances, namely, the revolving of this sphere as the valve-wheel at the trunnion is turned, thus admitting the etheric vapor from the receiver through the flexible copper tube as before described.

How this "engine" runs or on what principle a mechanical foothold can be secured within this smooth, empty sphere by the vapor for moving any kind of machinery, was a matter concerning which no one present ventured to proffer even an approximate guess. Mr. Keely explains the process and the *modus operandi* by saying that the gas when once let into the sphere takes a direction which causes a vortex or whirl around its axis, thus brushing its inner surface at enormous velocity, and that this inter-atomic vapor is of such a penetrating nature that it seizes upon the molecular structure of the sphere itself, thus pulling it along with it in its prodigious flight. This, perhaps, is as good an explanation as is possible to get at during the present stage of his invention, though it is utterly incomprehensible to the writer, even after thinking and dreaming over it for weeks since witnessing this marvelous feature in the working of the engine.

What is most astonishing about the rotation of this sphere, by simply turning on the vapor, is the fact that there is no escape for the gas anywhere, after it has done its work, nor any outlet or exhaust-pipe for such escape, as is well known to be absolutely necessary in the use of any gas, liquid, or vapor known to mechanics, and by which engines are readily driven. Instead of such apparently essential provision it seems, when the pressure of vapor is once admitted and the claimed whirling process has commenced, that it goes on indefinitely in some unaccountable manner, doing its work with unabated energy, and with no wings or internal projecting abutments against which to brace itself and thus exert a moving pressure. And even if there were such projecting abutments, the force, when once inside the globe, must be free, according to the laws of fluid pressure, to act on both sides of such projections, thus preventing all motion of the sphere by stable equilibrium. This must be so according to all known or even conceivable principles or laws of mechanics.

Another, and perhaps still the strangest performance of all, in the operation of this engine, is the startling fact that Mr. Keely can cause the sphere to revolve in either direction and with similar power and velocity by letting the gas in at the same valve, and precisely in the same way! We suggested to him several times during the hour the engine was working, which way to start the globe revolving, and after touching it with his fingers and moving it slightly in the direction we named, he would turn on the force and the revolutions would begin with almost terrific velocity in the direction we had indicated.

This single fact, with absolutely no exhaust and with no possible piston arrangement or movable abutment device inside as in rotary steam, gas, and water engines, demonstrates to our mind beyond the shadow of a doubt that the sphere must revolve by the whirling motion of the vapor inside of it, as Mr. Keely claims, and that the direction of this vortex, or whirl of gas, must be determined by the initial push given the sphere by the hand of the operator. This initial push of the globe in a new direction must therefore change in some way the end of the inlet pipe to an opposite whirl at the point where it emerges from the trunnion within the sphere. Still the mystery of its turning at all remains the same.

We have had some considerable experience of late years in physical and mechanical investigations, and, as our friends believe, with some degree of success in solving intricate scientific problems, but we have never before been so utterly nonplused and at our wits' end as in trying to give a rational explanation of this Keely engine on any known or conceivable principles of physical science or mechanics.

That the engine, as well as the frame on which it runs, is entirely disconnected from the floor, having no pipes, wires, or other devices leading below or outside of the building by which extraneous power can communicate with the sphere to cause it to revolve, is incontestibly certain, since the fullest opportunity was given us to scrutinize every part of it and the foundation on which it rested. That it actually runs, with the most tremendous mechanical power and velocity, alone from the gas or vapor, or whatever it is, let into it by turning the valve-wheel referred to, we are willing to stake and risk what little reputation we have, or ever expect to possess, for scientific or mechanical sagacity. We have been warned by friends since returning from the exhibition and expressing our opinion privately, not to injure our reputation by a public statement of such facts. But our reply has been that all the reputation we have ever earned has been from frankly avowing our conscientious convictions upon every physical problem presenting itself, and however much such opinions might fly into the face of the prevailing notions of science.

We are now too old to change front from any cowardly fear of being called a crank, though we are well aware that by this statement concerning the Keely motor we are indorsing mechanical results as simple facts, without any adequate cause for their accomplishment, so far as at present known to science and philosophy. All this, however, is the evident fault of science and philosophy, and not at all the fault of the facts which we have narrated, and of which more than twenty-five intelligent gentlemen present were witnesses with their eyes wide open in broad daylight, and concerning the truth of which, as here recorded, each one of them will certify if questioned upon the subject.

The power of the engine to do efficient mechanical work was abundantly demonstrated in sawing wood, running turning lathes, etc., in the room overhead, connected by belting from the pulley attached to one of the trunnions, and also by a plank pressed down on this driving pulley, in order to check its motion by friction, with the weight of two men resting on the plank.

With the actual running of this engine as an incomprehensible mystery, and with the demonstrated fact of a successful application of its mechanical power to do work, there can no longer be any manner of question but that Mr. Keely has made startling discoveries both in a new and undreamed of motive power and its mechanical application to machinery by new methods as astonishing as they are novel.

That he uses compressed air or any known gas, as charged and insisted upon in the *Scientific American*, is absurd and totally impossible to conceive of, when we consider the available space for such compressed gas or air in all the cylinders put together which Mr. Keely employs. Besides, the phenomena accompanying the discharges of this gas or vapor after each experiment are entirely different from those of compressed air or ordinary gas.

Mr. Keely justly complains that the *Scientific American* editors keep up the hue and cry of humbug and fraud against him, and at the same time have refused the most urgent invitations extended to them to come to Philadelphia and witness the operations of his discoveries before ridiculing them. It is a withering disgrace to the boasted progress of this age that any editor of a paper which flaunts "scientific" as a part of its title, should be afraid to witness and investigate a claimed new discovery before expressing an opinion upon it, lest it should render his journal unpopular with the unprogressive fogies of his patronage. Such spirit of journalistic cowardice is not only reprehensible, but detestable in the highest degree, and no paper pretending to be progressive should be considered worth reading by any thinking man so long as it fears to investigate any and all questions of science, philosophy, and mechanics which may come under its notice, and then give its readers the benefits of its unprejudiced opinion, let it strike where it will.

It is only proper here for us to state that during the early experiments of the exhibition we were intensely distrustful of the mechanical relevancy of the bowing of the forks and of other vibratory performances in order to generate the wonderful force Mr. Keely evidently exhibited, but supposed them to be a sort of ruse or blind for the purpose of diverting the ingenuity of inventors present, who might otherwise pry into and discover the secret of his motive power. This apprehension we frankly stated to Mr. Keely, not at all intending it as an imputation against his honesty, though he thus took it, in the excitement of his experiments, and

for which remarks we afterward apologized. Suffice it to say, we came very nearly being voted out of the exhibition for unguardedly expressing our skepticism, in which case, had it occurred, this report would never have been written.

But fortunately, after seeing the operations of the engine, the tuning-fork difficulty became a matter of little consequence—a mere bagatelle in the way—as we asked ourself the serious question—if this sphere really revolves as we see that it does, and if it must so act contrary to all known or conceivable laws of mechanics, may not this so-called etheric vapor, which is capable of such unique performance, be all that Mr. Keely claims for it? And if this be a reasonable conclusion, may not such an unknown and inexplicable force be actually generated or liberated by the inexplicable agency of sound-force as correlated to the cohesive force which holds the particles of the air together? In all candor, as we contemplated what we had seen as simple facts, we were forced up dead against this problem: If the engine itself really does what we saw it do, in total defiance of every principle known to science, should it be thought a thing incredible with us that the unknown force which was capable of doing such work might possibly be eliminated from the primordial constituents of the oxygen and nitrogen of the air by the interaction of sound and cohesion, combined possibly with the presence of electricity?

In our continued editorial in this number of THE ARENA, and which will be concluded next month, on "How Substantialism Solves the Problems of Science," we have shown, as will appear at the close, something in philosophy and science just as marvelous and inexplicable on any known principles of physics as anything claimed by Mr. Keely, but about the truth of which no scientist can have a shadow of doubt. If, for example, a bar of the solid metal *palladium*, under the mild influence of a negative current of electricity that would not be felt by a kitten, will expand its texture one-twentieth (which no mechanical effort could effect) in order to take into its pores 900 times its own bulk of hydrogen gas, thus mechanically compressing the gas to a solid as firm as the metal itself, a work which a powerful steam engine could not accomplish, all of which we show to be absolutely true, may not the correlation and interaction of the forces of sound, electricity, and cohesion, through certain sonorous appliances and manipulations, evolve an inter-atmospheric vapor of hitherto unknown expansibility, and which will also give out the working energy of a steam engine with a trifling expenditure of mechanical force for its origination, as Mr. Keely insists, no greater than that of the negative electric current to which we have just referred? As an able scientist insists, if Mr. Keely's discovery shall prove to be really what it claims to be, it will only be another overwhelming confirmation of the general truth of Substantialism in its solutions of nature's manifold problems, by the interaction and correlation of the substantial forces.

What the probable value of Mr. Keely's discoveries will prove to be, it is difficult if not impossible to predict. If his large engine, now nearly completed, shall prove as successful in operation in proportion to its size as has the smaller one whose working we have tried faithfully to report, there is no question in our mind that the doom of steam as a motive power is only a question of a little time.

The practical faith of Mr. Keely's adherents, who have stood by him unswervingly, raising the money for conducting the expensive experiments which Mr. Keely has been making during the past fourteen or fifteen years, ought to have some weight with the uninitiated in forming a probable estimate of the reality as well as value of these claimed discoveries. Business men, bankers, and scientific experts do not put hundreds of thousands of dollars into a claimed invention, as these gentlemen have done, until they have seen basic facts and experiments which justify such an outlay. These stockholders, so far as we have conversed with them privately (and we have talked intimately with more than one dozen of the original investors), still retain the most implicit faith in Mr. Keely and the ultimate triumph of his great achievement. We have heard them repeatedly declare their belief that no greater man ever lived on this earth, and that no man was ever more honestly sincere in what he claims to have discovered, and, as they insist, he certainly ought to know.

One of his earliest adherents, and one of the most confident believers in the almost incredible value of his discoveries—Mr. Charles B. Collier—was so fully assured of the claims of the invention and of the integrity of the inventor, before touching the enterprise, that he left a business, as patent-attorney which was paying him $20,000 a year, in order to cast his fortunes with those of the Keely Motor; and since then through evil report as well as through good report, he has stood shoulder to shoulder with Mr. Keely laughing at the contumely cast upon him, knowing, as he assures us, that the day of settling accounts with the croakers is near at hand, and that the reward of the faithful is sure. One thing is certain, if an educated attorney, who has devoted his life to the critical investigation of the mechanical intricacies of patents, is not to be trusted as an eye-witness to mechanical facts often repeated, and on which he has proved himself willing to sacrifice an income worth several fortunes, then good-bye to the value of expert knowledge in determining the feasibility of any commercial or mechanical enterprise. Such is Mr. Collier's position, and such have been his opportunities, as counsel of Mr. Keely to know whereof he speaks.

Mr. Keely has been persistently engaged in the development of his invention for more than seventeen years, meeting and overcoming difficulties as one after another would occur, until he now confidently claims to have reached the *ultima thule* of his hopes. During these years the company has furnished him with more than $200,000 in cash, as actual figures show, every dollar of which he has expended in the various machines he has constructed, and the almost innumerable experiments he has conducted. And what remains to be said is that during all the disappointments Mr. Keely has encountered, and the jeers heaped upon him by the press of the country, he has remained firm and calm in the belief that his privations and laborious efforts would ultimate in triumphant success.

SCIENCE OR SPECULATION.

BY THE ASSOCIATE EDITOR.

Is science more than speculation, and, if so, what makes it to be more? Is not the distinction the difference between a *positive* and a *possible* fact? Shall one look for the same degree of evidence before accepting a speculation or theory that may reasonably be demanded before admitting a science? Again, must we accept a theory as established science because certain learned men tell us it is true, yet offer in proof of their claim only the nursery argument, "*I saw the man who told me, and I know it is true*"? Such evidence may do for the "science editor" of the Cleveland *Plain Dealer*, but we doubt much if it will suffice for his intelligent readers.

The columns of that journal have recently been endeavoring to produce silence by the interference of two sounds, and have succeeded to the complete satisfaction of its "science editor." And he confidently hoists the old speculation about the wave-theory of sound into the department of science upon this remarkable evidence—*the college professors say it is sound science*, and that ought to produce silence. Well, it will not "silence" THE ARENA. "Ma says it is so; and if my ma says it is so, it is so if it ain't so," is hardly more conclusive even if *Alma Mater* be substituted for my ma. The whole question is one of *fact* and not of *opinion*. Who cares what Dr. Hall *thinks* about it or what all the college professors *think* about it? Why not demonstrate the fact? Certain theories are current as science, certain experiments are given as affording decisive proof that the theory is a fact.

Sound being only an undulatory *motion* of the air like the wave motion of water when disturbed, it follows that if one sound wave come in contact with another just right, they counteract each other and silence results, just as two water waves are *known* to counteract each other and thus a level is maintained. Harmonious as a theory, isn't it? yet anything but sound as a science. First, the starting point is the *assumption* that sound is an air *wave* analogous to the water wave. But most unkind of all, the experiment cited as one of the best witnesses for the theory actually *testifies against* it!

Here are Tyndall's own words upon the *theory*, the *experiment*, and the *result*: "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*" (the theory).

"It is plain, therefore, that the intervals between the puffs of the lower siren, which correspond to the *rarefactions* of its sonorous waves, are here filled by the puffs or *condensation* of the upper siren. In fact the condensations of the one coincide with the rarefactions of the other, and the *absolute extinction of the sounds of both sirens is the consequence.*" (The double siren experiment).

"I may seem to you to have exceeded the truth here; for when the handle is placed in the position which corresponds to absolute extinction, you *still have a distinct sound.* (The result). Yes, Professor, it does "seem to us" and all unbiased thinkers, "that you have exceeded the truth," and that your explanation of your noisy experiment at silence is *deficient* in the truth. In September, 1881, Dr. Hall published in THE MICROCOSM an offer of $1000 reward to any one who should succeed in producing silence by two sounds, and the reward has never yet been claimed, though numerous attempts have been made to verify this scientific experiment.

Yet the teachers of science in our colleges gravely affirm that such a theory is a fact, and the fact confirms the theory. We only trust that the students upon whom such instruction is inflicted will quietly insist that the fact be *accomplished* in their presence. Let the reading public hold the discussion to *one point* until that shall be verified or exploded, then take another, and thus capture stronghold after stronghold until the citadel of truth shall be delivered from the forces of error that now encompass it; and then shall speculation be turned to the left, while science proudly takes its place upon the right.

Meanwhile, remember we are dealing with a simple question of *fact*, with which *opinion* has no determining value.

Can *two sounds be made to produce silence?*

WE desire to express our appreciation of the interest so generously expressed and practically shown by the numerous ("too numerous to mention") friends who have sent in clubs for THE ARENA. We are greatly encouraged, and somewhat surprised, by the *general* interest so promptly manifested by all classes. Let it continue. We will make every effort to merit it.

A SKETCH OF DR. SWANDER'S LIFE.

"My boast is not that I derived my birth
From loins enthroned and rulers of the earth,
But higher far my proud pretensions rise—
The son of parents passed into the skies."
Cowper.

JOHN I. SWANDER was born at the base of Jenniejump Mountain, Hope Township, Warren County, N. J. The interesting little event of his birth occurred on the 3d of May, 1833. The first ray of sunlight that welcomed his arrival was deflected from the directness of its course by a tear. His name has no splendor borrowed from a royal pedigree. His ancestors were pious plebeians, and he claims to be a plebeian too. On his father's side he inherited Swiss blood which, however, had been Americanized a hundred years before one of its currents coursed its way through the veins of the poor little boy, the picture of whose maturing manhood may be seen on the first page of this ARENA. On his mother's side he is of Scotch-Irish extraction, which fact may possibly account in part for the prosiness of his style in literature. The Scotch side of his maternal ancestry was planted in this country by a Robert Bain, of whose pedigree history is silent, while tradition furnishes no evidence that the ashes of his kindred were "intermingled in the tomb with kings." His grandfather, John Blair, came from Ireland, and the best thing that the family record says of him is that he was a strict Presbyterian of the old predestinarian school. The subject of this sketch has in his possession a pocket-book which his grandfather Blair brought to this country a hundred years ago. For fear of leaving a wrong impression upon the mind of the reader, it is proper to state in this connection that the aforesaid pocket-book was entirely empty when it thus descended by the right of inheritance to the lawful heir and present possessor of the estate.

When John was five weeks old, his father, Thomas Swander, moved with his family from New Jersey and settled in the woods near Tiffin, Ohio. Thomas Swander was a farmer, and, believing that there was but little hope of salvation for children in idleness, taught his boy to pick brush and do such other work usually performed by the hardy sons of rustic toil. At the proper age he was matriculated into an agricultural college between a pair of plow-handles. John was fond of plowing, but exceedingly fearful of yellow-jackets. These little bees seemed to be more of a terror to our young Substantialist than the world, the flesh, and the devil combined. As the plowshare turned their nests up in the newly-made furrow, the plow-boy, like the patriotic Putnam, left the furrow for the field in love of liberty, with a storm of infuriated combativeness swarming about his fugitive person. He believed that preservation was the first law of life, and right gallantly did he seek to enforce the statute. His father differed from him as to what constituted true courage, and gave him a severe whipping for leaving the team to be stung into unmanageable desperation. The whipping cured the young man of his surplus timidity, yet even to this day John continues to practice becoming modesty, especially in the immediate vicinity of a yellow-jacket's nest. The pesky little savages!

Thomas Swander was a firm and consistent believer in piety, education, and common sense. His wife shared with him in the possession and practice of these excellent sentiments. In such a family John grew up, under covenant blessings, in the nurture and admonition of the Lord. If he should fail to make his Christian calling and election sure, he will have no reason to cast the stone of accusation at the graves of his sainted parents. They gave him such Christian nurture as God had ordained to convey in the bosom of a truly Christian family, and such an education as was afforded by the district school.

At the age of nineteen he began to spend his winters teaching. In the summer time he continued to work for his father on the farm. As opportunity permitted, he employed portions of his energy, time and means in perfecting his qualifications as a teacher. For this purpose he attended Heidelberg College, which is in sight of the old homestead. This manner of life he continued until 1856, when he began to incline toward the opinion that Providence was directing him into the ministry. Under this partially matured conviction, he entered upon an eclectic course in Heidelberg College, and pursued his studies with diligent perseverance until he had secured a small smattering of education and a desire for more. In 1859, after pursuing a regular course of study, principally under the instruction of that good Gamaliel, Moses Kieffer, D. D., he graduated from the theological seminary of the Reformed Church at Tiffin. In the following June he was licensed to preach the Gospel, and ordained to the holy ministry. He has now been engaged in the duties of his high calling for twenty-seven years. During that time he has served five different charges located in Pennsylvania and Ohio. For the first fifteen years he wrote his sermons and delivered them from MSS., believing that it was better to read the Gospel than to rant vain repetitions. His present method is to think out his discourse, get full of his subject, and then talk to the people in the name of the Lord God of hosts. He is a plain, practical preacher, disposed to give his audience something to think about as well as to believe. He constantly aims to impress the Christian portion of his audience with the fact that they are tenanted, surrounded, overshadowed and uplifted with the substantial though invisible forces and entities of a higher realm than this temporal and tangible order of existence, in which the god of materialistic-sentimentalism blinds the eyes of such as believe not in a more enduring substance.

For the last five years Dr. Swander has been pastor of the Reformed Church in Fremont, O., where he lives in the affections of his people and in the general confidence of the community. His life does not contain many incidents which the world would regard as worthy of notice, and yet he unassumingly believes himself to be of more value than many sparrows. His life has been like a stream whose banks are clear of jagged rocks, and surface free of ripples. The only tempest that ever dashed down upon him from the apparently angry skies was that chastisement from Providence in which he was called to part for awhile with his dear children—Sadie at seventeen and Nevin at twenty years of age—both of whom were just beginning to unfold Christian characters of fair promise for the future. With no child on earth, he regards himself as a tree stripped of its branches, buds, foliage, and fruit. His good wife shares with him in bearing the burden of a bitter bereavement as they wait and watch together in anticipation of a family reunion upon the borders of a better land.

Dr. Swander claims credit for diligence as a student in the school of science and philosophy. He does not pretend to be a master-workman, but a full-fledged knight of *labor* in the literary field. His contributions are neither very voluminous nor popular. They have occasionally appeared for the last quarter of a century in the *Mercersburg Review* and the *Reformed Church Quarterly*. Among his published papers may be found his "True Conception of Christianity," "Elements and Purposes of the Parable," "The Crisis in the Conflict between the Crescent and the Cross," "Christ in Hades," and "Wilford Hall's New Philosophy." The latter was a lengthy review of the "Problem of Human Life". In the studied preparation of the last-named paper, Dr. Swander had occasion to institute a searching examination of the several subjects treated in that immortal little book. This examination led him to embrace the Substantial Philosophy. He claims, however, that the Mercersburg Philosophy, of which he had been a disciple for twenty-five years, led him logically forward to the opening of the last scientific seal by Wilford Hall, and that no diligent student of Dr. J. Williamson Nevin can stop short of Substantialism without falling into the illogical messes of inconsistency and stultification. For the last four years Dr. Swander has been advocating the claims of the new philosophy before the world by his contributions in THE MICROCOSM and ARENA.

Dr. Swander's diligence as a close and discriminating student, and his consequent respectable attainments in literary and scientific pursuits have been recognized by some of the best educational students of this country. In 1869 he received the honorary degree of Master of Arts from Franklin and Marshall College, Lancaster, Pa. In 1885 he was pronounced a Doctor of Divinity by the Board of Regents of the Florida State University at Tallahassee. He will continue to give some evidence of his loyalty to the truth by further contributions to the pages of THE ARENA, in advocacy of the Substantial Philosophy as the proper standpoint in the study of all true science, and the very key to the sanctuary of all true religion, so far as the latter may be scientifically considered and apprehended.

HOW SUBSTANTIALISM SOLVES THE PROBLEMS OF SCIENCE.

BY THE EDITOR.

[Continued from last month, p. 14.]

UNDER these definitions it is not at all difficult to grasp the meaning of *momentum*, in its true sense, notwithstanding all the confusion which has resulted from the present unsatisfactory application and use of that term. To illustrate: the cannon-ball moves under the force of the expanding gases of the powder, and it moves with an *energy* proportioned to its ability or power to accept the action of this force from the powder. Such *force* is stored up in this energy under the common name of the *inertia of motion*, or under the more definite name of the *momentum* of the cannon-ball. *Momentum*, therefore, is simply *energy in action*, utilizing stored-up mechanical *force*. How plain and beautiful! Energy at rest, or static inertia, is the potential ability of a body to receive motion and momentum by the due application of mechanical force.

Having thus defined force, energy, inertia, and momentum, we have now to ask what is meant by the "property" of any given body, and how does it orignate? And here we approach one of the most profound and difficult fields of research and investigation in the entire domain of physical science. To this field, and the mighty problems it opens up, we propose now to give our serious attention; and we ask the reader to accompany us with all the powers of discrimination he can summon, as the task even of grasping the problems involved, after they are met and explained, is an immense one.

We say, first, that, while a property of a body is not a force or any form of energy in the true sense of these terms, yet its existence as a condition, quality, or characteristic of a body is always an *effect* of one or more forms of substantial force. Thus *elasticity*, for example, is the name of a certain property of bodies, as the result chiefly of the form of force commonly known as *cohesive attraction*, and by which the particles

or smallest conceivable portions of a body are not only held together when united, but by which also they were originally placed together under certain laws and arrangements at present unknown to man.

Indeed, we are not at all satisfied with the term *cohesive* force, as applied to the various natural operations not readily attributable to some other recognized form of force. The term is not broad enough to include the original construction of bodies, the arranging of their particles, the rearranging of them into a more contracted or expanded form, etc., etc. *Constructive* force would be a more generally appropriate term, making it to include cohesion, adhesion, rearrangement of bodies, chemism, etc. Then when destruction or disintegration of a body takes place by any form of force, the *cohesive* form of this *constructive* force would be destroyed, or, what is better, converted into heat or some other form of force, as when a piece of metal is pulverized into impalpable dust. The bulk of cohesion in such a case disappears, to be re-generated from the force-element of nature by the action of heat, as when this dust is melted into a liquid, and then cooled into a solid mass. When a chemical compound is produced, this general *constructive* force acts as chemism, and when the chemical union is destroyed by heat or electricity, such constructive force is relegated to the force-element, to be re-generated as chemism when the separated substances are again united, either with each other or with some other substance in practical chemical proportions. But we use *cohesive* force at present, as we have done in the past, with many grains of mental reservation, entering this mild protest as a part of the record of Substantialism.

Returning, then, to the cause of the elastic property of bodies, we say that without the original constructive energy of this force of cohesion in arranging the particles of the elastic body, and the continued static persistence of its energy in maintaining them, no such property as that of elasticity could exist in matter, nor could the opposite property of *inelasticity* exist either.

The property of elasticity has been superficially mistaken by all writers on physical science, ancient and modern, for one of the forces of nature, instead of being, as it is, the *effect* of force merely. This error runs through every text-book we take up, and the most critical investigators, we are sorry to say, even after their attention has been called to it, still persist, on account of their prejudice or habits of thinking, in trying to make a plausible showing of argument in defense of this most unscientific blunder of their predecessors.

We are humbly proud of the honor, and we say it without boasting, of having been the first to announce the true explanation of elasticity as in no sense a force, but as a characteristic or property of a material body superinduced by the action and persistence of the force of cohesion in so arranging and sustaining the particles of the body in relation to each other as to permit the mechanical force, after distorting the body, to store itself up in it, and thus react, when outside resistance is removed, by which to restore the distorted body to its original form. (See MICROCOSM, Vol. IV., pages 346, 347.)

We have repeatedly invited scientists to name the book, in the thousands published on physics, where any intimation of this fundamental and most essential principle of science can be found. Under this universal law can every property of matter be explained to the intelligent satisfaction of any unbiased student of science; and we unhesitatingly declare our belief that it is entirely impossible for us to solve one in a hundred of the more startling problems of physics, except by calling to our aid this essential view of cohesive force in its relation to the other forces of nature. We will, therefore, devote the remainder of this paper to the consideration of specimen illustrations of such physical properties and to other problems of matter, by which to aid young Substantialists in their investigations of these intricate questions.

Take the property of transparency in glass or crystal as one out of many mysterious examples. Why is such a body transparent while another body of the very same material composition is entirely opaque? Simply because the substantial but incorporeal force of cohesion has so placed together the particles of the glass, and so sustains them, as to permit the substantial light-force to pass through freely; while in opaque bodies of the same substance this governing-force of all material nature has arbitrarily so arranged the particles in relation to each other as to refuse passage to this immaterial force of light!

The diamond, for example, is the same in material substance, chemically and otherwise, as a piece of soft carbon coal. Why is the one the most transparent as well as the hardest of all known bodies, while the other is both soft and opaque? This same principle of physics, as here set forth and first revealed by the Substantial Philosophy, will answer this question also, namely, that the all-governing force of cohesion so rearranges the particles of soft carbon in their transformation to diamond as to produce this property of the greatest hardness known to science, as well as the property of the most perfect transparency existing in any solid substance. And it is therefore evident that when we shall learn, as we undoubtedly will in time, the simple method of utilizing cohesive force in its constructive power upon soft carbon, we can change cartloads of anthracite or bituminous coal into cartloads of diamonds, as easily as we can now convert cargoes of pig-iron into cargoes of the finest Bessemer steel.

Take another illustration, namely, the property of *weight* or ponderability in all material bodies, which, though not a force in any sense, is the effect of the action of two forces, namely, gravity and cohesion, and may be affected by others, as we shall show. Look at the singular fact that this property of weight is not at all "in proportion to the *amount of matter* contained in a given body," an erroneous law which all scientists have taught from Newton down to the present. The fallacy of this supposed law we also had the honor first to demonstrate, by referring to the almost self-evident but overlooked fact that a given ball of *glass* contains more matter than a ball of *gold* of the same bulk, simply because the glass is known to be *less porous*, that is to say, to have less vacant or unoccupied spaces, and hence of necessity must contain *more matter*; while the gold ball, demonstrably more porous, and consequently having less matter, weighs many times as much. (See MICROCOSM, Vol. I., pp. 134, 135.)

What causes this difference in the property of *weight* in these two bodies, if science has always been wrong, and if the difference in the quantity of matter may be in the contrary proportion to the weight? Plainly, with the force of gravity an admitted nonentity, as always taught, there was some excuse for the baseless law of Newton that the weight of a body must be in proportion to the quantity of matter it contained, even with the rebutting fact of *porosity* staring it in the face.

It was impossible, in the nature of things, for the true cause of the property of *weight* in bodies to have been discovered until Substantialism had come to the rescue and pointed out the true character of all force as substantial, and that the interaction of the immaterial forces alone was the cause of weight, as well as of every other property of matter. With the force of gravity acting on the material particles of all bodies by permission of the regnant force of cohesion, and according to its arrangement of said particles, it is plain to see how this latter force could construct, arrange, and maintain the particles of two bodies of precisely the same quantity of matter in such relationship that gravity or any other form of force would act more effectively on one arrangement of particles than on the other. Why should this not be so, since it is clearly so in the action of other forms of force?

Why is it that electricity, for example, will not travel through platinum, having vastly greater density, more readily than through silver? Plainly because the controlling force of cohesion has arranged the particles of the silver more in harmony with the force of electricity than in the case of platinum.

Why is it that one form of force will neutralize—weaken or strengthen, as the case may be—the action of another form of force under certain different arrangements of the particles of a body? For example, cohesive force, as exercised among the particles of platinum, as we have shown in a former article, will resist any amount of ordinary heat before yielding sufficiently to permit the metal to fuse. But let us allow heat to co-operate with cohesive force, as it acts among the particles of melted *lead*, by dipping the platinum into such liquid metal, and instantly the cohesive force in the platinum yields up its energy to the heat insomuch as to break its own hold and allow this most refractory metal to become as fusible as lead itself.

So, also, as we took occasion to show in our review of Sir William Thomson (MICROCOSM, Vol. IV., No. 1), the force of gravitation is almost entirely neutralized on a piece of silver or copper when placed in an intense field of *magnetic force*, as between the poles of a powerful electro-magnet, while a piece of any other metal of the same size would show no loss of weight whatever. What explanation, save that here given by Substantialism, is equal to such a mighty mystery as this? The cohesive and gravital forces in the silver and copper are manifestly so correlated to magnetism and the gravity of the earth as to prevent the latter from getting a hold upon the particles of these peculiar metals under these circumstances, while in other metals the correlation of these substantial forces does not effect the neutralization or even weakening of the gravity of the earth by the presence of or intermingling with magnetic force, however intense the field. We have challenged the scientific world to produce even the semblance of an explanation of this problem, save on the principles of Substantialism, as here set forth, namely, that the forces of nature are correlated with and affect each other as real substantial entities, and not as modes of motion. Such a view of force, in whatever form or manifestation, is consistent and harmonious with all we know of nature, and Substantialism thus applied is capable of intelligently solving every problem in the realm of physical science, however complex and mysterious such problem may be.

[TO BE CONCLUDED NEXT MONTH.]

"THE SUN DO MOVE."

SURPRISING as it must be to every thinker in matters of science, who has formed any true conceptions of the solar system and especially of the world we inhabit, there are educated men both in this country and Europe who seriously believe and teach with Parson Jasper, the colored preacher of Richmond, Va., that "the sun do move"—in other words, that the earth is not a globe, but flat and round like a silver dollar, and that the sun, moon and stars actually revolve around us once every twenty-four hours!

Those who know nothing of the various

publications issued and sent out by these believers in the "flat" system of astronomy regard the whole thing as some sort of burlesque or scientific joke, as no man, they suppose, with the least philosophical sense or education, or with any degree of rational reflection above that of an untutored savage, could possibly entertain such nonsensical ideas. But they are mistaken in their men. The whole thing is intensely serious, and is urged and set forth with such plausible reasoning and arguments, that several correspondents have written us, earnestly requesting that we expose the fallacy of the "flat" theory of the earth in THE ARENA, if it really be a fallacy, confessing, as they do, their inability to satisfactorily explain the difficulties presented.

Next month we shall undertake this supposed herculean task in a series of papers in this journal, and we warn Hampden, Carpenter, and other "flat" philosophers to stand from under.

Telescope Lenses.

FEW of our readers are aware of the cost and difficulty of producing perfect lenses for large telescopes. For many years this high branch of art-manufacture has been making progress toward greater and greater perfection, the magnifying effect being only limited by the size of the lenses possible to construct. For a long time Alvin Clark & Sons, of Cambridgeport, Mass., have led the world in the production of these essential parts of the great telescopes of this country and Europe. It is a very uncertain thing to construct a large lense even after the enormous mass of crystal glass has been suitably cast for it, which is of itself a most expensive and most difficult task.

The largest lens ever made is now on the stocks of Clark & Sons, and has been under their manipulation for years. The lumps of glass suitable for such work can only be cast in France, especially for the large-sized telescopes. The one here referred to is constituted of two plates, or disks, which, when finished, will be thirty-six inches in diameter. It took the French artisans about four years' experimenting, and after numerous failures, before the two masses were obtained sufficiently free from imperfections to ship to America. It will cost when completed between $50,000 and $60,000, and will be six inches larger in diameter than that made recently for the Russian Government, which was at that date the largest in existence. This monster lens now being polished is intended for the great Lick refracting telescope in California.

What the future of the multiplying power of the refracting telescopes is to be, as the art of casting glass in great masses and grinding the same to perfect form is improved, we can scarcely imagine. We have not the least doubt, however, judging from the wonderful strides of invention in the past half century, that persons who now read this article will live to see the telescope so improved as to reveal moving animals in the moon if there are such, or at least objects that are no larger. And so it will go on, no doubt for generations and ages to come. What a magnificent privilege it would be to live on this earth for 1,000 years!

The Philosophy of Color.

THE very thoughtful article of Mrs. Organ in this number of THE ARENA, on the philosophy of color, should be read carefully by every student of physical science. Excellent as that paper is, it contains some fine points which may need looking at from a somewhat different angle than that taken by the able writer. Next month we will, if time permits, throw out some new hints on the nature and characteristics of color which may interest investigators in that line of thought.

Spread the Truth.

IT will be gratifying to the friends of true science to learn that THE ARENA is not only hailed with most flattering expressions of satisfaction by scores of old and new friends of Substantialism, but is receiving a practical evidence of their interest in a stream of subscriptions coming in at the rate of above *one thousand a month*.

All classes are represented; and all are enthusiastic. Of course this is very gratifying; and it should stimulate the friends of science to prompt and redoubled effort. THE ARENA, at its present low price, should have a list of 25,000 subscribers.

We will easily secure that number within twelve months, if only our friends will *act* promptly and perseveringly for the spread of the truth.

A copy shown to a friend is about sure to secure a subscriber.

Let some good friend interest a young man in his immediate vicinity, giving him a list of probable subscribers, and thus secure a canvass of the section.

Any person of ordinary ability could secure sufficient names in a day to pay himself well for his effort at our commission rates.

Let action in this matter be prompt, energetic, and general, and the future of Substantialism is assured. See our terms to agents.

The "Plain Dealer" on Substantialism.

WE are sorry we have not room in this number of THE ARENA for a presentation of the exciting discussion sprung and agitated by the scientific editor of the Cleveland (Ohio) *Plain Dealer* on the merits and demerits of "Wilford Hall's" Substantial Philosophy. We had that discussion and our reply written out ready for the printer, but a press of other matters crowded it over to next month's issue, when it will positively be given to the public. In the meantime we sincerely thank Prof. Avery for his attack upon Substantialism, and for calling to his aid a symposium of eighteen prominent college professors. If he and his symposium friends will read next month's ARENA, they will doubtless learn something worth remembering.

Our Book Shelf.

The Missionary Review for May-June is an exceptionally fine number of that valuable periodical. The first paper on "France and Madagascar" is well worth the price of the number, while the report of the Philadelphia Presbytery upon Dr. Pierson's plan for the speedy preaching of the gospel to the world gives hope that the plan will receive the prompt consideration it merits. "Letters from the Field," Messrs. Smith & Studd, and the entertaining description of the appearance of the Hindu lady, Pundita Ramabai, before an American audience, afford a glimpse of the possibilities of mission work at *both ends* of the line, while the "Inter-Collegiate Y. M. C. A. Movement" and "Unsalaried Mission Secretaries" are both able and timely papers. Princeton, N. J.; $1.50 per year.

"THEISM AND EVOLUTION," a book of 480 pages, from the pen of J. S. Van Dyke, D. D. with an introduction by Prof. A. A. Hodge is a candid presentation of the arguments of evolution, running through twenty-five chapters, many of which were contributed to the readers of THE MICROCOSM. The object of their appearance in book-form is thus set forth in the preface: "Having enjoyed the opportunity of weighing the intellectual products of those who have enriched the nineteenth century, we presume to invite the reader to accompany us in an examination of some of the conclusions reached." "Theism and Evolution" bears abundant witness to a careful reading of the "Problem of Human Life," though the conclusions suggested are quite in accord with the Princeton view of evolution. If the work assumes to be an argument against evolution it is confined to "those forms of the evolutional theory which seem to tend toward atheism."

The mutability of species is conceded (page 35), the doctrine of evolution accepted (pages 36, 37), and then vigorous efforts are made to rescue *man* from its clutches that the Christian (?) evolutionist may have one little apology to offer for the existence of God, albeit no effort is made at a "refutation of any form of evolution consistent with theism" (page 121). Why one who seeks to instruct should not labor to refute every form of doctrine—evolution or revolution—inconsistent with the *truth* without reference to theism, is not stated.

The impossibility of the undertaking of "Theism and Evolution" is shown in the fact that so able a writer as Dr. Van Dyke was obliged to leave the whole subject just where he found it; scarcely a new argument is attempted.

Well, it will be an important advance in philosophy when the *facts* can be withdrawn and a *theory* survive.

We do not know of any theory of evolution yet put forth by an authority that does not include man; every law announced, every principle asserted is applied and must apply to man and monkey alike. If man can be hauled out of the system the whole fabric becomes a fabrication.

Reconstruction of the doctrine of evolution with man eliminated from its application will be found in the future as in the past an impossibility. "All the king's horses and all the king's men couldn't put Humpty Dumpty together again."

And since an effort at such a reconstruction seems to be the entire scope of "Theism and Evolution," we close this review of it with the following extract from Dr. Hall's reply to a similar theistic argument contributed to the January issue of THE MICROCOSM for 1884, Vol. III., page 186.

"There is not a man living who is capable of reasoning philosophically who would not say that if a single species of fully developed animals, with an anatomy like that of

lower animals, came into being by direct miraculous creation, then every vertebrate species must have originated in like manner; otherwise God's ways in Nature are neither uniform nor consistent. Haeckel, the most learned and consistent of all modern naturalists, has repeatedly said, substantially, that one demonstrable act of miraculous creation on the part of God must necessarily break down the evolution theory, whatever the appearances that may be shown to be in its favor. Hence, it is either evolution from the ground up, that is, from inanimate dirt by spontaneous generation up to man, body, soul and spirit, or it is miraculous interposition on the part of God for the beginning of each specific tribe. There is no compromise possible here with the evolution theory, either atheistic or theistic. Evolution, however, has its proper office to fill, and its legitimate work to do in the gradual improvement or development of a species within its specific limits. Thus man has been evolved, if you please, from the lowest tribe of savage barbarians up to the highest Anglo-Saxon civilization, just as he possibly once degenerated by retrogression or want of this evolution from a perfect man, as he left the hand of his Creator, down to the lowest depths of barbarism. But all this while, and during all this transition, he was still *man* and nothing else. No amount of retrogression could ever transmute him into an ape or into anything lower than a degraded human being, and no amount of evolutionary cultivation or refinement could ever raise him above the specific nature of humanity, or other human beings except in his physical, moral, and intellectual character."

A. C. ARMSTRONG & SON, New York.

THE PHYSICO-MEDICAL JOURNAL—"THE MOLECULAR THEORY OF SOUND."—Some one has sent us ten consecutive numbers of this ably edited journal, published at Indianapolis, Ind., containing ten concisely written articles on "The Molecular Theory of Sound," prepared by Jacob Redding, M. D.

Dr. Redding is a finished scientific writer, and has the remarkably clever ability of utilizing the facts, discoveries, and arguments of another author, and of putting them into his own language so as to make them apparently his own. We have run hastily over these ten numbers, which are to be continued, and, so far as we can see, the writer has used the precise arguments of the "Problem of Human Life," and in detail, from which to construct this entire series of papers. This in itself was, of course, all right and proper, but we regret to state that he has forgotten to give credit to the "Problem," for the arguments employed, or even to name its author, the editor of this journal.

The editor of the *Physico-Medical Journal* is no doubt innocent of this manifest neglect of journalistic courtesy, not perhaps having ever seen the "Problem of Human Life," or THE MICROCOSM in which the author and editor has for five years been repeating and enforcing the very arguments employed by Dr. Redding. We have no doubt when the editor of that journal shall have his attention called to this neglect he will be only too glad to make the *amende honorable*. We shall send him a copy of the "Problem" to help him to do so intelligently.

"PROBLEM OF HUMAN LIFE" IN METER.—Hall & Co. have also a few copies of the original edition of the "Problem" partly in octosyllabic meter. But a small edition of the work in this form was printed, after which it was reconstructed by the author into plain prose as now sold. Those who wish to keep a copy of that unique work, as a curiosity, and as a memento of the initial rise of Substantialism, can have one prepaid, by mail, or express for $2. It is beautifully printed on fine paper, and richly bound in morocco cloth. See the advertisement of Hall & Co.'s books on last page.

Publishers' Department.

Change of Style.

WE were so displeased with the appearance of THE ARENA as it came from the press that as soon as the large issue of 50,000 was exhausted, we had the *entire matter reset and new plates made*, before sending the remaining 50,000 of the 100,000 issue of our first number. We took advantage of the opportunity of the reset to make such changes in the make-up as we desired from the first. Of course subscribers who received the first number of the first issue, and desire to have the year's issue of a uniform style for binding, will be furnished a first number to correspond with the subsequent and permanent form, upon application to the publishers.

Our Portrait Gallery.

IN the next number of THE ARENA will appear the portrait of our editor, Dr. Hall, with the original sketch of his life and scientific discoveries as written by Eld. Thomas Munnell for the *Cosmopolitan Magazine*. We expect each number during the volume to contain a portrait of one of our leading writers. Our excellent list of contributors (printed last month) and their numerous friends will please take notice.

PERSONS sending in *two* names with one dollar, should state whether they wish for the premium. We send it only when ordered. Also please remember that the premium is not given to parties who retain the ten cents commission.

WE trust this improved appearance of THE ARENA will stimulate *every* friend of Substantialism to renewed efforts toward securing a large club of subscribers for his favorite paper.

THE delay in sending out our premium for two subscribers sent with $1.00 at one time, was occasioned by not receiving it from the press.

But all orders have been filled to date, and we trust those entitled to it will have received it before this.

WE *cannot* acknowledge by *letter* the receipt of subscriptions; we would have no time for other duties.

The receipt of our premium or THE SCIENTIFIC ARENA by parties entitled to them will be a sufficient acknowledgment.

Our Only Premium for Subscriptions—Terms to Agents.

WE offer but one premium to subscribers for THE ARENA, and that is the four former treatises of the editor on the "Immortality of the Soul proved by Science" and "Does Death End All?" These important papers are now published by us under one cover, and will be sent free as a premium to any one who will send us two subscribers with the money ($1).

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Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SCIENTIFIC EVIDENCE OF A FUTURE LIFE, No. 3.

THE SUBSTANTIAL NATURE OF ALL FORCE.

BY THE EDITOR.

[*Continued from last month, Page* 19.]

Hence it follows, not only that a real, demonstrated substance passes off from the poles of the magnet and returns toward them, by which the magnetic repulsion or attraction takes place, but that this invisible, intangible substance is indisputably an immaterial entity—a substance analogous, except in want of intelligence, life, etc., to the essence of what we may conceive God himself to be on an infinite plane.

God's substantial essence may thus occupy every part of every material body, fill all spaces, and extend through all extent with the most intensified presence and personality, without the physical recognition of a single being in the universe, unless the powers of such being should be especially fitted for such superhuman recognition.

This principle in philosophy is illustrated by the fact, as Sir William Thomson urged in his great Midland Institute lecture, that a man may place his head within the magnetic field, between the poles of a powerful electro-magnet, without feeling any impression whatever from the magnetism there present, even should a score of dynamo-machines send their currents through the magnet. Yet this man's head would be surrounded and permeated with an intense substantial presence, filling every portion of his sensitive brain. Why, then, may not the immaterial, personal, and substantial presence of God also surround, pervade, and permeate our bodies with a million-fold intensity, compared to that of this magnetic atmosphere, and still we mortals, as yet, know nothing of it corporeally for the want of the development of powers which the eternal environments will, without a doubt, in due time unfold?

Sir William Thomson, with all his scientific culture and gigantic philosophical powers, knew nothing of the cause or true explanation of that wonderful fact which he had observed, of the non-effect of such an intense field of magnetism on the human head. He was as bewildered over it as is an untutored savage over the true cause of an eclipse of the sun. Yet he saw and described to his audience in the same connection the simple, but to him incomprehensible fact, that a piece of silver would fall through that same magnetic field (which produced no effect on human sensations), as slowly as if it were settling through thin mud! And all the time that profound physicist, having no knowledge of the mystery-solving principles of Substantialism, could not catch the first glimpse of the self-manifest fact that this magnetism was a real but immaterial substance in thus counteracting the sudden fall of the mass of silver, but supposed it to be, as he expressed it, but the "rotation of the molecules" of the steel magnet! (See our solution of this silver problem, in THE MICROCOSM, Vol. IV., No. I.)

A. WILFORD HALL, PH. D., LL. D.

[For Sketch, see page 44.]

Who, then, with this one fairly representative force of nature demonstrably shown to be an immaterial substance, will dare to assert that it is not more reasonable to teach and believe that every other force of nature, even without a word of proof or argument on the subject, is also a substantial entity, than to hold the incongruous theory that some of the forces are substantial entities, while others are but modes of motion?

To hold that heat and electricity are but the vibration of the material molecules of bodies in or through which they are manifested, while magnetism (the result of electricity) is a real substantial entity, is to trifle with the physical laws, and to ignore the harmony and uniformity of God's natural system of things.

From the very first glimpse we caught of the Substantial Philosophy we were irresistibly impressed with this necessary law of the consistency and harmony which ought to prevail in God's universe. We then and there put on record as our conviction that the forces of nature, or the phenomena-producing causes by which our sensations are influenced and our reasoning powers impressed, must have a uniform constitution analogous to each other, and a uniform action as to the production of phenomena, and that this was a foregone conclusion in science unless a break in such harmony and consistency could be shown to exist by the most irrefragable evidence.

Beginning thus with the sense of *touch*, and finding the absolute contact of substance necessary to produce the tactile sensation, we passed to the next higher sense—*taste*—and found the same state of things to prevail. From taste we ascended the scale of the senses to *smell*, and still found by rational observation as well as by the concurrent testimony of modern science, that *odor* was a real substance, and that it produces its sensations by actual substantial contact with the nasal membrane and olfactory nerve rather than by setting them into vibrations through the action of odorous air-waves. Then came the supposed theoretic break. Is it possible, we exclaimed, that a consistent and harmonious order of nature would tolerate a leap here from substantial contact for touch, taste, and smell, to mere *motion* for *hearing* and *sight*?

One of the strongest arguments of Huygens in favor of the undulatory as against Newton's corpuscular theory of light, was the improbability of nature's having leaped from *motion* in *sound* (which Newton and the whole world believed) to *substantial contact* in *light*, as Newton insisted! Though this analogical argument was too much for Newton, and forced his surrender of the corpuscular theory of light, yet neither he nor Huygens saw the fatal trap they had thus set for the whole mode-of-motion philosophy from beginning to end, nor had any one else seen it till it was forced home to wave-theorists in the fifth chapter of the "Problem of Human Life." Huygens thought he was severely logical, yet how weak to employ such an argument against Newton when he himself had just forced nature to make a ridiculous leap from substantial contact in *touch*, *taste*, and *smell*, to the mere *motion* of air-particles in sound! And how easily overpowered must Newton have been to succumb to this logic of his adversary, with the universally conceded leap of nature from substantial odor-particles to insubstantial sound-motion right before his eyes!

Plainly, if nature could be so inconsistent as to tolerate a leap from substance to motion, in passing from odor to sound, Newton might well have used this fact with telling effect as a reply to Huygens, and thus have shown, that as nature was so in the habit of making leaps it had most probably kept it up and again leaped back from motion in sound to material particles in light! We are curious to know what sort of reply the great Dutch logician would have made to such a decided hit.

Substantialism, however, fears no such difficulties. It is the first and only theory or system of teaching known which could have been capable of solving the problem of Huygens, since it was the first to stamp consistency and uniformity on the face of nature. It did this in its original analysis of the five

senses, by showing that substantial contact was absolutely necessary in the case of every sense, from the lowest, *touch*, to the highest, *sight*, premising only that the substances employed by nature in causing the different sensations should be graduated consistently with the work the different senses had to do and the offices they had to fill.

This led directly to a similar analysis of the various forms or manifestations of force, from cohesive attraction, which holds all material bodies together, up through gravitation, magnetism, electricity, heat, light, sound, vitality, instinct, mind, soul, and spirit, even to God whence all were derived. If one of these forces, it was assumed, is a substantial entity, then all must be, or else any possible correlation of the forces was a contradiction in terms. If any one of the natural forces can be the mere motion of material particles, and not a substantial entity, then all must be, and the idea of the *conservation* of the forces is simply nonsense, for how conserve or preserve that which has no existence as an entity or objective thing, which is absolutely true of all *motion?*

To test this matter thoroughly and leave no room for doubt, and thus form a basis for defending the harmonious and consistent order of nature, while at the same time laying a deep and broad foundation for the Substantial Philosophy, we selected one force as a representative of all, and that force, as just illustrated, was *magnetism*. The claims of that force to a substantial existence we have fully presented in these papers, and although the same arguments are applicable to other forces, it is needless to extend the analysis, since all the laws of nature, physical, vital, and mental, must harmonize, and all the forces of the universe, proceeding from the one intelligent source and fountain of all things, must partake of the same general and substantial nature.

Hence, by the analogies of science, and according to the very harmony and fitness of things, the life and mental powers being also substantial forces, by which physical bodies are moved, and as a consequence indestructible, there is a true and logical basis for the immortality of man, and for the conscious existence of the soul after death, since it is just as reasonable and easy to believe in the substantial existence of the soul apart from the body, or even of the existence of the invisible and intangible God of the universe separate from matter, as to accept the substantial existence of immaterial magnetism separate from the magnet, which, as we have seen, we are compelled to do.

Thus do the analogies of science, in the very idea of the substantial nature of all force, go strongly to vindicate the higher intuitions of our being and to confirm the higher revelations of the sacred Scriptures, that death does not end all, but that though we die we shall live again.

The work of our life, and to which we have consecrated every power and faculty of our being, has been to so far establish and vindicate the principles of the Substantial Philosophy before we die, that no rational excuse can thereafter exist in the minds of men for its rejection. This work, if not heretofore done to repletion, is thus accomplished in these papers, and which, as we verily believe, must satisfy every reasonable demand of the mind that will give it sufficient thought and study to grasp its force. If any man who shall have made these arguments his own, and who shall have assimilated them, so to speak, as a part of his mental organism, shall still not be prepared to avow himself a constitutional Substantialist, then that man's intellectual nature must be specially adapted to the demands of materialism, and to that system of doctrine we commend him with our benediction.

Next month we shall attack the difficult problem of the existence of man's vital, mental, and spiritual powers separate from the body, not only as a substantial entity, but as a conscious, intelligent personality, with an organic, though immaterial, bodily identity as real as is the material organism we now inhabit. In that paper we will endeavor to explain the difficult question of the non-existence of the lower orders of animals as conscious beings in the life to come, while man alone, made in the image of God, is also to be made immortal.

WHAT IS MAN?—IN THE LIGHT OF SUBSTANTIALISM VERSUS MATERIALISM.—No. 2.

BY PROF. G. R. HAND.

RESUMING the investigation, I call my next witness.

5. With the materialistic scientist on the witness-stand, I again ask the question: What is man? And the nebulous answer squints strongly in the direction of evolution, hinting that man may have descended from the monkey, whose ancestors had also descended from the descendants of a long line of descent, until the "Descent of Man" is traced back to inanimate matter, from which man has been descending upward all the time. It would have man traveling on the evolution line and differentiation train for a few millions of cycles, while protoplasm, primordial germs, monerons, mollusks, marsupials, mammalia, monkeys, and men flit by, with numerous other invisible intermediate stations along the line, till the specter of evolution, a veritable tramp, stands at the terminal depot, with not so much as a check for his trunk to show that he came by that route. Then, if man's descent has been upward all this time, and differentiation continues in the same direction, may not men develop into angels, and angels into a God, to the utter consternation of materialism and evolutionists?

But Substantialism recognizes immaterial substance, spirit, self-existent in the regnant mind of the universe, and God placing the immaterial man in a material body, with the power of indefinite reproduction, and authority to have dominion over all the inferior animals; and man, the noblest work of God in creation, stands near the throne here, with possibilities and privileges, assured of life hereafter, when the substantial man shall have laid aside the material man.

6. We may learn more of what man is by what he has done, and is capable of doing, from his many discoveries and inventions.

I next call Electricity to the witness-stand. Philosophers had seen the zigzag lightning mapped out in the heavens long ages before they were introduced to electricity even by name, and had trembled at the roll of its thunder. Jupiter was supposed to be enthroned on Mount Olympus, from whence he hurled his thunderbolts. The aspiring poet mounted his Pegasus, and scaled the summit of Mount Parnassus, the home of the Muses, to drink new draughts of inspiration.

But young America outstrips the poet's flying horse, scales the summit of Olympus, besieges the throne of Jupiter, defies his thunderbolts, spikes his thunder cannon, and bears away his lightning as a present to mankind, to become a scientific international foot-ball. It was our own Dr. Franklin that lassoed the lightning steed with his kite-string, and brought it down to earth.

But there it stood, wild and prancing, and unbroken to the harness, scarcely rising above a scientific plaything, till Morse came along with his wires and batteries, and harnessed it to the telegraph, and commissioned it to bear along the trembling wire messages of intelligence from the enthroned mind of the supermaterial being, man.

Restless and aspiring, man stops not satisfied with flashing Godlike thoughts across the continent, over rivers and mountains and all terrestrial obstacles, but gazes across the ocean, bent on making a lightning connection with his intelligent cousins on the other shore. When rolling billows refuse him the right of way on which to plant his telegraph poles, he applies to Neptune for right of way, and lays his submarine cable in depths beyond the sporting grounds of whales and sharks, and undisturbed by storms and waves, and bids his lightning steed plunge, to rise on the other shore, with international messages from man to man. The question: What is man? seems to be answering itself, and elevating man above the animal creation, and from the material into the domain of immaterial Substantialism, as intelligence, overcoming all obstacles on land, in air, or ocean's depths, recognizes the superior and dominant intelligence of the enthroned and regnant mind of the universe, in the first telegram that pioneered the pathway of thought through the dark abysmal chambers of ocean's depths, in the queenly language: "What hath God wrought?" And now, the world over, intelligence runs to and fro as the lightnings flash, and knowledge is increased.

7. While Electricity is on the witness stand, it will be in order to interview the electric light, a recent discovery of the inquiring mind and inventive genius of man. Here the immaterial substantial entities and forces, electricity, heat and light, seem as playthings under the intelligent control of man, yet strictly obedient to his command.

Elevated on towers or poles, or suspended by cross-wires, in the streets of a great city, you see brilliant lights, dazzling like the sun, casting a radiance over the city. All night the vigils of that watchful eye keep guard without any visible fuel or supply. You visit the factory, and almost fancy yourself in the presence of that creative power that said, "Let there be light, and there was light." Tongues of fire ornament the rapidly revolving machinery, and cast a radiance over the scene that seems to invite you to some enchanted fairy palace. Force moves the machinery, and the friction excites electricity; heat is generated, and light bursts forth. Here, the conservation, transmission, and transmutation of these substantial entities seem playing a fantastic game of hide-and-go-seek.

But the potencies of immaterial substances assert themselves in this connection, and show that the agents, or so-called modes of motion, must be real entities. But the inquisitive mind calls for the relation existing between this factory where they grind out light and the lamp on yonder tower. Sanctified intelligence sees the connection, and superintends the *modus operandi*.

Man applies force, as motive power, and the friction of revolving disks excites and emits electricity, which, not as a mode of motion but as a moving entity, is conducted along the wire to the tower, where, coming in contact with a prepared substance, chemical action takes place, and light gleams out to illumine the surrounding darkness. Thus man speaks through the harmony of substantial forces, in their action upon material substances, and says, "Let there be light!" and suddenly, at his scientific mandate, all over the great city there is light where darkness was. Then what is man? In thought and action how like a God!

But prudence suggests that I stop here and modestly wait in the vestibule of potencies and possibilities, leading into the penetralia of Substantialism, the presence chamber of divinity, where full-fledged humanity may be introduced to companionship with the enthroned intelligence of the whole brotherhood of regenerated man, and the fatherly recognition of the regnant mind of the uni-

verse, and the question: *What is man?* be no longer interrogative or nebulous, but answered in the conscious possession of a living and moving realization.

SACRAMENTO, CAL.

IS LIFE A COMBINATION OF DEAD, INORGANIC MATTER?

BY J. C. DUVAL.

IN a scientific article I came across not long since in a periodical. it was stated that. if a man weighing ten stone were squeezed in a hydraulic press, seven and a half stone of water would run out, and only two and a half stone of dry residue remain. A man is, chemically speaking, forty-five pounds of carbon and nitrogen diffused through five and one-half pailfuls of water.

Therefore, according to the materialist doctrine, mind or intelligence is *created*, or at least is the result of the combination of those material substances. The materialist ridicules the idea that mind or soul is a creation of God, and then asks you to believe that it is a creation of five and one-half pailfuls of water, forty-five pounds of carbon and nitrogen, and a little iron, etc. It is decidedly easier for me to believe in the existence of a God than it is to believe that "dead, unreasoning matter," in which there is not a vestige of life, much less of mind or intelligence, should possess such a creative power.

Let us follow up this materialist doctrine a little and see where it will lead us. There really never was such a man as Julius Cæsar. There was in times gone by a certain 5 1-2 pailfuls of water, with 45 pounds of carbon in it, and a little iron, lime, etc., which was known by the name of Julius Cæsar. It was a brave combination, so much so that "as brave as Julius Cæsar" became a by-word—but it was an ambitious one also, wherefore another combination of 5 1-2 pailfuls of water, etc., yclept Brutus, "took his sign" in. But Brutus ought not to have done so, for the combination known as Julius Cæsar was no more to blame for being ambitious than it was for having a Roman nose! There was merely a "screw loose" somewhere in the combination for which "protoplasm" alone should have been held responsible.

The 5 1-2 pailfuls of water, etc., which, when combined, was known as Shakespeare, was also an A 1, No. 1 combination, or machine, and turned out first-class work when properly supplied with fuel in the shape of roast beef or venison pasties (of which last it was said to have been very fond, and that it would get them by *poaching* if not otherwise to be had); a Macbeth or a King Richard III. was the result. But the combination known as "Guppy," who does the sentimental for the village newspaper, is a very inferior or defective one, for although it be supplied with roast beef and venison pasties *ad libitum*, nothing comes of it except some namby-pamby "lines to Miss N——," or a mawkish, love-sick story; and yet Guppy, when subjected to the hydraulic test, will "pan out" as much water, carbon, etc., as Shakespeare.

The same combination of carbon, nitrogen and five and a half pailfuls of water—minus the tears it shed, when it found there were no more worlds to conquer—was known at one time as Alexander the Great. Every atom of the substances that once entered into this combination still exists, therefore Alexander is not dead. The combination has merely been taken apart (probably for repairs after that last drunken debauch), and in the course of time may "put in an appearance" again. "What has been may be again." But what an insignificant, conceited little combination it was after all! What interest could it have had in establishing a name that would be remembered for all time to come, when total annihilation most surely awaited it in a few fleeting years? The five and a half pailfuls of water, etc., which, when combined, might have taken pleasure in its renown, has been resolved into its constituent elements, and are now floating promiscuously around and indistinguishable from the countless atoms of similar substances. If I had a son I would call him Alexander the Great, and he should divide immortality with his namesake. Certainly, the immortality would belong as much to the one as the other.

Mary Queen of Scots was a very beautiful combination of 5 1-2 pailfuls of water, 45 pounds of *unfortunate* carbon, some *romantic* lime and iron, and a little *melancholy* nitrogen. It is believed by many of the combinations of the present day that it connived at the "taking off" of the Darnley combination. But suppose it did "put a spider in its dumpling," can you blame the sparks for flying upward instead of downward?

And there was that combination known as the Iron Duke—a combination of the same materials composing the others, with perhaps an extra amount of iron in its blood. It was the combination that beat Banniger, and everybody knows what Banniger beat. It is said, however, that it was avaricious and grasping, but, my dear sir, do you expect perfection from 5 1-2 pailfuls of water, 45 pounds of carbon, and a little iron?

And there were the five and one-half pailfuls of water, etc., known as George Washington. It was in many respects one of the most remarkable combinations of its day—especially for its love of the truth—*vide* little hatchet story—and yet it is said to have been an aristocrat, and given to sudden outbursts of passion and to the use of profane language; but what could you expect from five and one-half pailfuls of water, etc., especially when its ire was aroused by the shameful way in which its undisciplined militia combinations were thrashed by the well-drilled regular combinations of his Satan—Britannic Majesty, I mean?

And there were the five and a half pails of water, etc., known as Lord George Gordon Noel Byron (what a name for a little dab of mortar), that woke up one fine morning and found itself famous—and it was a forty-horse-power combination in the poetical line. Feed it with a few soda crackers and a glass or two of hock, and a canto of "Childe Harold" or "Don Juan" was the result. Guppy on the same diet would have produced a driveling anacrostic or a few mawkish "lines" that would have made a "bread-and-butter" schoolgirl sea-sick. And yet it is said that Lord George was not what is termed a strictly moral combination (*vide* Mrs. Beecher Stowe), and that it always made itself the hero of its own story; that he drew from his own experience when he wrote the lines beginning "The d—l's in the moon for mischief," etc. But, my dear sir, you must not be too exacting. Remember we are speaking of five and a half pailfuls of water, carbon, etc., things that never had the remotest idea of the existence of a "moral code." You can't say that either water, carbon, or nitrogen is a *moral* substance, then from whence do you expect your morality is to come?

The plans of the battles of Jena, Wagram, Austerlitz, etc., were no doubt the result of camp rations in the shape of pork and beans operating through that warlike combination known as Napoleon Bonaparte.

Then there's your moral, religious, amiable, villainous, courageous, cowardly combinations of water, carbon, etc., in fact as many different combinations as there are individuals in the world, each working precisely as it is *compelled* to work by the peculiar arrangement or combination of the material atoms of which it is composed. It may be a one-horse-power combination or a forty horse-power (and small blame to it for being either), but, whatever it is, it is compelled to be that precisely, and nothing more nor less.

Lastly, I know, like everybody else, that I am simply a combination myself of water, carbon and nitrogen—but yet this combination firmly believes that it could just as easily create a 500-pound granite bowlder as that it could produce even such a mind or intelligence as I possess myself. But don't be too hard upon me for making such an assertion. Remember I am only a combination of five and a half pailfuls of conceited water, forty-five pounds of foolish carbon, and a little ignorant, unscientific iron.

The materialist creed is a very poor one to live by and a worse one to die by. Taking away all "free will," and, of course, all responsibility, there is nothing left to restrain the evil propensities of man, and he will be like a dismasted ship at sea, driven wherever the winds of caprice or inclination may happen to blow. It says to the conscientious man, "What a miserable fool you have been to permit your superstitious scruples to stand in the way of the gratification of your desires. You have been pursuing an *ignis fatuus*—you have bartered present enjoyment for an imaginary utopian world of 'future bliss,' and now you will be annihilated, and be no better off in any respect than the most villainous scoundrel that ever walked the face of the earth. It says to the poor, the afflicted and sorrow-stricken, in vain do you look forward to a state of future happiness as a recompense for the woes and pains you have suffered here. It is a hard case, it is true, but with your life here terminates forever your existence, and what you may or may not have done—what you may or may not have suffered or endured, will all amount to nothing. You have simply been an unfortunate, unlucky combination of five and one-half pailfuls of water, forty-five pounds of carbon and a little nitrogen—and there's an end of it."

TRANSMISSION OF THOUGHT.

BY REV. F. M. MOORE.

I HAVE often tried to come to some satisfactory conclusion regarding the process by which thought is transmitted from mind to mind, and have as often been lost in the labyrinth of unsolved mysteries.

I know that by the law of association we familiarize ourselves with certain symbols of thought—such as words, signs, etc., which give us a certain amount of power over and access to the minds of others; but there is so much that I do not understand about the process by which thought is transmitted and the avenues by which it is conveyed, that I long for a clearer comprehension of the subject.

I cannot understand what so frequently occurs, when two persons, between whom there is an intellectual affinity, are able in a degree to understand the thoughts of each other. For instance, how many times you have been in company with a friend, when just as you were about to speak of a certain subject he surprised you by speaking of the same thing, using, perhaps, the exact words that had been framed in your own mind!

These things do not simply *happen*, as some may say; they are too frequent and must be governed by some law evidently unknown to us. It is true that the surroundings have much to do in making *general* impressions upon our minds, but I believe that science will yet show us a more specific law by which this phenomenon is governed.

I have observed, too, that in listening to very able and eloquent speakers the mind is led to *anticipate* the unspoken thought. There seemed to flash upon the mind of the audience a mental conviction of that which

was to follow. It seemed that animated thought outran the slow process of speech and noiselessly entered the citadel of the intellect ere words had knocked at the outer gate. Will not science reveal to us the hidden route?

And then, who of us have not been impressed, or rather *oppressed*, by a consciousness of impending trouble of which we had not yet received other tidings, but which so quickly followed our apprehensions that we were made aware that "Coming events cast their shadows before them?"

By what mode of travel do these forerunners of joy or sadness reach us?

Is there not in the Substantial Philosophy that which will, when applied, clear away much of the mist which now shrouds these important questions?

I am not able to theorize upon this subject, but I hope that those of more ability will favor us with their considerations through the columns of THE ARENA.

I believe that science is a potent instrument in the hands of Jehovah by which superstition will be obliterated and infidelity will receive its death blow.

How grand, how sublime, how glorious, when science, reason and philosophy shall cluster about revelation and hold up before the inquiring mind and heart the standard of God's eternal truth!

ARROWSMITH, ILL.

THE NATURE OF ODOR.

BY REV. T. NIELD.

THE real conscious self in man is the spirit. A material body is necessary as a medium through which he may become aware of the presence and properties of his material surroundings. Through the nerves he acquires his knowledge of the material *not-self*, either by direct contact with concrete matter, or through the medium of matter in some semi-etherealized form. For only spirit can act *directly* on spirit; only matter can act *directly* on matter.

Concrete matter is inert. Semi-ethereal matter is made such by an expression of energy, either chemical, mechanical, or vital; hence it may be termed energized matter, through whose energizing we become conscious of the material realm that lies beyond the reach of our tactual nerves. Through odor we become aware of the vicinage of matter that possesses certain qualities: through sound, that specific and local energy has been expressed; through light, that matter has color, contour, etc. Thus we see that the nerves are nature's telegraphs; odor, sound, light, electricity, etc., being the currents that convey to us our knowledge of the material universe. This theory of matter, and of the spirit's relation to it, is new; and we think it can be proved to be as true as it is new.

Matter, in every form known to man, is a compound and can be resolved into its elements; from which we conclude that it exists by virtue of the chemical affinity of the elements of which it is composed.

The elements of which matter in one form is composed may be liberated, and, by union in other proportions, or with other kinds of free matter, form new compounds.

Changes in the combination of elemental matter produce all the phenomena in matter appreciable to the senses, as odor in the growth of a flower, sound in the explosion of gunpowder, light in the generation of electricity, color through the action of light, etc.

In the present paper we propose to confine our attention to some of the phenomena of odor, and from those draw our inference as to its nature.

1. Odor can produce sensation by an impression on the olfactory nerve.

2. It emanates from material substances.

3. It can escape from a substance and leave it odorless or changed in odor.

4. It is quantitative, being diffusive, with a limitation, and capable of concentration.

5. It can be preserved or dissipated, as it is or is not secured against the action of the atmosphere.

6. It can be absorbed by one substance as it is emitted by another—as in butter or milk when placed near to fish, etc.

7. Its presence or absence affects the flavor of substances.

From the foregoing we conclude that odor is an entity, and that, since it has many of the properties of concrete matter, it must itself be free matter. Whether, as in light, it forms a compound with the atmosphere, is immaterial to consider. In either case the sensation recognized as odor is produced by the contact of matter, in some subtle form, with the olfactory nerve.

So far as known, odor is the product either of decomposition or of recomposition. Decomposition may be by disintegration, as in burning, or by decay. Recomposition may be by absorption from other substances, as milk absorbing the odor of onions; by the formation of a compound, as in making perfumes; or by the process of growth.

In decomposition, whether by artificial disintegration or by decay, the elements of a concrete substance are liberated, and the compound is dissipated. In the process new combinations with the atmosphere keep forming, with a consequent and equal change in the quality of the odor emitted; and the quicker the disintegration, the greater is the odor, and the more sudden its change of quality. In recomposition, however accomplished, a process of combination of simple elements is going on, so forming a compound; and as the material modifications progress so do the modifications in the quality of the odor.

Here, then, we have most, if not all, the subtle phenomena of matter, as manifested in its higher attenuations, in odor; from which we conclude that it is a highly attenuated form of matter.

Some investigators have hesitated to accept our conclusion, because some substances, as a grain of musk, emit odor for a great number of years without the least apparent diminution either of the substance or of the odor. But when we recall that all the phenomena of matter, whether concrete or free, are the result of adjustment in the combinations of its elements, and that odor, too, is subject to the operation of this law, we see our way clear to a solution of the problem. In the growth of a rosebud, it is evident that its odor, which develops with its growth, is a quality absorbed either from the soil or the atmosphere, or both, or is the product of the chemical action of light, through the atmosphere, on the material of the flower. Whichever it be, the odor has a material source; and we see that, as the flower increases in size, it increases both the quantity and the quality of its odor. From this, we infer that the musk absorbs from the atmosphere that which replaces in quantity what escapes from it as odor, and, at the same time, by a chemical change constantly going on, keeps the quality unimpaired. It would be a somewhat similar process of recomposition of elements to that which forms odor in the rose. True, the rose is an organic substance while the musk is inorganic. Inorganic substances, however, can absorb odor itself, as we have noted in butter and milk. Therefore, in view of this and all the other phenomena of odor, we conclude that musk can and does absorb the *elements* of odor, by their combining with the original compounds, so replacing whatever is emitted in the form of odor. And so of all other substances whose emissions of odor leave their bulk undiminished.

Odor, then, may be defined as free matter, exceeding rare, produced by the chemical action of the atmosphere on concrete substances.

GREENSBURG, KY.

REMARKS ON THE ABOVE BY THE EDITOR.

THE more we study the subject of *odor*, the more mysterious the problems involved in its nature and character become. In the "Problem of Human Life" we took the position, in accordance with the views of Prof. Tyndall, Dr. Carpenter, and most modern writers on this phase of physical science, that odor is a highly attenuated material substance, and consists of the almost infinitesimal particles of the odorous body. Indeed, this view, as maintained by the Rev. Mr. Nield, seemed to us formerly as about the only consistent view possible to maintain. But as the Substantial Philosophy became gradually developed in its details, and the substantial character of the immaterial forces of nature became more thoroughly and indisputably established, we were led more and more to the growing conviction that if odor was not one form of immaterial force, somewhat analogous to that of sound or electricity, it must at least be the veritable connecting-link of substance between the material and immaterial forms, partaking of the nature of each, and designed by creative intelligence to span the chasm lying between the two grand divisions of the substantial entities of the universe, namely, material and immaterial substances.

In the economy of nature and all through its gradations of progressive development connecting-links are common between all the principal classifications, both in the organic and the inorganic departments of existence, and that, too, without involving the transmutation, or evolution of the class above from that below.

Many instances could be named, such as that of *asbestos*, forming the connection between vegetable fiber and inorganic mineral; such as the *mimosa* or sensitive plant so strangely constituting a connecting-link between vegetable and animal life; such as the *flying-fish* connecting the fish proper with the bird; or such as the *flying-squirrel* and *bat*, so beautifully linking bird and mammal. When such connecting-links are observable everywhere in nature, should it be anything surprising that a substantial entity should form the connecting-link between the material and immaterial entities of the universe, and partake of the characteristics of both classes? Such really now seems to us to be the character of *odor*, though we prefer not to be too positive.

In the "Problem of Human Life," page 27, we speak of the wonderful nature and character of our atmosphere as the connecting-link which unites visibly fixed and tangible liquids, such as water, with the invisible and almost intangible gases, and that this natural order is probably one of the means which creative wisdom had designed by which gradually to carry the thoughts of intelligent and reasoning beings from the gross materials of earth to the sublimed and refined immaterial entities of nature, and thereby to convince us that the *immaterial* is the *real* of all existence, while gross matter is but the temporary means of its manifestation.

May not *odor*, therefore—that marvelous something which enables the hound to follow the fox hours after it has passed, and without keeping within rods of its actual path—be neither material nor immaterial in the strict sense, yet partaking so much of the nature of both as not only to reach across the chasm which divides this grand classification, but to lap over at each side upon the two divisions so as to blend insensibly with each? Such a view helps us, in our attempted analysis of the physical mysteries of the universe, to catch a glimpse of the vastness

and almost infinite complexity of the realm of nature into which the Father of spirits has barely introduced his rational creatures for a brief hour, that by proper reflection they might catch a foretaste of the mighty domain of entities and realities in which our separation from this gross environment would ultimately make us perfectly at home?

Such visions of the possible realities of human and divine existence are only practicable by the aid which Substantialism affords in our benighted sojourn here below. Those who have read the past volumes of THE MICROCOSM and the present volume of THE ARENA, in which the Substantial Philosophy has been so elaborately discussed and elucidated, can more readily grasp the meaning of these hints than can be expected of readers who have not before had their attention called to this inspiring theme. Still, to those who shall continue to read this journal, even to the end of the present volume, we can safely promise a degree of light and joy in believing that will a thousand times repay the paltry cost of a year's subscription.

Next month we shall copy a narative of facts involving the wonders of odor that will be simply astounding to every thoughtful mind, and if duly studied will form the basis of an intelligent belief that will prove a stepping-stone to a still higher plane of thought, and which will in due time lead the reflecting reader into the open and broad expanse of Substantialism itself.

THE NEW THEOLOGY.

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

DOES theology involve the possibility of anything new? Yes, truly new and newly true: new discoveries of old truths, and truly logical development of old principles. The term may be properly employed, even though it be sometimes dishonestly possessed and improperly applied. Strange that such "New Theology" should have been evolved from the fixed and finished orthodoxy of Plymouth Rock! Was it so evolved? Yes, according to Puritan presumption. The new light, as it frequently flashes from the luminous pages of the Andover *Review*, shineth in darkness, even into the more Anselmic theological theory of Princeton, and yet the staid orthodoxy of the latter school comprehendeth it not. The inventive genius of New England is proud and happy over the discovery of a principle in theology which was announced a third of a century ago, and which was advanced, defended, and partially developed when some of the present nutmeg theologians were yet in the swaddling bands of their infancy.

What is the "New Theology?" What is the central principle thereof? What is the new line of inquiry which its discovery and introduction have opened for the most stalwart activity of Christendom's future combined faith and reason? One answer is sufficient for all the foregoing questions. It is *the proper theanthropic person of the historic Christ*. This Christo-fontal and Christo-centric question has been coming to the front for several decades of anxious years. It is now fairly before the footlights of an audience more appreciative than the one that tried to hiss it from the stage at its first appearance in the middle of the present century. It is destined to work its way into the blood and fiber of all theology worthy of the name. The Church will not much longer continue to advocate the barren idea that man is saved primarily by what Jesus began to do and to teach; but rather by what He began, and yet never began to be. Of course, the doctrines which this principle of the "New Theology" fontally involves have not yet been fairly and fully formulated; not even by that vigorous Mercersburg school of thought which delved after the gem and announced its discovery in 1845, and held it up for the amusement of New England theologians, until their characteristic Yankee shrewdness has led them to join the swelling chorus which is now echoing this great principle and its concomitant sentiments of sublime truth through all the land and to all the inhabitants thereof.

Why has the aforesaid principle been as yet but partially developed? Why have not the doctrines logically deducible therefrom been reduced to system for the edification and symmetrical development of the body of Christ? The answer is just as short and simple as its truth is obvious to unprejudiced intelligence. The prevailing philosophy of the world rendered it impossible. Theology can never go very far in advance of the more secular sciences. Some of these had been lagging in the rear; others, in their diverging tendency from the line of truth, had wandered away into the wilderness of materialism. Even where the sciences have kept company with the best apprehensions of revealed truth, their mutual progress has been impeded by the constantly accumulating *debris* of materialistic theories. In fact, the proper stream of the world's religious and scientific onflow has been dammed by the devilish stuff. The result has been too many silly, circling eddies, instead of a more proper progress in the mighty majesty of the grand central current of human history. This was virtual stagnation in the world's life-stream of thought. Stagnation bred malaria, and sent its germs of poison into every department of science, and into every zone of its philosophy. Science was too sick to know that it was afflicted, while philosophy unconsciously cried for the balm of Gilead. That balm was given in the fullness of time. Substantialism has come with healing in its wings. The several sciences may here find vigor for their blood, beauty for their countenances, straight paths for their feet, and glory at the goal of the race. Theology is to be the greatest beneficiary, while all move upon slightly converging lines to the front. The queen of all the sciences will now soon be seen to unfurl her Christo-centric banner, with a new meaning in the motto inscribed thereupon. Substantialism will protect both wings of the advancing host, and furnish the best munitions for an offensive warfare upon the last enemy, while the presumptuous Andoverian School of "New Theology" may continue its efforts to deceive the nations by telling how *it* killed the old heterodox bear.

Fun? Not a bit of it! We were never more serious in all our life. To the testimony! What is the record which the essential principle of this "New Theology" has made for itself? Its goings forth, though not of old, are certainly not of such recent date; neither did it first salute the world on the classic banks of the Merrimac. Germany, with all her past erratic tendencies in philosophy, is something more than a nest of rationalism. The mighty mind of Schleiermacher caught a glimpse of the "New Theology" eighty years ago. True, he saw it in confused vision, and mixed it up with some heresy, but what pioneer prophet, excepting only the Saviour of mankind, ever yet did otherwise? Drs. Rough and Schaff brought the seed-thoughts from Europe and planted them in American soil at Mercersburg before the middle of the present century. Dr. Nevin recognized its germ principle as a revolutionary power in theology, and devoted the best half of his octogenarian life to its development and defense. Thirty volumes of the Mercersburg *Review* have been warmed by the radiations of its heat and made luminous by the scintillations of its light. Dr. Schaff, the first church historian now living upon the face of the earth, proclaimed this "New Theology" in his "Principles of Protestantism" forty years ago.

And what were New England theologians doing at that time? What, in short, was the attitude of American theologians in general toward the "New Theology?" Did they not "seek the young child's life to destroy it?" The New York *Observer*, standing then, as now, upon the highest watch-tower of perfected orthodoxy, and representing more theological sentiment than any other periodical upon the continent, had something to say concerning that incipient movement which is now, under God, at work saving its denomination from becoming an ecclesiastical valley of dry bones. In its issue of April 8th, 1848, it denounced the new theology then advocated by Dr. Schaff as "German transcendentalism." But great changes have been wrought since the promulgation of that Protestant bull. If theologians are not more honest, they are at least more sagacious now than they were when "German transcendentalism" first landed upon our shores. The late lamented editor of the *Observer* was a member of the Church Congress at Hartford, when the Christo-centric principle was urged and seemingly accepted as something essential to the salvation of modern popular theology, while no one dared to arise and say that Dr. Schaff, the German transcendentalist, was not the biggest Indian in the tangle woods of American orthodoxy.

Of course it is not admitted that all the doctrines now seeking to shield themselves under the expanding wings of the "New Theology," and taught by its latter day advocates, are legitimate outgrowths of the Christo-centric principle. That were impossible indeed. How, for instance, could the fundamental principle as held and developed by Mercersburg be accepted by Dr. James Freeman Clarke, as seen by the great Unitarian divine from his Socinian standpoint? So, too, with the new doctrine of second probation as advocated by some of the "new" theologians. Whether true or false, it seems to us like chaff winnowed from some other sort of grain. The most noteworthy thing connected with the "New Theology" is that it is *not new* in the sense that some men date the birth of their own little bow-legged bantling; and the most remarkable thing in the recent chapters of its falsified history is an utter absence of all proper acknowledgment that its central principle is not a production of New England's inventive genius. The Andover *Review* should make a note of this, and, in the future, govern itself accordingly. Trickery may do for a while in the secular sciences, but honesty is an essential commodity in the science of divine things. The Christo-centric principle, when legitimately developed, involves and enforces a code of ethics in harmony with the requirements of the eighth commandment; and the "new" theologians would do well to study this part of the catechism that they may render honor to whom honor is due. Have they done it? We think not. Will a man rob God? Yes, and the very elect.

It has ever been thus; and history is even now repeating itself. The primary object of this paper is to sound the alarm. Let all friends of Substantialism place themselves on guard. There are men, both in this country and in Europe, now waiting for an opportunity to appropriate to themselves what belongs to another. They are convinced that our position is the real Gibraltar of science and the key to the true interpretation of nature, and yet they maintain a significant silence before the public. Why are they silent? Some of them have gone so far in the opposite direction as to make it impossible for them to turn without an entire recantation of their former false faith. Others are planning a stupendous job of grand larceny. This is nothing remarkable, as we have shown in the foregoing paragraphs of this paper. The larcenous work is to be labeled "new" science, or peradventure "progressive" philosophy. We now know that an effort has been made to rob the Mercersburg

school of its Christological theology. Look out, therefore, brethren: lest by a similar Yankee trick the "Problem of Human Life" should be burglarized for the purpose of robbing its immortal author of the glory which, under God, belongs to A. Wilford Hall. Some men will not advocate a newly discovered principle of science until its leaven has begun to work in the public meal, and not even then unless they can see a chance to steal the product of another's brains, and shine in the questionable luster of another man's work. What shall we say to these things? Shall we lose faith in the truth because it is in danger of falling among thieves? God forbid! How can we, who are dead to the false trend of materialistic reasoning, live any longer therein? Theft can neither diminish the value nor dim the luster of the gem, the honor of whose discovery is in danger of being filched away. Even in the hands of robbers, Substantialism would continue to illumine the world's dark night, and drive its sombrous shades away. But there is no probability that such a crime can be successfully perpetrated. Let the founder and early advocates of the new philosophy take courage to hope for something better than the triumph of such rascality. Although the world is still disposed to crucify its benefactors, it shall no longer succeed in its attempts to part their raiments, or to cast lots upon the vesture of their imperishable glory.

FREMONT, O.

PHRENOLOGY. "IS IT A SCIENCE?"

THE above question comes from a subscriber: and in reply we should say that the subject is too large to be disposed of by a paragraph.

As the name implies, Phrenology is a discourse on the mind, and claims to explain the faculties of the intellect, and all the feelings and dispositions, by studying the brain during life. Its doctrines, briefly stated, are:

1st. The brain is the organ or instrument of the mind, including the dispositions as well as the intellect.

2d. The mind is not a single power, but has many faculties, some of which may be stronger or weaker than others in the same person.

3d. Each faculty and propensity has its special organ in the brain.

4th. Size of brain, if the quality be good, is the true measure of natural power. The brain when deficient in size or low in quality, denotes a low degree of mental power.

5th. Organs related in functions are grouped together in the brain. The organs of Intellect are located in the forehead; those of Passion, Appetite and Self-preservation in the side head; those of Aspiration, Pride and Ambition in the crown; those of the Social nature in the back head; and those of Sentiment, Morality and Religion in the top head.

6th. As each function of the body has its specific organ, so each faculty of intellect, sentiment or propensity has its own organ. If this were not so, each person would exhibit the same amount of talent or power on all subjects, such as arithmetic, music, mechanism, memory, courage, pride, or love. Persons rarely show equal power on all topics. Indeed, one is a genius in one thing and weak in several others. In respect to the special senses the same is true; eyesight, hearing, taste and feeling are varied in the same person, these powers being each dependent on different organs.

7th. Quality, or temperament of organization, determines the degree of strength and activity of the mental and bodily powers. These temperaments, indicated by external signs, including build, texture and complexion, are easily comprehended; and similar differences in quality are everywhere recognized as applied to horses and cattle, as well as to timber and other things. The framework being predominant, with the complexion dark and hair strong, indicates the motive or enduring temperament. The organs that produce nutrition predominating, indicate the vital temperament; and the brain and nerves, serving the processes of mind and character, indicate, when predominant, the mental temperament; and these vary in power in different persons in wide degree. When the temperaments are equally developed we have the best health and greatest harmony in the functions of body, mind and character.

8th. The brain is not a mere soft mass like custard, but, though delicate, is made up of fibers which start at the medulla oblongata or capital of the spinal cord, and radiate to the surface of the brain, as the cauliflower grows from its stem and forms a mass resembling the brain. The length of these fibers shows the size of the brain, as length of spokes shows the size of the wagon wheel. It is not by bumps on the surface, but by distance of the surface from the medulla oblongata, that the size of the brain, and of its several organs, is ascertained. And this doctrine is as old as Phrenology; and Gall, its discoverer, and Spurzheim, his associate and fellow-laborer, were the first to dissect the brain in a systematic manner, carefully separating and showing its fibrous structure, and unfortunately their art of doing it died with *them*, half a century ago. Now, however, all anatomists teach that the brain is fibrous, which in 1820 was stoutly denied by nearly all besides phrenologists.

When this method is understood, of studying the size of the phrenological organs by distance from the brain center, and *not* by "bumps" (as the public for half a century has erroneously supposed was the case), the study of character becomes a comparatively easy problem. Many persons question phrenology because they cannot find bumps on the skull, and because some men who wear the same size of hats are not of equal intellect, forgetting that the brain may be largely *forward* of the ear in one and the intellect be strong; and in another, the brain be less in front and large in the *sides* and *back*, in which last two regions propensity and *not* intellect is located. Hence in a group of scholars the anterior brain will predominate. In a criminal and brutal classs the base of the brain will be broad and heavy, the forehead short and the top low. In schools, in society, everywhere these differences are easily seen, and offer hints on domestic and school culture, and especially on legislation and jurisprudence.

SUBSTANTIALISM IN THE REALM OF MIND.

BY C. W. SEWELL.

ON page 15th of THE SCIENTIFIC ARENA, No. 1, the editor springs the question whether the attributes of the substantial mind can be strictly regarded as entities. We would concede that a spiritual organism, such as mind, is more subject to *changes* of *state* than material organisms, and that many of what may be called the *qualities* or *attributes* of mind, are only different *states* of the mind.

But these changes of state are not automatic changes, in which the organic *tissues* of the mind change their own form or state by their own inherent power. The soul itself is but an organ receptive of higher powers more living than itself. And for this very reason this higher, living force is more substantial than the soul itself, just as the sou is more substantial than the body. If you can grant me these premises, I step at once to the conclusion that the Creator himself in his Infinite personality is more substantial than anything he has created, and that inert matter is less substantial than any other substance, because further removed from God, who is substance itself, and the source of all substance.

It is said that God is love. Many interpret this to mean that love is the chief attribute or quality of God, but is not a substance—not an entity. To admit this, though, would be to surrender the whole question to the materialist, who assumes that matter is the *most substantial* of all substances, at least, if not the *only substance*. Now all the thinking world knows that love is the most powerful of all the forces known to man; for we all know that love, in some one of its myriad forms and degrees, either genuine or perverted, rules all minds, and that mind rules matter, so far as it can acquire *organic union with it*, and often even by mere *mechanical relation to it*. Let us then try the assumption that love, in its highest and purest form and degree, is the most substantial of all substances, and that it is the very essence of God's being, and the entity of all entities. Never till we reach this basis will Substantialism be builded upon its true foundation.

For if love, the most potent of all potencies, the most forcible of all forces known to man, is not an entity, we may as well surrender the claim of spiritual entities, and grant that a mother's love, in all its omnipotent sweetness, is but a transient motion of material molecules, and that the burning hate of the worst felon in the dungeon, which makes his eyeballs glare with murderous vengeance, is but another mode of motion among the molecules of another brain: and that neither the love of the mother who pours out her soul upon the bloody corpse of her murdered son, nor the burning revenge of the murderer who slew him, has any real existence. "*Conscience then would be but an educated lie*," responsibility a myth, and law an empty and pompous imposition upon a king-ridden and priest-ridden race who have innocently evolved from a fish or an oyster. But if we assume love, as it exists in the bosom of Deity, as the very essence of his existence, and remember that as heat is the mother of light so love is the mother of wisdom, we then have a sufficient cause for all causes, and the origin of all entities.

Building upon this basic rock, we take all the substances in the spiritual realms as effects, whether these substances are organic or inorganic, God being the originating cause. We then assume these substances in the spiritual realms as being both the effects of a cause above them, and at the same time as causes of effects beneath them in the material world.

Now, the choice of terms is very important in science and philosophy. And we venture to suggest that to talk of the *qualities* or *attributes* of mind might not be to use the aptest terminology. Some things which are now called qualities or attributes of mind might be organic parts of the mind, and had better be called faculties or powers. Other things, such as joy or sorrow, might properly be called *states* of the mind as an organic whole. But to concede actual nonentity to any of the so-called qualities or attributes of the mind, would be, to my mind, a concession of doubtful expediency for the champion of Substantialism to make.

I make these modest suggestions in the hope that if there is any substantial importance inherent in the thoughts above given, they will be taken up, developed, improved and utilized by abler pens in this great work of the age.

IS LIFE WORTH LIVING?

BY HENRY A. MOTT, PH. D., L.L.D.

It is not the object of this paper to submit the problem, "Is Life Worth Living?" to the theologian for an answer—for we well know what answer we should expect, which would be to the effect that this life is only a preparatory one to fit us for the life to come, which will be everlasting—and on the principle that we often have to submit to annoyances and inconveniences in this life to attain a given object, so in securing the right to a future life we must naturally have to submit to temptations and undergo severe trials to test our adherence to the laws of God as laid down in the Decalogue. Accepting, therefore, this view of the subject, no argument remains if we wish to secure the life everlasting. The seeming injustice, as regards the unequal trials and suffering to which those who endeavor to lead an upright and Christian life are subjected to as compared with the wealth, health, and luxury enjoyed by those who pay no attention to religious matters, and who treat them with absolute indifference, is explained by saying that "God's ways are not our ways," and that if we knew the whole we would see that it were better so. There is no answering this argument, as we are but finite, parts of an infinite, and consequently cannot understand the ways of the Infinite; we have, therefore, to submit with Christian resignation, with the hope that, as there are numerous grades in this world, that from the standpoint of human judgment and justice there should, and will, be different grades in the next, entitling those who have led a conscientious and upright life in this world, and have endeavored to abide and be governed by the laws of God to the best of their finite ability, to a higher sphere in the next, and be brought into more intimate connection with the great ALL IN ALL in a much shorter time than will be exacted from those who have never endeavored to lead a life that even commands the respect of mankind.

It is evident, therefore, if for a seeming gratification we wish to discuss the apparent injustice and deprivations as judged by our finite ability, that the majority of the human race are subjected to, we must abandon the theologian and inexplicable articles of faith, and appeal to human justice based upon reason and common sense. We have therefore to leave the world of the unknown for the world of the known, as a man has to starve if he has not the money to buy a loaf of bread. Leave poetry and faith, then, and descend to the hard realities of every-day life which the multitude have to contend with.

In considering, then, the problem "Is Life Worth Living?" from this standpoint, we must first of all be agreed as to what constitutes "living." One thing is very clear to my mind—that the simple fact of self-*existence* does not convey to the mind even an apology for the broad meaning which should be given to the word "living." A man could probably exist on one meal a day, composed of bread, milk, and water; this, however, would not be "living." It is true that body and soul could be kept together by such nourishment, and probably, in many instances, for a much longer period than when every luxury is placed within the reach—but the question is not how long can we exist, but rather how long can we *live*, if the question reduces itself to the number of years we are to be on this earth.

I am quite familiar with the theoretical argument that a person who is contented, has wealth* and happiness. Whilst it is true in a sense that a person who is contented may be said to be "living," yet we must not be misled by the word contentment. If contentment means the pleasure afforded by the adoption of certain methods which are continually enhancing our knowledge and furthering the interest of humanity, then I agree with this view, for health, wealth, and education are involved. But if a person intends to be contented with his education, the amount of his worldly possessions, with the little good he can do, without striving to do more and to perfect himself by the acquiring of knowledge and riches, by means of which he can benefit the masses—such contentment is to be despised as unworthy of recognition, as its final effect can only be an impediment to all progress and the advancement of civilization.

"Living," therefore, constitutes more than contented existence, when we view contentment in this life. A person can be said to *live* who is blessed with health, wealth and education. Of these three factors it becomes difficult to judge which is the most important. HEALTH is the unanimous cry—but then it is a serious question, if we are possessed of wealth and education, whether on the one side education will not dictate the precautions necessary to secure and maintain health, while on the other side our wealth can put all such directions into practical effect. Without knowledge it must be quite certain that health could not be maintained, and on the other hand, without health knowledge, which could direct us how to maintain health, could not be acquired. Wealth, on the other hand, furnishes the means for procuring the necessaries to treat the sick and thereby secure health, which, on the other hand, with oceans of knowledge, and no wealth to follow its dictates, could not be improved or even maintained.

There can be but little, if any, doubt that a person born wealthy, so to speak, stands a better chance in maintaining health and acquiring knowledge than a person born into poverty.

I maintain that on the principle that for everything an equivalent should be given—it is impossible to secure and maintain health and acquire education without wealth.

It is no argument to say that, without health, no matter how much wealth we possess, we cannot enjoy it, for the simple reason that without wealth neither sustenance can be provided or life maintained. The old saying, Money is the root of all evil, is not true; it is the basis of health, education and happiness; it is the abuse of wealth which is at the root of all evil, as it is the abuse of the luxuries of this life that is the root of all sin and sickness. Moderation in all things, as education would dictate, is what will secure to us the enjoyment of every pleasure in this life. Prohibition in one sense takes away from man his liberty, his individuality, except in such abnormal cases over which the mind has no control, and then it comes into use only as a remedy directed by our education, which in turn was acquired by our wealth.

Turn this problem how you will, its final solution must proclaim wealth to be the most important factor in this life.

We often hear a rich man say: "How willingly I would give up my wealth for health," always forgetting that if it were not for his wealth he would not be as well as he is, and without wealth he could not live at all, even if he was given health, as every means of procuring sustenance for the maintenance of health would be taken away.

The answer to this would naturally be, with health one can start at once to work to secure wealth and thus provide the necessaries of life.

Place the man on a barren island, from which there is no chance of escape, without food or clothing, but possessed of robust health, it is true that his chances of living are as good as those of the wealthiest man on earth would be if placed along with him, and he would undoubtedly live (so to speak) for a much longer time than he would if placed there in a sick or weak condition. This, however, would be simply a question of existence for a longer or shorter time, and is foreign to the real question at issue.

To find out the exact importance of each factor—*i. e.*, health, wealth and education in the problem of living—it becomes necessary to dissociate from each factor the other factors, and then determine the importance of each separately and alone.

Surely a man in robust health placed in a large city, or even in the smallest village, without a cent, is infinitely more wealthy than the same man would be if placed on a barren island, where all chances of profitable work and of obtaining food is impossible.

The rich man does not mean, therefore, that he would give up all his wealth for health, but means, if he can have his health, and still be placed in a position where by his exertions he can again acquire wealth, he would give up his possessions.

Such a man, from the fact of the position or environments he wishes to surround him after parting with his possessions for health, is still wealthy.

It must be understood that wealth does not consist alone in money and convertible securities, but in desirable positions, which surround one with a pure atmosphere, with food which can be acquired by the asking, or by work, and the presence of sympathizing friends.

Before man was created, the atmosphere was made for him to breathe, the waters for him to drink, vegetables, fruits, and animals for him to eat. Man was placed in this world surrounded by wealth on all sides, and it has only been in the struggle for existence that some men have acquired possession of more wealth than others. It is but just, in the struggle for existence, that those best fitted to contend with existing conditions should succeed and surpass others. The only question arising is, What should qualify a man to succeed? There can be but one answer—*i. e.*, education. Education is not a gift; it must be acquired by diligent study and research. Surely, then, the man who has acquired knowledge by his own endeavors, whether born into poverty at the start, in comparison to a man born into wealth, should be entitled to every pleasure and luxury that this life can afford.

It is the educated man who is entitled to a "living," and from a finite conception, it is a gross injustice that he should be made to suffer and struggle through this life for a bare existence, when others, without education, like parvenus, are blessed with every comfort and luxury that money can acquire.

I claim it should make no difference, whether a man happens to be born of people in high or low spheres of society, if he afterward acquires knowledge so that he can be singled out as an educated man—such a man is entitled to shake the hand of the greatest and wealthiest personage on earth, and be classed superior to him if he is better educated.

Education alone is what should entitle a man to respect and consideration.

It is no argument to say that a man of low birth lacks refinement, for such will not be the case in an educated man; otherwise he would lack the education of refinement. Refinement and knowledge are acquired by one's environments and ambition, and when acquired the conditions of birth are unworthy of consideration.

Judge every man as you find him; not what he was, but what he is, and on this impartial judgment should be meted out accordingly every comfort and luxury that this life can afford, for his education entitles him to it.

Such, then, is the decision that common judgment and justice would dictate; but,

* The sense in which the word wealth is used in this article is ready money or convertible securities or their equivalents.

after all, such justice will never be enforced in this world. We may appreciate the injustice, we may proclaim from the house top the rights we are entitled to, but they will be wafted by the wind and disappear unnoticed, unheeded.

The question, then, "Is Life worth Living?" not taking into consideration a future life, is answered every day to the contrary by those who have their fondest hopes based upon purely worldly pleasures and worldly good. The problem is only answered in the affirmative by those who live in this life for the hope of a life to come. There is only one thing to be done—recognize the fact that we are but finite, parts of an incomprehensible yet all-pervading Infinite, whose ways are beyond our understanding, whose goodness and justice will make itself known at the proper time—when all on this earth will be reduced to the same footing—the same level—and judged according to the use they have put the "talents" to which the Great Intelligence has from time to time imparted to them.

It will be a strictly business proposition. You have been given so many "talents;" how much interest can you give in return? If you have been just or unjust in the treatment of those who were entitled to consideration and kindness, which means "loving your neighbor as yourself," your interest account will be low or high in proportion, and you will be judged and classified accordingly.

The fact, therefore, that this life is but temporary, and that the life to come is everlasting, and that we will finally receive our deserts (which naturally is all we are entitled to) at the hands of the all-wise Ruler of the universe—we must be honest in answering the problem under consideration, and unanimously proclaim in the affirmative, Life is worth living.

THE "PLAIN DEALER" ON SUBSTANTIALISM.

A SYMPOSIUM OF PROFESSORS.

ABOUT the first of last May we received a letter from Prof. Elroy M. Avery, Ph. D., editor of the scientific department of the Cleveland *Plain Dealer*, and author of a popular text-book on physics, requesting us to send him a brief statement of the Substantial theory of sound, for publication in his paper, intimating that there might be opportunity for further discussion of the matters involved in the future.

We at once wrote out and sent the statement as requested, without an intimation from the Professor concerning the use to be made of it, and then awaited developments. In a couple of weeks we received the *Plain Dealer* of May 16th, explaining the reason for asking the statement from us, and which contained four closely printed columns of what the professor calls a Symposium of Professors on the wave-theory of sound, in which he presents, first, his own introductory statement of what led to the symposium; second, our brief statement of the Substantial Philosophy, in answer to his request; and third, the opinions of some eighteen professors of different colleges with whom he had communicated, as to the merits, or rather demerits, of our attack upon the wave-theory of sound, as well as their views concerning the truth of that theory.

To copy that whole symposium discussion would take too much of our limited space. We shall therefore at present only copy *verbatim* the Professor's introduction, with our own statement, leaving the various opinions of the Professors cited, as well as all arguments on the sound question, for a future number, if occasion shall require their publication at all. The following is the extract from the *Plain Dealer:*

About eight or nine years ago there was published in New York a book entitled "The Problem of Human Life, Here and Hereafter." Its author was known as "Wilford," a *nom de plume* for A. Wilford Hall, Ph. D., LL.D. The avowed object of the book was to throw "some new light, from a philosophical and scientific standpoint, upon the problem of men's conscious and substantial existence beyond the present life." More than half of the more than five hundred pages is given to a discussion of the "Nature of Sound." The author has a "predominant thought that all things in nature which exist or can form the basis of a concept are really substantial entities whether they are the so-called principles or forces of nature or the atoms of corporeal bodies, even extending to the life and mental powers of every sentient organism, from the highest to the lowest. And since science had determined that no substance in the universe can be annihilated, there must, therefore, be deduced a scientific basis for the immortality of the soul if the life and mind should be conclusively shown to be substantial entities."

It is true that science teaches the indestructibility of matter, and no one can question the truth of the last sentence above quoted if by the word "substance" the author means "matter." But further study shows that it is rather difficult to learn just what he does mean by the words "substance" and "substantial." Possibly they are among the things "that no fellow can ever find out." We are inclined to exonerate "A. Wilford Hall, Ph. D., LL. D., founder of the Substantial Philosophy," from any suspicion of being so gross a materialist as such an exegesis of his words would imply. This exoneration may be not without value as the reader advances.

The author is willing to "venture the assertion that the reader will find, ere he finishes this volume, numerous scientific proofs which may be fairly classed as demonstrative, showing that the life and mental powers are as really substantial entities, though intangible to the physical senses, as are the blood, bone and muscle constituting our corporeal organisms," and confesses an ambition to make his work "so harmonious and consistent with the current modes of thought as to command the attention and respect of advanced thinkers and investigators in whatever department of scientific research." The measure of success achieved by the author in the direction of commanding the "attention and respect of advanced thinkers and investigators" will possibly appear in the latter part of this article.

Further on Mr. Hall says: "If the wave-theory of sound is really a fallacy in science, then nothing remains to be accepted but the hypothesis that sound consists of corpuscular emissions, and is therefore a substantial entity as much so as is air or odor; and if sound is thus absolutely proved to be a substance, there cannot be the shadow of a scientific objection raised against the substantial or entitative nature of life and the mental powers.

Here again we see that the author is gunning for bigger game than the fleeting phenomena connected with any animal sensory apparatus. He would not call out, "Friends, Romans, countrymen, lend me your ears!" he would want the whole animal and mental and spiritual possessions of the crowd, to hold and to keep, "here and hereafter." This is an ambition worthy of a Napoleonic philosopher, truly. Mr. Hall is the founder and editor of a monthly magazine called THE MICROCOSM, of which Dr. Henry A Mott is managing editor. In the issue for last February there is an article by Mr. Hall, entitled, "The Meaning of the Sound Discussion." In this article we find the following:

"We saw that unless the physical forces, such as light, heat, electricity magnetism, and gravity, could be shown to be substantial entities by utterly wiping out sound as a mere undulatory motion of the air, and as the mother of all the other so-called modes of motion, it was worse than futile to attempt to oppose atheistic materialism which defiantly denies the entitative existence of the soul, life, mind, or spirit, and does it too most logically upon the universally admitted science of the schools that all the other natural forces from which result the various observed phenomena around us are but modes of molecular vibration. Let this basic principle of philosophy be intelligently accepted and courageously employed, and a child could drive Haeckel and his entire cohort of materialistic disciples from the field by planting itself invincibly upon the impregnable rock of truth as here set forth, namely, that the soul, life, mind, and spirit are as really substantial entities or objective existences, as is the corporeal organisms they inhabit. [There is inviting game in that last sentence, but we forbear.—Ed.]. Yet after such overwhelming evidences as here given of the value of this new departure in crushing out the very bacterial germs of materialism, it is marvelous to reflect that even ministers of the gospel, standing speechless and paralyzed in the presence of this otherwise unanswerable argument of the materialistic philosophy, still persists in rejecting, or at least, paying no heed to the Substantial Philosophy, which so conclusively furnishes the only means of escape. And we venture to reassert that if the current doctrine of acoustics be true, then the Substantial Philosophy is totally without foundation either in reason or the laws of physical science." Thus does the philosopher burn the bridges behind him.

The publishers claim that "over 54,000 copies of the 'Problem of Human Life' have been sold in less than five years." The attack on the wave-theory of sound and light is so impetuous and protracted and accompanied by such an assurance of victory achieved that many persons, reasoning from the smoke to a fire, became uneasy. Their newly-born doubts were not lessened by the non-appearance of refutations from the adherents of the old established undulatory theory. In fact, Hall and Mott valiantly declared that they were invincible, and that the reason that Goliah did not show his front lay in his wholesome fear of them—the little Davids of the Substantial Philosophy. They more than intimate that Tyndall, Helmholtz and Mayer, having had copies of the book for several years, and "realizing the unpleasant predicament of accepting the new hypothesis, and thereby admitting their own exhaustive treatises on the subject" to be without foundation, "have adopted the policy of silence, hoping that by ignoring the whole matter as if it had no existence, the author's obscurity would allow the work to fall still-born, and in this manner prevent a sensation in the scientific world such as a total destruction of a universally accepted theory must necessarily produce."

The editor of this department was in receipt of frequent inquiries on the subject. For such reasons the following circular-letter was sent to the professor of physics at each of the leading colleges of the country:

THE PLAIN DEALER.

CLEVELAND, O., April 20, 1886.

DEAR SIR,—I am in frequent receipt of letters, chiefly from the Southern and Western States, inquiring about the validity of the "Wave-Theory of Sound." For example, one high-school teacher in Indiana writes:

"Is there any good ground for doubting the wave-theory? What is that ground? Is it likely to be displaced by another theory? Are there any scientists who teach another theory? I cannot well accept the wave-theory without some doubts."

[*Continued on page 45.*]

THE SCIENTIFIC ARENA.

A. WILFORD HALL, Ph., D., LL. D., Editor.

PASTOR HENRY B. HUDSON, ASSOCIATE EDITOR.
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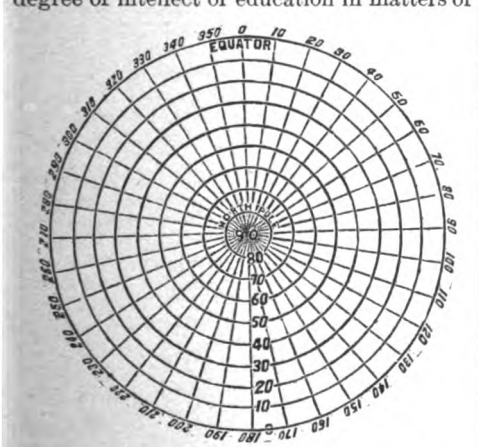
IS THE EARTH A GLOBE?—NO. 1.

BY THE EDITOR.

THIS will be looked upon as a strange, not to say ridiculous question, to ask at this age of the world, much more so to discuss in a serious manner in a scientific journal; for if there is one single problem of science or physical philosophy about which educated men have no patience to argue or even to converse, it is the absurd and even childish supposition that this earth is *flat*. The impression produced on a mind having the slightest acquaintance with the unavoidable facts of astronomy, whenever this subject is introduced, is one of downright commiseration mingled with contempt for the serious advocate of the flat theory of the earth; so much so that one feels more like looking on in silent disgust while the superficial dupe of his own shallowness proceeds to ventilate his limited conceptions of things rather than condescend to their refutation. Indeed, a person possessing any true idea of the fitness of things, not to say self-evident facts of nature all around, above and beneath us, can only view one of these flat philosophers, should he chance to possess any degree of intellect or education in matters of



THE FLAT THEORY OF THE EARTH.

general literature, as a scientific excrescence on society of no practical use to the world, and whose epitaph should be written at the close: "Lived in Vain!"

That some excuse for maintaining the flat theory of the earth, and the supposed impossibility of its being a globe, should have existed in earlier times, when the grasp of the greatest intellects was confined to the mere surface or appearance of things, may well be conceded; but at this advanced age, when appearances have had to give way in tens of thousands of instances to the inexorable logic of facts and necessities, for an otherwise intelligent and educated man still to adhere to such misleading appearances in defiance of the myriad facts of the universe which are only explicable on the principles unfolded in the Copernican system of astronomy, is to exhibit a mulish incapacity for advancing intelligence which, by following out similar appearances, would strongly warrant Darwin's theory of his lineal descent from some long-eared ancestor on that same line.

But try to ignore this fact of scientific stupidity as we may, it nevertheless stares us in the face, that at this very time there are probably thousands of otherwise intelligent men, in this country and Europe, who believe and teach that the earth is *flat* and round like a silver dollar, lying fixed in space, with its north pole in the center, as shown in our diagram, while the sun, moon and stars, all trivial bodies in comparison, revolve daily around this immovable earth, and only at a distance of a few hundred miles at farthest, so as to keep clear from touching it!

Not only do these deluded men hold and teach privately these puerile ideas, but they collect and spend large sums of money in issuing books, pamphlets, and papers, urging the same views upon others, and with a system of reasoning and argumentation so plausible and defiant as to confuse and often to confound those who have no doubt of the truth of the Copernican system of the universe, just because they have no definite facts and arguments at their fingers' end with which to crush out such scientific nonsense. Indeed, some of these books now in circulation are so puzzling, even to careful thinkers in matters of science, that their readers have often called our attention to the *Zetetic* system of astronomy, as it is termed by its advocates, and have urged us time and again to expose it in such concise and fitting terms as to place on record a definite and easily grasped antidote for this rapidly spreading fallacy of science.

At first we looked upon the whole matter as too trivial a question to discuss in a serious manner, and as only worthy to be laughed out of countenance. But these flat philosophers proved to be made of somewhat different stuff from Davy Crockett's coons and would not come down out of their zetetic tree with any amount of grinning. The more the followers of Copernicus laughed, the more industriously and audaciously would they circulate their books and the bitterer would become their denunciations of the ignorance and prejudice of college professors in not condescending, or rather in not daring, to meet their invincible arguments, as they claimed them to be.

One zetetic philosopher, a Mr. William Carpenter, of Baltimore, Md., has issued several editions of a pamphlet giving, as he entitles it, "One hundred proofs that the earth is not a globe;" and so plausibly do these proofs appear to some minds to explain and account for the globular arguments relied on by astronomers, that the author's proffer of a considerable sum of money as a compensation will not induce any of the leading professors of astronomy to undertake their refutation.

It was not until we had become convinced, by extended inquiry, of the rapidly spreading influence of this teaching, both here and in Great Britain, that we saw the necessity of taking some immediate and definite action to counteract a doctrine so utterly false on its face and so monstrously absurd in its general bearing, while at the same time so plausible as to deceive thousands of educated people. We waited for Prof. Proctor (to whom Mr. Carpenter's pamphlet of "one hundred proofs" was dedicated) to make a decisive reply to the entire fallacious system of reasoning, but he only wrote the author a letter thanking him for the courtesy of the dedication.

Finally, when two highly educated ministers of the city of Brooklyn, one a leading Episcopal clergyman, came to us and confessed themselves unable to answer the arguments of the flat philosophy, or to demonstrate the earth to be a globe in the face of its reasoning, we determined to commence a series of papers in THE SCIENTIFIC ARENA which would so fully settle the matter in controversy for all time to come that no student of science, with the merest smattering of astronomical knowledge, would need to be troubled hereafter for arguments and facts with which to ovewhelm the doctrine. The present paper, therefore, is only introductory to that series, and not intended as a presentation of the direct proofs in favor of the globular form of the earth, but is meant to be merely explanatory of the opposite or flat hypothesis, in order that the reader may the more duly appreciate our arguments when presented.

The zetetic theory of astronomy is but a revival with some modifications of the Ptolemaic system, which reigned supreme for more than a thousand years, when it was finally and systematically overturned by Copernicus, who showed from innumerable reasons and facts that the appearances among the heavenly bodies could only be explained and harmonized by assuming the sun to be the center of the solar system, and that the earth is a revolving globe in space, not only rotating on its axis, but circling in an annual orbit around the sun in company with other planets of greater or less magnitude, all pursuing orbits of different diameters around the same great solar center. So telling and conclusive were the arguments and deductions of Copernicus, that with all the prejudice and influence of the Church, firmly bound to the literal interpretation of the Scriptures in a few passages which represent the earth as fixed and the sun and moon as moving bodies, it was but a little more than 100 years from the death of its founder when the Copernican system of astronomy had completely triumphed over that of Ptolemy. This result being finally conceded, the Church was forced in great humiliation to surrender her prejudices to the inexorable laws and facts of science, and to seek for some other and more rational rules of interpretation and such as would not make the Bible a laughing stock to mankind by contradicting facts.

Yet with all this demonstrated necessity for a change in the laws of biblical interpretation, the same old exploded plea that "the sun do move" has been resuscitated by a modern writer by the name of Rowbotham, who signed himself "Parallax," and which plea has been taken up and pushed into wide acceptance by numerous other writers and lecturers, including the eloquent colored minister, Rev. John Jasper, of Richmond, Va.

One of the most enthusiastic and persistent, as well as able defenders of the views of "Parallax," is Mr. John Hampden, of Balham, England, who is devoting his life and fortune, as well as all he can obtain from others, to the spread of this flat philosophy, apparently in the belief that by overturning the Copernican or globular theory of the earth, he will be vindicating the truth of the Scriptures, and thus prove that the sun and moon were really or *positively* moving through the heavens when commanded by Joshua to stand still, instead of moving

relatively by the actual or *positive* rotation of the earth. Mr. Hampden has issued, during the last twenty-five or thirty years, hundreds of thousands of pamphlets, at his own expense, in favor of the zetetic philosophy, and has circulated them gratuitously wherever he could find persons willing to read them. His arguments and challenges, as well as those of his coadjutors, have been defiant even to bitterness against teachers of the present system of astronomy, often being based upon propositions and assumptions so flagrantly erroneous that it would seem no one could be bigoted or ignorant enough not to detect their absurdity. Yet these denunciatory challenges have continued to ring out all the same, apparently on the supposition that what is lacking in sense must be made up in sound.

Had "Parallax," or Hampden, or Carpenter, discovered anything new by which to strengthen the position of the Ptolemaic system of astronomy as overturned by Copernicus, there might be some show of reason in this persistent crusade against Newton, Kepler and Galileo, and this bitter challenging right and left. But they confess it to be but a revival of the same old philosophy, with slight modifications, which, as they claim, go to answer and set aside the Copernican arguments for the earth's globular form. Yet this very system, substantially as now resuscitated, was forced to succumb, after more than a thousand years of trial, to a class of facts and deductions, the simplest, clearest, and most self-evident known to science, and after the most hotly-contested scientific controversy the world has ever witnessed.

One would suppose that men of any degree of intelligence and caution in scientific matters would have studied long and weighed well the chances of success before trying to revive a long exploded theory, unless they had made radical discoveries of new evidence which would put an entirely new face upon the abandoned cause. But these modern advocates of the flat theory claim nothing of the kind, and still, without the assistance of any of that mathematical ability of the old disciples of the Ptolemaic system, by which even partial calculations of eclipses could be made in advance, they shout eureka with a want of modesty which would have paralyzed the assurance of the most inveterate persecutor of Galileo.

Mr. Hampden complains bitterly that the scientists of England treat him and his zetetic theory with contempt, paying no attention to his thousands of books, pamphlets and circulars sent out. They are called cowards and other bad names without stint, because they will not allow him to ventilate his views in their different scientific periodicals. The man is evidently sincere in his badgering challenges for the great astronomers to prove the globular form of the earth, though it is a question if any amount of proof, or even the most unanswerable demonstrations, would tend to convince him of his error when he can thus ignore the most self-evident proofs, many of them right before his eyes, that the earth is a globe—facts which he does not even pretend to deny or to explain away.

So firmly does Mr. Hampden believe that the earth, with its vast bodies of water, is a perfectly flat plain, and that the surface of the ocean is not convex or curved in the slightest degree, corresponding to the supposed globular form of the earth, that in 1870 he actually wagered $2500 with a Mr. Wallace that he could not prove the convexity of the surface of still water by experimental test. Mr. Wallace selected six miles of a canal in England, made his experiment and won the money. Yet Mr. Hampden even to this day insists that the money was fraudulently awarded to Mr. Wallace, and so does Mr. Carpenter, of Baltimore, the protesting referee. They both assert that the disappearance of vessels in the distance, by their hulls apparently sinking out of sight, is an optical illusion, and that there is no curvature whatever of the ocean's surface corresponding to a segment of a globe's surface rising between us and the departing vessel! What stubborn stupidity!

Still, notwithstanding all these things, we are sorry for Mr. Hampden, and can sincerely sympathize with him not only in the loss of his money, but in the rebuffs he receives from the scientists he tries so hard to enlighten on the merits of his flat notions of the earth. We have had a somewhat similar experience ourself as the result of our attack upon the wave-theory of sound, many scientists having assumed an attitude of contempt for it without stopping to examine into the nature and meaning of such a new departure in physical science. But, unlike the crusade of Mr. Hampden, we think we have just grounds for complaint at this silent indifference on the part of eminent scientific investigators, since our facts, positions, and arguments, whether correct or not, including the theory of Substantialism growing out of them, were entirely new to the world when first announced some seven or eight years ago. They were not an exploded doctrine of centuries gone by that had passed the ordeal of the most scrutinizing investigation and then been abandoned; nor had they been a represented theory with the same stereotyped arguments slightly modified. Had we no better claims than this zetetic theory to a hearing, we should never think of blaming a scientist who had anything else in the world to occupy his time, for not giving the slightest heed to any such rehash of a long exploded theory.

On the contrary, our position on the sound-theory was as new as it was startling, placing us on a somewhat similar footing with that of Copernicus in attacking a theory centuries old by one entirely new, rather than in trying to resurrect an old one that had been for centuries exploded and dead. The very fact that the entire basis of the substantial theory of sound, as opposed to the wave-theory, was new to the world, justly entitled those arguments to respectful consideration by all investigators of science who did not egotistically suppose that they had reached the *ultima thule* of human knowledge and achievement. And although we have been unjustly ignored by some, we are thankful to record the fact that our new departures in science have not by any means met the treatment justly accorded to the zetetic philosophy on the part of able scientists, many of whom have gladly received the new doctrine of sound and have forever repudiated the old one.

As in the case of the Ptolemaic system, which Copernicus overthrew, so the wave-theory of sound was based solely on the appearances in science which superficially had led early physicists to the notion that sound really consisted of air-waves, just as the surface reasoners in the times of Ptolemy supposed the earth to be flat and that the sun really revolved around it. Hence, it was our purpose, as was that of Copernicus, to prove that appearances many times falsify the facts of science: and as our facts and arguments were new to the world—even newer than were those of Copernicus—we claim the just and indefeasible right to denounce the bigotry of any college or university which refuses them a fair hearing and an impartial investigation.

Still, old, threadbare, worn out and repeatedly exploded as are and have been the facts and positions of the zetetic theory, we are sorry for Mr. Hampden all the same, and purpose now to come to his assistance, meet his difficulties for him, prove the earth to be a globe so that he never will dare to deny it again, and thus settle him in the true faith of Copernicanism, a thing which the English scientists ought to have done long ago.

We conclude this introduction by referring to our cut at the head of this article, which presents the view of the earth as a flat circular surface or disk, with the north pole in the center, the expanse, in the meantime, extending in all directions south to the equator, as shown by the thirty-six meridan lines. Zetetic philosophers, while admitting the existence of this equator, the meridian lines as shown, and the parallel lines of north latitude, numbered from the equator to the pole, or from 0 to 90, also claim that this flat and circular earth extends away on beyond the equator south to an unknown distance, not rounding off as a globe with a southern pole, as astronomers teach, but continuing right on with the same flat or uncurved surface till it terminates in perpetual ice, beyond which no man can ever go. Mr. Carpenter in his "One hundred proofs that the earth is not a globe," says:

"That the earth is an extended plain stretched out in all directions away from the central north, over which hangs, forever, the north star, is a fact which all the falsehoods that can be brought to bear upon it with their dead weight will never overthrow." Page 5.

This is the great central zetetic assumption on which the whole theory is based. This assumption we faithfully represent in our diagram as far as to the equator, where the earth is 24,000 miles in diameter, but, as before stated, the flat theorists continue it on indefinitely beyond the equator, in the same ever-expanding circles of the flat disk of sea, dry land, and ice. Hence, it follows that the equator does not begin to represent the greatest diameter of the earth (diameter with them meaning only the distance across any one of these parallel circles which surround the North Pole), but that this diameter of the earth increases in size just in proportion as you continue on south beyond this equatorial line; that is to say, if you should go as far south of the equator as the equator is from the North Pole, or from the center of this great flat surface, its diameter as well as its circumference would be just twice that at the equator, and so on to the supposed jumping-off place or ice-barrier.

To go east or west on the earth's surface, these philosophers tell us, is simply to follow one of the parallels of latitude in a perfect circle around the North Pole, keeping the polar star (which hangs directly over this center a short distance from the earth) on the left in going east, and on the right in going west, but keeping it all the time at the same angle of elevation if we wish to continue our course due east or west. In this way only, they tell us, the earth can be circumnavigated. Should we go south on any meridian line the north star will appear to sink toward the horizon, not as the effect of rounding the curve of a globe, as we advance, but alone as the perspective of vision-lines will naturally decrease in angle on a plane or flat surface. The same optical effect is reversed as we go north.

We have thus explained our diagram of the flat theory of the earth just as that theory is taught, and which is finding numerous adherents in this country and Great Britain, not, as we should hope, to any alarming extent among the more intelligent classes of people, yet, as we happen to know, many such advocates of the doctrine are to be found. Next month we shall commence our exposure of the absurd impossibilities of this theory, and instead of giving only "one hundred proofs" that the earth is *not* flat, we will present and elaborate a single argument which will embrace *more than ten million positive proofs that the earth is a globe, each proof being constituted of an absolutely authenticated and recorded fact, and each fact as incontrovertibly self-evident as that two and two make four!* We call

upon flat philosophers everywhere, as well as upon all who have been puzzled by their reasoning, to watch us closely and see if we do not fulfill this pledge to the letter, since we are well aware of what is signified by the enormous number of "*ten millions.*"

HOW SUBSTANTIALISM SOLVES THE PROBLEMS OF SCIENCE.

BY THE EDITOR.

[*Concluded from last month.*]

TAKE another illustration, which a beginner in physical science will comprehend, but which no physicist has ever attempted to explain, simply because it is inexplicable according to any present scientific theory. We refer to the well-known fact that a certain proportionate alloy of *lead, tin,* and *bismuth* will fuse at 201 deg. F., while *lead's* fusing point is 619 deg., *tin's* fusing point is 442 deg., and that of *bismuth* is 510 deg. Why is it that these metals when mixed will melt at less than half the heat required by the lowest, and less than one-third the heat required by the highest, of the three metals constituting the alloy? Surely here is a problem worth attacking by science. But difficult as it seems, all mystery disappears when we give proper consideration to the nature and correlation of the forces as substantial entities.

The melting of any substance by heat consists simply in the yielding of the cohesive force which holds the body in a solid condition, sufficiently to liquify it. The intensity of heat required to melt any given body, and thus overcome its cohesion as a solid, depends entirely upon the correlation existing between these two substantial forces, as regards the cohesive arrangement of the particles of the particular substance to be fused. Plainly the same metallic substances must exist in the alloy which existed in the three separate metals before mixing, the only difference, so far as the action of heat-force is concerned, being a new and different cohesive arrangement of the particles in the alloy, by which heat can the more easily master and thus neutralize cohesion. If there is nothing in these forces by which substantial co-operation or conflict can occur, then the melting point of the alloy should be the *mean* of the three separately; that is to say, about 523° F., just as the *weight* of the alloy would be the mean aggregate of the three weights before melting. This is as it should be, and according to observation, for the reason that no change takes place in cohesive force in its relation to gravity in this act of forming an alloy, while there does a change take place in cohesion in its susceptibility to be overpowered by heat; for, instead of the fusing point in the alloy occurring at the average mean temperature of 523°, it is actually reduced to 201°.

The truth is, this mingling of the three separate arrangements by cohesive force, in the three separate metals when alloyed, simply weakens its hold on their combined particles and, on account of the peculiar contest it experiences with heat in the alloying process, now makes it an easier prey to its chief enemy in nature—heat. If these forces were not as really substantial as the metals upon whose particles they act, we see no possible ground for an intelligible solution of the mystery they present. As real substantial friends or enemies in the economy of nature, these forces may oppose or assist each other, as circumstances require, and thus exhibit all the wonderful phenomena observed, but not otherwise.

The contraction or expansion of bodies under the action of certain forms of force, is another mystery only explicable by this hypothesis of the rearrangement of the material particles under the controlling force of cohesion. As is well known, some metals will contract by heat, while most all known bodies will expand under precisely the same circumstances, as we have formerly taken occasion to show. Water will continue on contracting in bulk as its heat radiates till it comes to the freezing point, when, in the formation of a solid, cohesion steps in with renewed energy, asserts its power over what heat remains, rearranges the particles of the water, by which they are made to occupy much more room than before, in defiance of the expanding tendency of the heat, and it exerts this power in the new effort at rearrangement with such force as often to burst granite rocks asunder which even giant powder could not break. Nothing could give stronger proof of the active energy of cohesive force than this rearrangement of the particles of water into ice and its mechanical effects.

To prove that cohesive force is the chief agent in nature by which such rearrangement of particles takes place even in the soldiest of bodies, we have only to refer to the remarkable fact that a solid piece of the metal *palladium*, without any change in temperature at all (except as the effect instead of the cause of such rearrangement), will actually *expand to nearly one twentieth its additional bulk, or sixteen times more than if heated from the freezing point up to that of boiling water, alone by the absorption of hydrogen gas and its strange process of solidifying among the particles of this metal!*

It is a demonstrated fact that a solid piece of palladium will receive among its particles, transformed into a solid condition, *more than nine hundred times its own volume of hydrogen gas*, and will expand to receive it, by the wonderful rearrangement of its material particles under cohesive force, and by which combination, as just stated, the solid metal has to be increased in bulk about one-twentieth. That a solid metallic body, under the mere action of a slight current of electricity, could admit among its particles another material body of nine hundred times its volume, and thus be compelled to crowd its solid substance apart one-twentieth in order to make room for such outside substance, and that, too, without the application of any mechanical force whatever, is one of the most marvelous and suggestive exhibitions of the working of cohesive force ever witnessed, and should teach modern scientists, who deny the substantial nature of force, a lesson in physics they could hardly forget.

And another thing equally surprising in this transformation is the fact that cohesion, in its peculiar relation to the particles of palladium, aided by electricity from the *negative* pole of the battery, has the mysterious power of rearranging the material particles of hydrogen gas so as to contract this substance to about *one eighteen-thousandth* of its normal volume, thus reducing the lightest and most attenuated known gas to a solid of the compactness of a metal itself. All this, too, is done by cohesion, without the aid of mechanical pressure, and even in opposition to the expanding presence of heat, simply abetted by this mild negative current of electricty.

Then, again, by co-operating with the *positive* current from the same battery, this governing force of the material universe has the power not only of rearranging the solid mass of metal to its original bulk (reducing it one-twentieth), but of releasing the solid hydrogen gas and letting it escape into the open air, restored to its normal volume and density, and which, by suitable protection, will combine with oxygen, and under this new transformation will change to water and fall upon the experimenters in a shower of rain!

And here, incidentally, by way of "hedging" on our hitherto decided conviction that the "Keely Motor" must be a vagary and mechanical deception, we remark, why may it not be possible for a new discovery to have been made by Mr. Keely, in the wonderful correlations of the natural forces, by which his so-called "etheric force" can actually accomplish the mechanical marvels he claims? This force, according to all accounts, seems, it is true, out of all the proportions of cause and effect, judging by everything we know in mechanics; but is not the same, or even greater, disproportion manifest in the facts just examined into, by which hydrogen gas is absolutely condensed to a solid without one pound of mechanical force, and for the accomplishment of which hundreds of tons of pressure would not suffice if applied to the gas in any way at present known to mechanics?

We sincerely desire Mr. Keely's claimed discovery to turn out true, as set forth by those who have seen his experiments. At all events, with such wonders of the natural forces in correlation and co-operation, as exhibited in the action of electricity and cohesion in the combination of palladium and hydrogen gas, doing the work of a steam engine by a current of electricity that would not hurt a chicken, we should be very careful how we repudiate in advance any claimed discovery in science, however marvelous it may seem. When the rationale of Mr. Keely's achievement shall have become public, if ever, we will take the privilege of analyzing it in the light of the Substantial Philosophy.

In this connection, and in conclusion, we will name one other mystery in science which we have never seen referred to in any text-book, though it involves one of the profoundest physical problems ever observed. It consists of the fact that a mass of cold iron, condensed to the most contracted and imporous condition by hammering, when thrown into a crucible of melted iron will float upon its surface like a cork on the surface of water! Why is this, since the liquid iron is of necessity greatly expanded by heat, and necessarily much lighter, bulk for bulk, than the cold and condensed mass of the same material? No answer is possible to this startling enigma, save that based upon the interaction of the substantial forces of nature, and their modifying effects upon each other under differing conditions and circumstances.

But the reader asks, How is this latter problem to be solved, even according to the laws of Substantialism, since the solid and cold iron bar manifestly appears to become lighter when it rests on the molten mass? This is not only an appearance, but an actual fact, and to explain it we have only to revert to our solution of the piece of silver or copper, which, as we have already shown, becomes actually lighter by the neutralized condition of gravity in consequence of the presence of other forces in certain relations. The silver, as the reader will remember, could not fall suddenly, because the relation of its own gravity and cohesive force was such, in the presence of dense magnetism, as partly to make its metallic substance impervious to the downward pull of the substantial gravity of the earth. In like manner we assume that the presence of heat, constituted of so much suspended cohesive force in this molten mass, acts on the cold iron somewhat as the dense atmosphere of magnetism acts on the bit of silver to shield it partly from the downward pull of gravity. Hence, let such a block of cold iron be accurately weighed in its relation to the molten mass, and we guarantee it will be found to have lost part of its gravity by the neutralizing effect of the other forces present, just as certainly as the piece of silver must have weighed less while immersed in the magnetic field, as described by Sir William Thomson. How clear and rational are all these solutions, viewing the forces of nature as correlated substances instead of nonentitative modes of motion.

Let us bear in mind constantly that with-

out the substantial but immaterial force of cohesion no material body could have existed as matter. Take away this force entirely, or even convert it into heat, and the famous molecules and atoms of the physicists, and upon which the whole present doctrine of physical science depends, would fall to pieces, and those pieces of molecules would be as much smaller than the supposed indivisible atoms of the present theory as those atoms are smaller than planets. It is, therefore, upon this elementary force of cohesion that the character, properties, and even material existence of all bodies depend. How reasonable, then, that a correct apprehension of this governing force should, as we have maintained, tend largely to solve all the mysteries of the material universe!

SKETCH OF DR. HALL'S LIFE AND SCIENTIFIC DISCOVERIES.*

BY THOMAS MUNNELL, A. M.

THE subject of our present sketch [whose portrait appears on the first page of this ARENA] was born near Bath, Steuben County, N. Y., August 18, 1819. His father, Samuel Hall, was born in Muncy, Pa., in 1791, emigrating when a young man to Geneva, N. Y., where he enlisted as a soldier in the war of 1812 under General Scott, and took part in the celebrated battle of Lundy's Lane.

The boyhood days of our present hero are little known, and we may judge from the fact of his early years having been spent largely as driver on the Erie Canal that they would not be of much public interest, however full of incidents they may have been. His parents were poor but respectable.

On leaving the canal, nearing the age of eighteen, he was urged by an Episcopal clergyman to go West and grow up with the country. He at once took the advice, and emigrated to Ohio in company with his father and a younger brother to seek their fortunes in the then young and rapidly-growing Buckeye State. Traveling on foot in northern Ohio, an accident, which lamed the subject of our sketch, compelled him to stop at the nearest house, but a short distance from Warren, the county seat of Trumbull County, and which house happened to be the residence of Dr. Orsemus Dean. This educated gentleman seeing, as he thought, future promise and probable outcome in the young wayfarer, persuaded him to remain with him for a term of years and go to school, he having up to that time barely learned to read and write. He gladly accepted this kind offer, while his father and brother pursued their journey to their destination in Huron County, in the same state.

This accidental halt at Dr. Dean's was the turning point in the young man's life, as it threw him under the educational influences that gave a trend to the natural powers he possessed, and which have since borne such important fruits to mankind, leading to those achievements in science and philosophy which we will soon try to narrate.

Having gone to school two years, pursuing elementary studies, aided by the private assistance of his benefactor, he was advised to take a term of the higher branches at Farmington Academy, in the same county, which he did, thus to prepare himself for teaching school, an occupation which he followed for nearly three years. In the meantime his almost phenomenal acquaintance with the Scriptures, to which he had been led by the numerous religious debates in which he had taken part, attracted the attention of his friends, and caused them to urge his taking upon himself the work of the ministry, which he was finally induced to do, and which he pursued with unusual success for ten years, or till his health failing him, forced his retirement from public life.

* Written for the *Cosmopolitan Magazine*.

During his early experience as an itinerant preacher he was thrown into several public debates, and among others with Universalist ministers, as there was great excitement about that time throughout the entire West on the subject of Universalism. Many of the ablest divines in the country as public debaters were drawn into these controversies with the Universalist gladiators, who defiantly challenged ministers of all denominations to defend the orthodox faith if they could. But as it turned out, the old methods of defense, to which the learned clergy had invariably resorted in times past, proved of no avail in meeting the new tactics and new rules of interpretation employed by the skilled champions of Universalism; and it became soon known abroad and circulated widely through the public press that these old methods of battling against Universalism were entirely powerless when pitted against such armored theological giants as the Revs. Flanders, Doolittle, Pingree, Rogers, and a score of others who made it their business, no less than their pleasure, to capture and disarm all the assailants who could be induced to meet them.

At last the young preacher, known as the "Walking Concordance," was called upon to try his powers at standing before the defenders of this revolutionary theological teaching; and suffice it to say, after one year spent in these public discussions, in which he was constantly employed contesting the field with all comers, beginning with the Rev. G. T. Flanders, D. D., their ablest debater, it was given up that no skill or ingenuity on the part of Universalists could withstand the new line of Biblical exegesis which the young and unknown defender of orthodoxy had brought to bear on Universalism. In three of these successive debates, each arranged for a term of days with three different ministers, the discussions were abruptly terminated before the first day's debate had ended, by his opponents pleading sickness as the cause of the breakdown.

This single campaign, short as it was, practically cleared the West of the troublesome Universalist debaters, not one being now found willing to meet the young champion. Nothing, then, remained for him to do but to give his new methods of exegesis and argumentation to the world, which he did in his remarkable and even phenomenal book, "Universalism Against Itself," whose publication virtually extinguished that sect throughout the Southern and Western States. Their ministers, who still continued to preach, became greatly toned down in their disposition to challenge for debates, and to such an extent that an "orthodox" preacher, as they were called, of whatever denomination, had only to exhibit a copy of "Universalism Against Itself" to be severely let alone by the hitherto invincible defenders of the liberal cause. And it is but truthful to date the general decline of Universalism throughout the whole country from the first appearance of that book, many churches which before had been prosperous, disbanding and selling out their church property to other denominations solely from a want of interest among the members sufficient to support the cause.

As soon as this book had come well into circulation, and the plates had been disposed of to Cincinnati publishers, the author disappeared from public notice, spending many years in the Rocky Mountain regions in geological and mineralogical researches, communing with nature in her primeval recesses, and cogitating those plans and preparing his mind for those revolutionary scientific discoveries which have since made him so famous as an original thinker and investigator.

He was mourned as lost by many of his former friends, and was even reported in the press as dead, not having been heard of till about eight or nine years ago, when a work called the "Problem of Human Life," by "Wilford," was announced in the press. From the favorable notices of this book, and from the enthusiasm manifested over its surprising arguments against materialistic atheism and evolution by the different reviewers who had examined it, much interest began to be felt in its perusal, thus greatly increasing the demand for it, till in a few years tens of thousands of copies had been sold. People wondered at the novel arguments, and made all sorts of conjectures as to whom this "Wilford" could refer, he having cautiously concealed his identity under the *nom de plume* of this portion of his name, which he had never employed when young. At length, by the merest accident, President Clark Braden, of Ingersoll fame, made the discovery, and soon the news spread through the papers of the country, that "Wilford," the author of the "Problem of Human Life," was none other than Alexander Hall, the author of "Universalism Against Itself," written forty years ago.

The secret now having been let out, it was no longer necessary for him to keep up the *nom de plume*, and the great book was thereafter issued in the full name of the author, and it is gratifying to know that up to the present writing more than 60,000 copies have been sold.

This work was practically the beginning of the scientific career of our author. As the book was based on the most radical departures in physical science ever made by any investigator, involving principles which were claimed to overturn many theories and branches of physics regarded as mathematically established, and which had never before been called in question, it naturally brought the author and his book into sharp antagonism with college professors, and called down much severe and even bitter criticism from colleges in different parts of the country. To these criticisms the author replied in his usual caustic style, in the various papers where the attacks appeared, meeting and exposing his assailants' want of scientific knowledge in an unmerciful manner, till no man who had been incautious enough to attack the book could hardly be induced to attempt it a second time.

These incessant attacks from new sources, as new professors chanced to get hold of the work, finally made it necessary for the author to have a medium of his own by which to reach the public, and thus not to depend upon casual papers throughout the country to publish his replies. The result was the establishment of THE MICROCOSM, in which through five volumes the author and editor has not only continued to meet and repel attacks and criticisms from whatever source, but he has likewise unfolded therein and built up the Substantial Philosophy as a system of scientific teaching, naturally growing out of the fundamental principles originally laid down in the "Problem of Human Life."

This new philosophy is founded upon broader, more radical, and more original principles of science, and involves more abrupt departures from the beaten track of human thought, than any other theory of science or system of philosophy ever established by man. While the so-called philosophies of the ancients, as well as later philosophies, were based upon assumptions whose outlines were many times so obscure as barely to be distinguishable from the chaos of contemporaneous speculation, the Substantial Philosophy is not only based on radical and well-defined principles of science never before taught, but in order to lay the first stone in the wall of its superstructure, its founder was obliged to overturn a universally accepted theory of science, regarded for centuries as demonstrated, and which had not been called in question since the days of Pythagoras. That was nothing less than the present wave-theory of sound.

Why had Dr. Hall to overturn the wave-theory of sound before he could begin to

formulate the Substantial Philosophy? Because the broad principle of that philosophy and upon which it all depended was, as he himself has so often expressed it, "that every force of nature, or every phenomenon-producing cause in nature, must of necessity be a substantial entity or objective existence; and hence, that the assumption that any force, such as sound, heat. or light, can be a mode of motion, and not an entity, must be a fallacy of science." And as the *motion* theory, which teaches that sound consists only of air-waves outside of our sensations, was the cogent and even chief cause of all the other undulatory theories of modern science, such as those of heat, light, electricity, magnetism, etc., it became absolutely necessary for the founder of Substantialism to attack and overturn the current theory of acoustics, lying at the bottom of all the others, before he could show any rational or consistent reason for claiming all the forces of nature to be substantial entities.

Having broken down the wave-theory of sound, as he has most satisfactorily done, he has necessarily demolished all the undulatory theories which have grown out of it, thus establishing the principle that force *per se*, in whatever department of nature, is a substantial, though immaterial entity; and consequently that life-force, mind-force, and spirit-force are also substantial entities, thus extending his philosophy from the physical realm to the domain of metaphysics and religion, and by which to vindicate a rational plea for the immortality of the race based on the analogies of science. In this way the broadest foundation ever conceived by man for building thereon a universal system of philosophy was outlined.

That the philosophy itself, as it has been elaborated by its founder during his more recent writings since the "Problem of Human Life" was first published, is well worthy of the noble foundation which has been laid for it in the proof that all the forces of nature are substantial, is already recognized by thousands of ardent adherents of that cause throughout the country. No one, however, can fully master those details at a glance, or even without the most careful study, in going over the various set papers in the different volumes of THE MICROCOSM relating thereto, in which the editor has met and answered every possible objection that can be raised, and with a persistent patience which could only have been born of a purpose reaching far beyond worldly renown or any hope of earthly gain.

Even now, nearing the age of sixty-seven, his intellectual labors are incessant. while his published papers, even on this hackneyed question of "Substantialism," show originality of thought, fertility of illustration, and wealth of ideas, as if the subject had but barely been introduced. He never repeats himself, however many times the question in hand may have come up for discussion, showing a facility of resource and language, and a broad grasp of the underlying elements of the questions discussed. in all their manifold ramifications of science, which could only have come of long and deep study and of an unquenchable devotion to the cause he pleads.

This sketch will be concluded in a subsequent number, in which we will name a few of the new and original discoveries in physical philosophy which have been made by Dr. Hall, and recorded in his various writings. many of which will no doubt live in the annals of the coming ages while scientific books shall be read.

THE "PLAIN DEALER" ON SUBSTANTIALISM.

[*Continued from page* 40.]

A correspondent writes from Kentucky:

"Wilford Hall has destroyed the wave-theory of sound. and the sooner the fact is recognized the better for the intellectual wholesomeness of the country."

This circular is sent to you and other scientists with a request for a brief but definite statement of your views on the subject. The definiteness is more desired than the brevity. There seem to be hundreds of teachers who do not know whether to think that the so-called substantial theory set forth in Wilford Hall's "Problem of Human Life, Here and Hereafter," and other writings, and as expounded by H. A. Mott in the *Scientific American Supplement* for April 3, 1886, is entitled to recognition in their study and teaching, or whether it should be ignored as idle chatter of ill-educated enthusiasm. Please remember that very many of these persons have not the time to give the matter special study, and that some of them are not qualified by training in scientific methods to determine for themselves whether Tyndall, Helmholz, *et al.*, are wrong, and "Wilford" is right, or *vice versa*. An answer from each one who receives a copy of this circular will do much, very much, to clear up these doubts and thus add greatly to the teaching power of many schools.

Hoping for a prompt reply, I have the honor to remain yours very truly,

ELROY M. AVERY.

Most of the persons who received the circular sent replies, specimens of which are printed below. Not a single reply of a tenor different from those printed was received. Mr. Hall was asked to make a brief statement of his position, and kindly responded as follows:

NEW YORK, May 5, 1886.

Professor Avery:

DEAR SIR,—I inclose a brief statement of the substantial theory of sound and the scientific principles upon which it is based, according to your request. I think it will make about half a column of the *Plain Dealer*.

You can say whatever you deem proper of me as the founder of this new philosophy. I send you some copies of my MICROCOSM to aid you in obtaining information. Yours very truly,

A. WILFORD HALL.

THE SUBSTANTIAL THEORY OF SOUND—BY ITS FOUNDER.

This theory is the exact opposite of the undulatory-theory, or the wave-theory as it is commonly termed. The substantial theory of sound is based on the general position, as maintained in the Substantial Philosophy, that every force of nature, or phenomenon-producing cause in nature, whether physical, vital, mental or spiritual, must be a substantial entity. That philosophy insists that the substances of the universe are by no means limited to material bodies, however gross or attenuated they may be. Hence, that substances may be immaterial as well as material entities. The leading principle of Substantialism is that motion, *per se*, is absolutely nothing, being the mere position of a body in space changing from one place to another, while that which causes motion or change of position, namely, force or energy, is of necessity a veritable substantial entity or objective thing.

It follows from this that sound, light, heat, gravitation, electricity, magnetism, etc, cannot in the nature of things be the mere motions of some material substance or substances, but must themselves, as natural forces, or as phenomena-producing causes, be different forms of immaterial substance.

By immaterial substances are meant such entities as are not limited or confined by material conditions, as best illustrated by magnetism or gravitation, which totally defies a material body to impede its progress. Other immaterial substances, as, for example, heat, sound, and electricity, seem to be limited by matter in their progress to a greater or less degree, since they travel with greater freedom and velocity through some material bodies than through others. This, however, is only in appearance, as the different facility with which electricity, for example, travels through different bodies, is alone caused by the action of the governing force of cohesion among the particles of different material bodies, and not by the material particles themselves.

For example, electricity, though an immaterial substance, will not travel perceptibly through glass, while silver is its best known conductor. Why is this? Science as now taught offers no attempt at explanation, while Substantialism has a ready and rational answer to all such questions. The force of cohesion, another immaterial substance, has so arranged and combined the material particles of the glass, and so presides over that arrangement as to interfere with the passage of electricity, while in silver the arrangement is such as to favor and co-operate with the electric current.

So with the passage of substantial light rays through bodies which are transparent. This property of transparency, as also its opposite property, opacity, is due to the action of cohesion among the particles of a material body. By different cohesive arrangements the very same material substance will be transparent or opaque as the case may be. In one case, the same as with electricity, the substantial force of cohesion co-operates with light, and in the other case opposes it.

But I must not argue the case. I merely, by request, make a brief statement of what constitutes the principles of Substantialism, or of the substantial theory of sound. Sound being universally regarded as but the motion of air-particles, outside of our sensations, it was necessary for the founder of the Substantial Philosophy especially to attack that theory, and by setting it aside, thereby to corroborate his general position, that sound as well as gravitation, heat, light. magnetism, electricity, etc., must be an immaterial but substantial force. A score or more of proofs in favor of the correctness of this new departure in modern science have been presented by its originator in his various publications, beginning with the "Problem of Human Life." In reply to this new philosophy no arguments worth mentioning have yet been offered, while on the other hand it appears so consistent, when understood, with everything positively known in science, that many professors of physics have already abandoned the wave-theory of sound, and have publicly announced their adherence to the Substantial Philosophy.

A. WILFORD HALL.

Then follow the brief letters of the various professors whose opinions had been solicited, most of whom, it is but fair to say, do not believe either in "Wilford Hall" or in his philosophy, while some of them admit that they know nothing about either, though they claim still to believe in the wave-theory of sound—a very natural thing under such circumstances.

On reading this symposium article, we immediately wrote Prof. Avery a polite letter requesting to be informed if he would be willing to print in his paper an article from our pen presenting two arguments against the wave-theory of sound, assuring him that these two arguments would be of such a character that we would cheerfully risk the whole controversy upon them, and at the same time permitting and urging him to call to his assistance any of the professors named in the symposium in order to meet and answer those two arguments if it were possible to be done.

This proposition looked so very much like business on our part, and so much like a desire to bring to a definite settlement the mooted question, that we had not the slightest hesitation, judging from the Professor's apparent disposition to deal fairly, in believing that the readers of the *Plain Dealer* would at once be treated to such light on

the sound question as would put things to rest.

But to our surprise and great disappointment, the cautious Professor declined even to reply to our letter, much less to accept our very fair proposition, and thus give his readers what he was in duty bound to furnish them under the circumstances, namely, the real grounds upon which we had opposed the wave-theory of sound. Charitably as we were disposed to feel toward the Professor on reading the symposium paper, we are now obliged to change our opinion, for which we are extremely sorry. We now believe that he was afraid to admit us into his columns in a set argument against the wave-theory of sound, lest he should thereby play havoc with the teachings of his own book in the schools where it has been adopted, fearing, as he necessarily must have done, from what he had already seen of our arguments, that neither he nor any of his symposium friends could succeed in blunting the edge of what would thus be spread out before the readers of the *Plain Dealer*.

If we have here done Prof. Avery injustice in the slightest degree, let him prove it by dropping us a line, offering us even one column of his paper for only one single argument against the wave-theory of sound, and we will at once furnish it, and thus, no doubt, highly gratify every intelligent reader of the *Plain Dealer*. Until he shall do this, every reader of his paper, under whose eye THE SCIENTIFIC ARENA may chance to fall, will draw his own conclusion as to the correctness of our suspicions concerning the true reason why Prof. Avery declined to answer our letter.

In conclusion upon this question, we remark, that the eighteen professors, all told, marshaled by Prof. Avery (one of whom declines to give his name or habitation), amount to nothing whatever as evidence for the correctness of the wave-theory of sound as against the scores of professors who already reject that theory, after teaching it for years, solely from a careful examination of our arguments against it.

We need not urge upon Prof. Avery's mind the law of evidence so well understood by jurists, that one competent eye-witness to an alleged fact will outweigh any number of negative witnesses who simply aver that they did not see it. To the same degree the opinion of one single professor of physics who has taught the wave-theory for years, and who is forced to abandon it and to accept the opposite view from a careful study of the new arguments on the subject, must weigh many fold more in the estimation of any judicial mind than would the opinion of one equally learned who clings to the old theory, probably from habit, not caring enough for the new arguments to investigate them sufficiently either to accept or oppose them. Such, manifestly, is the case with every professor arrayed against our new departure by Prof. Avery in that symposium article. Several of them had not read our writings at all, and others had not even heard of them. Yet Prof. Avery triumphantly places them in the list of his eighteen competent witnesses against Wilford Hall's Substantial Philosophy, because they still teach the wave-theory!

Why, Professor, the council of dignitaries which condemned Galileo to prison could easily have secured the names of all the leading professors in all the colleges of Italy, repudiating the views of Copernicus as false and absurd, and indorsing unqualifiedly the Ptolemaic system of astronomy which those views had overturned, even one hundred years after Copernicus had written his book! Yet what would such a negative symposium of scores of names, however learned, have weighed in the balance of truth as against one single *Galileo*, who had carefully gone over and verified the observations and deductions of Copernicus and then approved them? Just as much, verily, as does the negative symposium of eighteen professors now weigh placed in the scale opposite the one single name of *Henry A. Mott*, who has abandoned the wave-theory as totally false and absurd after carefully and patiently examining all the arguments for it as well as against it! Yet, instead of one hundred years having elapsed, it is but about seven or eight years, all told, since the "Problem of Human Life" was first given to the public, or since the wave-theory of sound had been first called in question. When one single generation more shall have passed away, we venture to predict, and here record it for the benefit of future students of science, that not one intelligent professor of physics will be found to indorse and defend the wave-theory of sound, any more than one intelligent scientific man can now be found to indorse and defend the Ptolemaic system of astronomy. Does Prof. Avery want his name to stand on the right side of the scientific record in the coming ages? If so, let him hasten to revise his book on physics in the light of the Substantial Philosophy.

[*Concluded next month.*]

Publishers' Department.

Our Only Premium for Subscriptions—Terms to Agents.

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Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SCIENTIFIC EVIDENCE OF A FUTURE LIFE, No. 4.

THE MORAL AND RELIGIOUS TENDENCY OF SUBSTANTIALISM.

BY THE EDITOR.

THAT the principles of the Substantial Philosophy, as a system of doctrine and belief, must produce a marked moral and religious effect upon those who intelligently accept them, can admit of no rational doubt. That this effect upon the mental constitution of the adherents of that philosophy will be deep-seated, and as permanent as the human memory itself, is equally certain, judging from the very nature and character of the teachings upon which these moral, religious and intellectual effects are founded.

Substantialism is no mystical or theosophical system of thought, involving mentally intangible lines of investigation, though it grapples boldly and scientifically with the intangible entities of nature. Unlike Spiritualism it depends not for the convictions of its adherents upon dreams, visions, materializations, or supposed supernatural appearances and happenings in darkened rooms, which may and do often result from the collusion of circumstances, or from downright hallucinations combined with mechanical deceptions ingeniously contrived. Substantialism depends upon the absolute verities and demonstrated realities of nature herself, always uniform in their operations and in their infallible stability, and which shine out the brighter the more critically their foundation principles are scrutinized. Its basic laws and formulated tenets invite the crucial analysis of the most refined mechanical appliances and the most uncompromising investigations of science, while as a system of doctrines it disdains to ask or accept quarter from the most desperate assaults that can be made upon it. Such is the confirmed confidence of those who have become fully initiated into its principles, that they are ready to wait with a calm equanimity for the developments of the near future, which are sure to bring all thinking men and women to this universal standard of philosophical truth as it is in nature herself, on which, as a platform of scientific reconciliation, the world shall at last see eye to eye.

With the physical forces of nature demonstrated to be substantial entities, as already done in this series of articles, thereby equally demonstrating the substantive nature of the vital and mental powers and forces of all living and conscious beings, this philosophy at once spans the chasm between time and eternity, and embraces within its logical grasp the substantial *hereafter* as well as the invisibly substantial *here* of humanity, and thus confirms the correctness of the great classification of all the entities of the universe into *material* and *immaterial* substances, which Substantialism was the first formally to announce to the world.

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

[For Sketch, see page 59.]

With the entitative, and consequently indestructible nature of all force, *per se*, proven to be a fact, and thus also the substantial and indestructible nature of all vital and mental powers demonstrated, Substantialism found the analogical way cleared for solving the one remaining problem, namely, to furnish a reasonable proof of a conscious and personal immortality for the human race when this purely physical and temporary existence shall have passed away. But since the mind and life as substantial forces are necessarily indestructible, on the basis that no substantial thing can ever be annihilated though changed in form however often, the difficulty arises, does not this great principle of Substantialism prove too much by including the conscious immortality of all lower animals, since their vital and mental powers and forces are as really substantial entities as are those of human beings? We admit the plausible force of this difficulty, and it was among the earliest that attracted our attention when trying to solve the "Problem of Human Life" here and hereafter. (See the "Problem of Human Life," pages 468 to 471.) And although the problem cannot be settled as we would solve a problem in mathematics or mechanics, it admits, as we believe and will endeavor to show, of a sufficient weight of evidence to form a well-grounded hope for the personal immortality of the one class; while the vital and mental powers of the other, or lower class, are only conserved as crude force returned to the primordial fountain whence all vitality and mentality originally came.

If electricity, magnetism, sound, heat, light and gravity are really substantial or entitative forms of force, and not mere modes of motion of material particles, then these various forms of force, though immaterial, are necessarily as indestructible as is gross matter itself; and instead of ceasing to exist when their manifestations are no longer observed, they are either converted into some other form or forms of force, or, as the Substantial Philosophy so rationally teaches, they subside into the universal force-element or fountain of crude force from whence they originally came, and from which they are remanifested as needed in the economy of nature and through the various means and processes appointed to those ends in the wise counsels of the creative will.

So also, as we have just hinted, must it be with all the lower orders of the animal kingdom. Their vital and mental powers, being also as truly and really substantial as are their bodies, are equally indestructible; but as these powers or forces, judging by reason, have served the extent of the uses and purposes of their manifestation here, they, too, must subside, at the dissolution of such animals, into that compartment of the force-fountain of nature suited to this department of the force-element from which the vital and mental powers of all living creatures must originally have come. This special compartment of the force-element of nature, where vitality and mentality are conserved, so to speak, is especially correlated with the personal God of the universe as to his vital and mental powers, just as the physical force-element, before referred to, is correlated with God's physical laws and powers by which the corporeal operations of the universe are carried on through the variously manifested forms of force as they emanate from this physical fountain.

But according to the reasonable view which Substantialism takes, and which is supported by other rational considerations, the vital and mental powers of man, as the culminating and crowning work of the Almighty, and like unto the personality of God himself in every conceivable way, only on a finite plane, must have been designed and originally destined for a personal and conscious existence in a future life analogous to that which God himself must possess and enjoy as surely as he exists at all. The vital and mental faculties and endowments of man—this culminating achievement of infinite wisdom and power—with their innate self-consciousness and self-contemplation, and with their limitless capability for eternal advancement, would seem to prove an infinite absurdity in their very creation if they, too, were destined for the utter loss of personal consciousness and identity as soon as the body dies, and, like the no longer valuable or available powers of the beast, to be consigned to the unconscious and impersonal vital and mental force-fountain from whence they came.

We have frequently considered this phase of the argument in the past volumes of THE MICROCOSM, drawing the line of demarkation between the human and the lower orders of animals, and have presented elaborately the rational considerations from science and philosophy which go to show why the one should enjoy personal immortality while no reason or necessity could exist for it in the case of the other. (See THE MICROCOSM, vol. v., p. 285.)

The very strongest, however, of all scientific and philosophical arguments by which to prove the personal and conscious existence of man in another life is—first, the scientific and philosophical demonstration that God himself must and does exist as the personal, intelligent creator and organizer of this universe, as proved by the design, artistic beauty, and order everywhere manifested in nature, from the whirling clockwork of the celestial spheres to the painted marvels of a humming-bird's crest, even down to the artistic and intelligent taste displayed in the exquisite lines and colors of the microscopic shells of ocean found in the rayless depths of her darkest caverns.

Nothing but the very highest order of the intelligent and artistic powers of a personal being could conceive such orderly designs, and work out such exquisite harmony and beauty of forms and tints as these works of nature display, almost infinitely surpassing the conceptions of the most intelligent human artist. In the light of these designs, and beauties, and wonders of creation and their unanswerable evidence of the presence of a personal and intelligent artist, the atheist hides his head in confusion at the very audacity of having called in question the existence of such a being, and at his own measureless stupidity for having supposed it possible for such art-work to have come by chance or to have been evolved by "Natural Selection" or "Survival of the Fittest."

We speak of God's *personality*, since it is impossible to conceive of any intelligence of the highest order only as we make the mental comparison with our own conscious powers and rational personality. We can imagine such personal being to be higher than ourselves—even to be an infinitely intelligent and powerful being—but we can never conceive of such surpassing intelligence, power, and artistic skill to be less than ourselves, or less than a personality. Call this anthropomorphism or what you like. We shall always prefer to liken God in our conceptions to the human form divine, so long as we only conceive him to be infinitely greater than ourselves, rather than adopt the questionable modesty of the atheist in supposing that no God can possibly exist surpassing in personal ability his own egotistical and puny self!

The fact that God is corporeally invisible and intangible to our perceptions and observation does not militate against the overwhelming evidence we have in his works as all-sufficient proof of his actual personality and existence. We simply know that our own personal and individual existence, which is capable of achieving analogous works of art and beauty here, is limited at present to the corporeal forms of our bodies. But when we reflect how little we know of the real and wonderful entities which exist all around us in nature, of which the earth, air and ocean are full, and of which our bodily senses can take no recognition whatever, we ought to be very modest in claiming that personalities of the human form, but constituted of immaterial, vital and spiritual substances, may not exist even now in our very presence had we but the spiritual vision to behold them. A God who can work out the wonders of this universe, might easily assume any form, or even millions of personal forms at one time if they were necessary, or one separate form for each living creature, and thus be personally present everywhere beholding the evil and the good.

The very fact that man is intuitively led to recognize, and thus prove to others, his own real personality, from what he is able to achieve, should indelibly impress upon his mind the personality of an infinite being from his works alone. The material body of man achieves nothing, even in the present gross state of being, only as the physical instrument through which the immaterial entity acts and which dwells temporarily within and manipulates such body. We are but lifeless, inert matter as soon as that immaterial entity has departed at death. Hence the immaterial entity within us is the real man which is to endure.

As sure, then, as a personal God exists independently of material form and conditions, so surely may every thoughtful and rational human personality rest in confidence, with hope scientifically and philosophically grounded in the nature and fitness of things, that he, too, has a personality not dependent on this corporeal frame except for a temporary schooling through which the inner man is passing and preparing, like the butterfly during its chrysalis state, for the higher development when it shall be released from crude dross to mount on gilded wings.

This very fact of a rational personality within us says in unmistakable language to every man: If God lives, and can think and plan and work without a material organization, then I can live also, and think and plan and work without a material body as an instrumentality. For why should an infinite personal God have made this immaterial, personal being within the present gross structure of flesh and bones with asperations and capabilities for infinite duration and enjoyment, except to live substantially as God himself lives, unless he originally intended to mock his crowning work with conceptions of possibilities never to be realized, and with longing aspirations for enjoyments which were never to be gratified? We totally fail to conceive the possibility of an infinite personality working out such a scheme as this universe filled with countless millions of intelligent personalities like unto himself, except in degree, and with the certainty that these crowning triumphs of infinite skill, so suitable for his own intellectual associates throughout eternity, are doomed to annihilation after this brief and often miserable existence on earth. We repeat that it is impossible to conceive of a scheme involving such infinite possibilities wrought out by an intelligent God to end in human annihilation without entailing upon himself eternal wretchedness at the contemplation of such an unnecessary and stupendous failure.

As a specimen of this line of thought, we quote a few sentences from our reply to Mr. Rice, as printed in Volume V. of THE MICROCOSM, at page 285:

"If an intelligent God pervades this universe, not as gross matter, but as infinitely refined intellectual and vital personality (for which innumerable rational considerations can be produced), would it not be in keeping with such intelligent and personal spiritual essence and *ego*, that other corresponding intellectual and personal beings on the finite plane should exist as the crowning work and glory of such an infinite personality? And whence could come such glorified beings except as transformed personalities from the human vital, mental, and spiritual organisms, which for a time are permitted to tabernacle in this material body, thus allowing them from their exalted environment to earn and inherit individuality and identity forever, rather than a subsidence into the crude vital and mental force-element to which inferior vital and mental forms of force are appropriately consigned?

"Unless there is no intelligent First Cause, or primordial fountain of vitality and mentality in the universe, a supposition at which every higher faculty of reason and human consciousness revolts, then rational analogy and the eternal fitness of things irresistibly proclaim that *man*, nature's superlative diadem of glory and the Creator's noblest work of divine art, must personally survive the catastrophe of bodily dissolution, and prove the sole exception to the otherwise universal law of nature's force-element as the receptacle of all other forms of energy after they have served the purposes of their manifestations here. If this be not so, then the creation of man with his mighty intellectual powers, so analogous to what the Deity himself must be, was a consummate trifling with infinite possibilities by infinite power and wisdom, making the failure so lamentable and stupenduously pitiable that even angels, were there such beings, would cover their faces in shame.

"We infer, therefore, from the very nature and essence of the intellect of man, which is capable even while in the body of virtually living in the spirit realm by anticipatory yearnings, that it was originally and chiefly designed by the Creative Will to fit man for that form of existence as being the state of God himself, and therefore that such must be the sphere best suited to the perpetual development, exercise, and enjoyment of faculties and powers so far transcending anything else the earth affords."

In conclusion we would say, that it is the mission of Substantialism, after reconciling the physical mysteries of the universe as they manifest themselves all around us, to grapple with this problem of all problems—the possible conscious and personal existence of man after his body shall return to dust. Every principle of the new philosophy, from its foundation law of the substantial nature of all force up to the substantial personality of the infinite God, points infallibly to the immortality of the human soul, and by innumerable considerations brings all true science and true philosophy into complete harmony with all true religion. If the principles of Substantialism be not true, then there is nothing true in science, nothing true in philosophy, and nothing true in religion, for whatever is intrinsically true in either, Substantialism not only recognizes but accepts as the truth of God.

OLEOMARGARINE—REPLY TO DR. MOTT.

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

IN Dr. Mott's reply to my article on oleomargarine, some statements are made which indicate that some points in my argument are misinterpreted, and justice demands that I should make correction.

But that which is of vital importance is to arrive at definite and scientific truth on this question; for this necessarily interests every member of the human family, as it materially concerns physical health; and upon health depends mental, moral and commercial advancement.

I make no pretensions whatever to being learned. I only claim to be able to comprehend the elementary principles of physiology: some of which Dr. Mott, in his reply, has strangely overlooked or ignored.

Dr. Mott states, that when Mege, the French chemist, deprived cows of food, they still continued to give milk, and that this milk contained butter-fat; and he at once came to the conclusion that this butter-fat was manufactured by the vital process from the fat of the animal. In this conclusion Dr. Mott unreservedly coincides.

To state it mildly, this is strange physiology, and if the vital force could voice its disclaimer, it would protest against such misrepresentation of its official function. Assuredly the teachings of physiology are, that all

the constituent elements of milk are transmuted *directly* from the food ingested. The formation of milk, as of bone, muscle, and tissue, is through a process of vital transformation of *organic* elements. The constitutional organization of the animal economy is such that its vital force cannot transform *inorganic* elements into its own substance.

When the various tissues of the body are broken down through the eliminating process of vitality, they become simply excretions—are reduced to inorganic elements—and as such cannot be used by the vital powers to form muscle, bone, nerve, tissue, or milk.

Will Dr. Mott claim that the *fat* of the animal could in any way be thrown into the circulation, except through the eliminating process of the system? And when it is eliminated, it is simply broken-down tissue—dead, inert, inorganic matter; and which the system could no more transform into the constituent elements of milk than it could from the elements of the inorganic world direct.

The milk secreted by the cows which were deprived of food, was from the volume of blood still contained in the system, and which had been manufactured from the food previously ingested. We are not informed how long the cows were deprived of food, nor how long they continued to give milk.

The *vis preservatrix naturæ* ever uses its powers for the welfare of the animal economy; and if the adipose or fatty tissues of the body could be transmuted by the vital powers to serve as its own nutriment, then in cases of fasting or starvation it would certainly do so. That it cannot so use it, is demonstrated by the fact that an individual of ordinary muscular dimensions will, in the event of starvation, live longer than an individual possessed of a large amount of adipose or fatty tissue. The reverse of this would certainly be true, if the vital power could use its own fat as nutrient material.

An individual whose physical dimensions represent organized space, is not in normal conditions, and therefore has not as great a power of vitality to resist the tendency to dissolution, as that of an individual of a normally balanced physique.

Dr. Mott states that chemistry reveals the fact, that the constituent elements of oleomargarine are very nearly identical with those of butter. But, while chemistry may demonstrate this, it cannot decide as to its wholesomeness or unwholesomeness. Chemistry shows that there is but little or no appreciable difference in the constituent elements of the chyle made from perfectly pure food, and that from impure food; yet the healthfulness—the vitalized quality—of the former is much greater than that made from the latter. This shows that vitality takes cognizance of qualities that chemistry does not and cannot recognize. But vitality is not an omnipotent power, it cannot manufacture healthy, vigorous tissue from impure aliment; and if vitality cannot do this no artificial process of purification can possibly do it.

Dr. Mott informs us that Barker, Maston, Caldwell and other prominent chemists pronounce oleomargarine a wholesome food.

In reply we would simply call the Doctor's attention to the fact, that Tyndall, Helmholtz, Mayer, and the major part of the scientists in this country and Europe, pronounce the wave-theory of sound and light correct, which demonstrates the fact that the greatest intellects may arrive at wrong conclusions when they reason from a false premise.

Dr. Mott says: "Dr. Organ seems to think animals are fatted, and abnormally so, to secure fat for the manufacture of oleomargarine . . . that the suet or fat from which oleomargarine is made depends for its formation upon the diseased condition of the animal . . . if the animal did not have any fat, it would certainly be diseased."

With all due courtesy we disclaim thinking anything of the kind, and we have the impression that in our youthful days we learned from our school-physiology that a certain amount of fat is demanded by the animal organism, to subserve its wants. In certain parts it serves as a lubricator of the solids; in others, as an elastic cushion, diminishing pressure, sensibility, etc., etc. But I do assert that it is a fact universally known, that animals fatted for market are fed more than the system demands for healthful growth; and whenever an excessive amount of food is ingested, it produces an unbalanced condition between the assimilating and disintegrating organs; this is an abnormal, and therefore a diseased condition.

The animal system can appropriate a definite amount of nutriment, but no more, no matter how much food is ingested; and any amount taken beyond this overtaxes the digestive organs; the chyle elaborated from this imperfectly digested food must necessarily be lacking in vitalized power. This surplus of nutriment is deposited in the form of fat, as this is the best thing the vital intelligence can do to preserve the organic equilibrium.

Even under the most healthful conditions the fatty tissue of the system is the very lowest order of organic formation; and if, through any means, impurities or poisons are taken into the system, which cannot readily be eliminated, this tissue is always made its depository. This has frequently been demonstrated in the hygienic treatment of patients who had years before taken mercury, sulphur, etc. For a period of ten, fifteen and twenty years these poisonous substances had been lodged in the deposits of adipose tissue.

That the adipose or fatty tissue is the very lowest in the scale of organic formation, is shown by the fact that it is the first thing the eliminating absorbents lay hold upon when the system is deprived of food; the vital intelligence always removing first that which is the least essential to the interest of the organic economy.

In view of the physiological facts given, can the suet from animals fatted for market be a healthful dietetic product? Add to this, the still greater unwholesomeness of the fat through the feverish and irritated condition of animals herded together in close, hot cars previous to being slaughtered, and the result is, a decidedly impure article of diet—an article essentially different in healthful or wholesome qualities from that made from the milk of cows, which as a general thing are never overfed.

THE WONDERS OF ODOR.

In accordance with our intimation last month we copy below an account of the tracking of convicts by a species of Southern hounds as graphically given in the Atlanta *Constitution*, to show the wonders of odor. We introduce this startling narrative as a text from which to emphasize the claims of Substantialism in a way not previously presented. We need only remark before giving the article to our readers that we know the facts as narrated to be substantially correct from sources of other and personal information:

While at Oldtown I saw a race between a convict and the hounds. It came about in this way:

Mr. Williams claimed, and he was backed by Captain James, that any convict could be selected out of a hundred and sent off to circle through the woods, passing through a dozen squads of convicts; that, an hour later, he could put his hounds on that convict's track, and they would thread him through the squads of convicts, never be shaken from his individual track, and finally bring him up. I remarked that I could understand how the hounds might carry a convict's track through a crowd of outsiders from some scent of the camp, but not how they could separate one convict from another.

"There may be a hundred convicts," he said, "clothed precisely alike, and wearing precisely the same shoes. They may be fed together on precisely the same food, and sleep in bunks that touch each other under precisely the same cover, and yet each one of them has a scent that marks him just as distinctly to my hounds from his fellows as his appearance marks him under your deliberate study."

"And do you expect me to believe that the dogs can catch this scent from the flying touch of his thick shoes on the hard ground?"

"Undoubtedly. And further. He may stop in a squad and change shoes with a convict and the dogs will still follow him. On the hardest ground his scent will be plain to them; though his shoe soles are half an inch thick. When he runs through the woods, where his clothes touch the bushes, they will trail him, heads up, in full cry, fifty yards, running parallel, but away from where he ran."

"Do you mean that you can take fifty convicts, all clad in convict suits, let them run through the bushes, then send the convict the dogs are trailing through the same bushes, and the scent of his body, left on the yielding twigs as his clothes brush them, will lead the hounds through the maze?"

"Yes, fifty yards away, they will run it parallel at full speed. To prove this, I will start a convict. I will let others follow him through the woods. I will let him make a semicircle in the woods with fifty yards' radius. When the hounds come to this, instead of following the curve they will scent the opposite side of the circle, fifty yards away, cut across to it, take the track up there and follow it."

A gaunt convict, long of leg and flank, was selected for the run. He was told to put off quickly, circle in the woods, take a swift run over the fields, roads, and through every squad of convicts he could find in his way. This he did. The hounds were then loafing about the stockade yard, as listless a lot of dogs as ever were seen. "I'm tempted," said Mr. Williams, "to let the convict ride a horse for a mile or two after he has run awhile. I have had dogs trail a convict on horseback four miles, and then take the track where he jumped from the horse." By this time the flying convict was a small speck on the broad fields, and in a moment more had melted into the horizon and was gone, as if, indeed, he had found that liberty for which his soul panted, and had gone as the strong-winged birds go when they vanish in the blue ether.

In an hour we mounted our horses. The hounds were loafing about in the sunshine. Suddenly Mr. Williams, squaring himself in his saddle, blew three quick, short blasts on the cow's horn that hung at his side. As if by magic the hounds awakened and charged at his saddle—eager, baying, frantic. "Nigger!" he said sententiously. Like the wind, they were off, nose to the ground, tails up, circling like beagles. Larger the circles grew, the hounds silent as specters, eyes and nose eating the earth for its secret. "They will pass over the tracks of convict squads, but will open on the first single track they find. If it is the wrong track we will simply sit still. They will run it a hundred yards or so, and noting our silence will throw it off and search again. When they get on the right track we will halloo and start after the hound that has it. The others will join, and the race is opened."

At last a red hound, careering like mad across the field, halts suddenly, tumbles over

himself, faces about, noses the ground eagerly, lifts his head, "A-a-o-o-w-u!" and is off like an arrow from a bowstring. "That's the track," shouts Williams, and after the howling hound we go. The other dogs join in pell-mell at first, then each hound, true to the track, in full cry at a rattling gait. Away off to the left Captain James calls attention to a moving speck against the sky. "That is the convict circling back to camp," he said. On the dogs went, keen as the wind, inexorable as fate, following the track of the convict as true as his own shadow.

Across the tracks of hundreds of others, along high roads, over fields, through herds of cattle, by other convicts that smiled grimly as they passed, the hounds went, holding the track of the flying convict where it had been laid as lightly as thistle on the firm earth, but where it left its telltale scent all the same. Nothing could shake them off —nothing check their furious rush. Over other tracks made by convicts wearing shoes from the same last and same box they went without hinderance, led by some intangible miracle of the air straight on a single trail.

"Now we'll see them wind his scent fifty yards away," said Williams, as we neared a patch of forest. Close to this was a squad of convicts. These we had sent through the woods an hour before. We had made "trusties," walking singly, touch every bush and tree. Then the convict we were trailing was run through, making a half circle, with at least fifty yards' radius. The hounds entered the forest at a hunting pace, a small red dog leading. Suddenly the leader faltered for an instant, with nose in air, then burst with fierce cry to the left, ran obliquely for full fifty yards, with head up, when he took up again the track of the convict, and lowered his head to the ground. He had simply made a short cut across the semicircle, having caught scent of the convict on the bushes more than a hundred feet away. I am aware that this is incredible to those who have never seen it. I cannot explain what it is that the flying man, clad and shod as a hundred others, fed on the same food, chained daily to the same bunks at night, imparts to a yielding twig touched by his clothes so that it attracts a hound fifty yards away. But it certainly does just that.

The last test was now coming. We were moving toward a squad of convicts at work in a cotton field. We had sent the fugitive convict through this squad. We had then made them walk in a double circle around him. They then crossed and recrossed his tracks, many of them wearing exactly such shoes as he wore. One hour later the hounds struck this point. There was not an instant's pause. There was no deviation, no let up in the pace. Through the labyrinth of tracks the hounds went, as swallows through the air, hurrying inexorably on the one track they had chosen.

The end was now near. The convict, having run his race, was seen leaning against a tree and watching the hounds plunging toward him. "Won't he climb the tree?" I asked. "No; the hounds are trained to simply bay the convicts when they come up with them. Otherwise the convicts would kill them." By this time the hounds have sighted him. They halted about twenty yards away from the tree against which he stood and bayed him furiously. Pretty music they made, and not deeper than I have heard often and again under a 'possum tree. Mr. Williams called them off, and the convict came forward. "Dem puppies is doin' mighty well, cap'n," he said, grinning, as he lazily swung by on his way to the stockade.

These dogs are not bloodhounds. I doubt if there is a bloodhound in Georgia, though two are reported near Cartersville, descended from a pair owned by Col. Jeff Johnson in the days of slavery. The Oldtown dogs are foxhounds of the Redbone breed, trained for several generations to hunt men. They are never tempted by other game. They are neither fierce nor powerful, and are relied on solely to trail the convict and lead his pursuers to his lair.

REMARKS ON THE ABOVE BY THE EDITOR.

Readers of this surprising story of facts, who have previously been inclined to doubt the basic principles of Substantialism, can now open their eyes and see for themselves. If a dog has the ability to select and isolate one single form of odor from a hundred other almost exactly similar forms, with these various forms of smell intermingled in the most confused and tangled manner possible, as here shown, and, at the same time, with odor a real objective *substance*, as the whole scientific world admits, is it not reasonable to suppose that the well-known ability of a practiced ear to select and isolate one single tone from an orchestra of a hundred different instruments, must come in like manner from the *substantial nature of sound?* If not, then what sense or meaning can there be in the so-called analogies of nature?

The attempted reconciliation with the wave-theory of this single orchestral fact has cost many ponderous volumes on acoustics, involving the most abstruse mathematical calculation and theorizing. Lord Rayleigh, the eminent English scientist, has produced a book on sound of some four or five hundred pages, devoted almost entirely to these singular mathematical wave-formulas, by which to vindicate the practical possibility of the truth of the current theory, and to show how the almost infinite complexity of air-motions, necessary to the hearing of so many sounds at one time, can result by the intermingling of condensations and rarefactions, and the superposition of various systems of air-waves upon each other.

He may have succeeded in representing all this on paper, by which to prove that one little membrane called the tympanum—not a third of an inch in diameter—shall take on all these superimposed forms of wave-motion at one time, and thus communicate them intelligibly to the brain. But the fatal difficulty in the way of all this complexity of mathematical theorizing by Lord Rayleigh can surely apply only to the air, or rather to his printed formulas, as it can never be reproduced as motions in the ear-drum of any living creature. This is proved from the fact that the tympanic membrane is not a stretched or tensioned diaphragm at all, but is a loose or flaccid mass of sensitive tissue incapable of any sound-vibrations whatever.

For centuries the scientific world has labored under the misapprehension that the tympanum is a "drumskin" stretched across the passage leading to the inner ear, ready to respond by sympathy and reproduce all the supposed complex motions of the air as formulated by Lord Rayleigh's mathematical ingenuity. But this notion concerning the ear-drum, so long in vogue, is totally false, as now proved by anatomy, and hence all this laborious effort, to show mathematically what is possible as to complex motion in the air, turns out to be a pitiable scientific abortion, since no vibrations are possible in such a flabby piece of tendinous tissue as this ear-drum.

In contrast with this incomprehensible mathematical mystification by Lord Rayleigh how easy and simple is it to conceive of the possible hearing and analyzing of any number of the most complex sounds at one time, on the basis of the contact of substantial sound-force against this delicate and sensitive auditory membrane, especially in view of the demonstrable illustration just given of a hound snuffing a hundred complex but substantial odors at the same breath, and by means of his nasal membrane alone, without any vibratory motion whatever, isolating one of these smells out of the hundred and retaining it in spite of all the complications that could be invented by man! Of what use, then, in the name of all that is reasonable in science, is this complex superposition of air-waves in accounting for sound-sensations, when in the adjoining sense next to it, namely, that of smell, every purpose of nature is served by the substantial contact of odor, and that, too, amid a confusion of conflicting smells which would make a volume of Lord Rayleigh's worst mathematical superpositions appear like simple reading?

But suppose odor to consist of vibratory motion, which certainly should be the case if it is true of sound, and then imagine that poor dog, before selecting the special form of odor he was to follow, being obliged to figure out with his nose over a little patch of dirt one of the easiest of Lord Rayleigh's superpositions as applied to odoriferous condensations and rarefactions in order to determine which angle of the parallelogram to select before he could start on the track of the right convict! Then imagine these odorous vibrations caused by the impacts of the convict's shoes to have been made an hour in advance of the dog's starting,—pray how could his olfactory membrane be made to respond sympathetically to such vibrations an hour after their motions had ceased to exist?

Jesting aside, why cannot Lord Rayleigh be induced to give us a book on the mathematical superposition of odor-waves, with suitable geometrical diagrams for showing the blending curves and cross-angles of three or more fundamental smells, including their harmonics, by which to explain in his usual lucid style how this hound succeeded in tracking the convict, as the effect of the combination chord of odorous vibrations as they tickled his olfactory nerve? Then let the distinguished savant write an appendix to the same work, formulating the scientific law of the *conservation of nothing*, or the *persistence of motion*, by which to prove that the vibratory effluvium from the convict's clothes could easily keep up their fragrant tremors against the twigs of the bushes during the two hours the red dog was swinging around the circle. Such a book would, no doubt, sell as a fitting companion-piece to his corresponding work on sound, and would be equally as scientific in every respect.

The truth is, this simple and serious fact that odor is a substantial force, impressing the nasal membrane of this dog and thus producing its complex sensations by substantial contact alone, and with which vibratory motion has nothing to do, is conclusive analogical evidence that sound sensations are produced in a similar manner. This beautiful and consistent view of nature would have been reasoned out long ago from the necessary analogies of physical science based on substantial odor alone, had the rational classification of all substances into material and immaterial entities suggested itself to any of our distinguished physical philosophers. But regarding nothing as substantial but gross matter, and stopping there, has hitherto barred the path of progressive advancement until Substantialism, with one fortunate stroke of its leveling ax, broke down this chief barricade of materialism.

Now we can see and understand, with but a modicum of rational reflection, that if the nose of that Georgia hound is capable of analyzing a hundred mixed smells on the basis of substantial odor, it would be the height of physical inconsistency to charge nature with upsetting this substantial order of things by abruptly introducing for the next higher sensation a nonentitative mode of motion. We repeat our original statement, as given in the "Problem of Human Life," that a man who can suppose such an unnecessary incongruity in nature's harmonious plans as a leap from actual substantial contact in one sensation to mere motion for the sensation next adjoining, when the latter

sensation only requires a more refined form of substance to answer every purpose, has too trifling a conception of nature to be reasoned with or to reason logically on any matter of science.

SUBSTANCE—MATTER.

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

ABOUT fifty copies of THE ARENA are now subscribed for, paid for, and read in Fremont and vicinity. The circulation is on the increase. The writer of this short paper occasionally circulates himself also among these patrons of our most scientific monthly journal. They are persons above the point of mediocrity in the possession of natural abilities and intellectual attainments. The list consists principally of ministers, lawyers, doctors, teachers, merchants, and equally intelligent farmers and tradesmen. While in matters of morals they can all stand before the mirror of self-reflection and inspection, they differ very widely in their respective religious views and principles. The most of them are somewhat enthusiastic over the great work which the Substantial Philosophy has undertaken to do in the world and for the world. Some of them, after reading their copies of THE ARENA, are sending them out through the mails to their friends in other sections of the country, with an anxiety to tell to sinners round what a treasure they have found in the mine of scientific wealth now being opened up by the delvings and the diggings of stalwart Substantialism.

A neighbor of ours who had always avowed himself a confirmed atheist, is now publicly announcing that the arguments of Dr. Hall in favor of a future life and the existence of a personal God, cannot be answered by all the infidels and atheists under the sun. Of course there are some who read THE ARENA and dispute the soundness of the premises taken. We have found none, however, who are not willing to admit the soundness of the logic which makes its arguments beautiful to look upon. Those who do not agree with Dr. Hall in his basic premises seem, however, to have an essential agreement among themselves as to the alleged weakness of his major proposition. What is that major proposition or cardinal principle of the Substantial Philosophy which is even yet, to some considerable extent, the stone of stumbling among men who are sincere and honest in all sentiments which they entertain and hold for truth in the respective spheres of philosophy and religion? That major proposition is that *all being is substance.*

Under the first view of the case, it would seem that no rational being could deny the substantiality of all being. Indeed. it is really astonishing that educated men—men who compass the whole field of all pure and applied mathematics—men who can grasp the most intricate questions of metaphysics, and disentangle the knotty skeins of medicine, law and diplomacy—should be found to deny the existence of everything which they cannot measure as so much matter in particles, lumps or worlds of different shapes and sizes. Why, gentlemen, what are you thinking about? Is there nothing but matter in the constitution of your being? If so, it matters but little what you think. If you are nothing but matter, it is matter that thinks, or you do not think at all. If you are anything more than matter, then the Substantial Philosophy is true, and you, to be true to the facts of nature, as well as to your own dignity and attainable destiny, must throw aside the rottenness of your own premises, and the sophistry of your own arguments, before they succeed in dragging down to the low level of inanimate mud a being endowed with the possibility and power of ultimately stepping into the skies.

But perhaps you will not admit your belief that you are constituted of nothing more than matter. If so, we shall be glad to hear that you are not willing to become the victim of your own logic, and that you resent the insult which your own philosophy seeks to heap upon you. But if you are anything more than matter, what are you? You reply that you are matter in vibratory action—matter in motion. Well! What is matter in motion but matter still? You say that you are matter in molecular motion. If so, that does not relieve you from the laughable sophistry of your pitiable case. What is molecular motion but a molecule in motion? Does a molecule in motion undergo any other change than that of place or attitude? But you may admit that you have a soul as well as a material body. Very good! Thank you! Now please tell us whether your soul is also matter, or whether it is something else than material substance. If you do not change your first position, you will not dare to claim that your soul is anything more or else than matter. You say that your soul is not made up of matter, but that it is a very small thing. Very true again! We shall certainly have no dispute upon that "small" point; but please tell us of what substance your little soul consists, since, by your own confession, it is not composed or constituted of matter? If you have a soul, and it is not constituted of matter, it is a matter of some scientific importance for you to know what it is made of, even though it be not very large in its dimensions. You answer that it is constituted of an *immaterial* substance. You are right, and that is precisely the position of the Substantial Philosophy so far as its teachings are applicable to the problem of human life.

FREMONT, O.

A SECOND VISIT TO MR. KEELY.

BY THE EDITOR.

THE LARGE ENGINE FINISHED.

ON the 24th of July, after our August ARENA had gone to press, we received a letter from Mr. Collier informing us that the large engine (250 horse-power) had been completed, and that Mr. Keely desired us to witness its exhibition at four o'clock that afternoon. So, in company with Mr. Hudson, the associate editor, and Dr. Richmond, of this city, we took the eleven o'clock train to Philadelphia. Promptly at the time designated, we repaired to the shop in North 20th Street, and were cordially welcomed by Mr. Keely and a number of the stockholders present, who congratulated THE ARENA for its fair and faithful report of the previous exhibition, and its description of the new motor, as printed in the July issue. Mr. Keely pronounced it the only rational and consistent description of his invention that had yet appeared in any scientific journal.

As on the previous occasion, the shop was well filled with earnest admirers of Mr. Keely and seekers after knowledge concerning the working of his engine, which now stood completed in its enlarged form in the middle of the room, ready to astonish one of the most anxious and expectant assemblies ever congregated in a room of similar space. Although we had witnessed the previous tests, we are free to confess that our curiosity on the present occasion was even more on tiptoe than at the former exhibition, since, as everybody knew, the final and triumphant success of the Keely motor as a revolutionizing invention was to depend largely on the working of the formidable apparatus now ready to demonstrate its powers.

The first thing that attracted our attention was the jaded and careworn look of Mr. Keely, who declared that he had been working almost night and day to get this engine ready, since we bade him good-bye at the previous exhibition, and that he was so nearly worn out he had barely strength enough left to give the present demonstration. Still, as new visitors crowded into his shop, and expectation began to effervesce into animated conversation all over the room, the old fire commenced showing itself in Mr. Keely's face, and he soon forgot that he was tired.

Those who will revert to the July ARENA and read our explanation of the liberating apparatus and the engine at the previous exhibition, will not need a preliminary word from us except to consider the present hollow sphere, constituting the engine proper, of about eight or ten times the capacity of the one previously employed, it being fully four feet in diameter, with its frame and other parts correspondingly massive. And we must not forget here to state that, in addition to this globular cylinder and its trunnions, there was in this large apparatus a supplementary shaft telescoped through the center of the revolving trunnion, its inner end passing into the interior cavity of the great four-foot copper sphere. On the outer end of this supplementary shaft were secured two great steel Chladni disks nearly three feet in diameter.

These resonators or wave-plates were placed about eight or ten inches apart, and between them was secured the belt pulley. This supplementary shaft, as it seems, revolves independently of the great sphere and its rotating trunnions, and when they are in motion it makes exactly *five* rotations to the sphere's one. What could have been the object of this supplementary shaft and how its greater velocity could possibly have been effected (being apparently loosely telescoped into the trunnion attached to the rotating sphere), were problems incomprehensible to anybody present save Mr. Keely himself.

On opening the exhibition, as on the previous occasion, the etheric force for driving the machinery was generated in the usual way, by first getting the liberator in tune or harmony with its various parts in what Mr. Keely now designates the "mass-chord," by which he means the average chord of the mass of all the resonators of the apparatus, including the tuning-forks, Chladni plates, resonating tubes, and steel wire rods. When this had been accomplished to the satisfaction of Mr. Keely's practiced ear, the bowing of the forks began, and it was but a minute more when the force was announced as present, and was also demonstrated to be present by turning the valve-wheel of the receiver which had been previously shown to be empty, when out rushed a hissing discharge of the "etheric" vapor resembling the sound of a small jet of high-pressure steam, but leaving nothing in the atmosphere of the room to mark its presence.

As on previous occasions, this power was first applied to the lifting of weights, and at the second attempt more than 22,000 pounds to the square inch were raised as explained in our July report. Mr. Keely's assistant then stood on the outer end of the long arm of the weighted lever without counteracting the pressure of the vapor, proving it to exert more than 25,000 pounds to the square inch. All present cheered Mr. Keely at this successful demonstration of power fully up to everything he had claimed.

But as the old stockholders there present, who had frequently witnessed this feature of the experiments, were becoming impatient to see the operation of their long looked-for perfect engine, we suggested to Mr. Keely the propriety of passing over all minor tests, however interesting to strangers, and let the impatient friends of the motor see for themselves and at last realize the accomplishment of their long-cherished dreams. This request was at once complied with, the force being diverted from the weighted lever

to the stationary trunnion of the great sphere through a number of small receivers (all previously shown to be empty) by means of a diminutive copper tube having a hole passing through it no larger than a small knitting-needle, a section of which is now before us as we write.

When the connections had all been properly secured, Mr. Keely turned the valve-wheel at the stationary trunnion of the engine, and as quick as thought the supplementary shaft with its Chladni plates started with a velocity of rotation that was simply frightful, and to which the great copper sphere responded in the ratio of one to five, itself making a rotation velocity so great as to be anything but assuring to the nerves of those present. As proof of this, the reader should have heard the ominous humming roar of the various parts of this mighty machine as they whirled, felt that brick building shake to its foundations, and seen the crowd of brave investigators, including THE ARENA delegation, philosophically piling themselves up close together in the securest corners of the room out of range of the copper globe's centrifugal menace, while the great calm figure of the ruling spirit of the occasion, monarch of all he surveyed, stood at the throttle to say to the terrible force—Thus far shalt thou go and no farther.

It was a relief to all present when, after about two minutes of roaring suspense, he reversed the valve-wheel and slowed down the monster globe so that those present might safely approach and examine it in motion with its one-to-five complexity of rotation. "Well, that beats the world," was the simultaneous exclamation of more than thirty voices as soon as the roar had ceased sufficiently to let them be heard.

This experiment was repeated over and over, till no one present, who had witnessed the tremendous velocity of the sphere, and the five-fold velocity of the Chladni-plates, resembling the action of enormous circular saws, could doubt the actual presence of at least 250 horse-power of working energy, while that prodigious force was in operation.

At the close of the exhibition Mr. Keely was asked many questions concerning the working of his engine, all of which he answered off-hand, in a manner to astonish his visitors even as much as they had been astonished by the working of the engine. One man asked how many times he would have to draw the fiddle-bow across the tuning-forks to generate force enough to send a train of cars from Philadelphia to New York? "*Once*—only *once*," was the emphatic response of Mr. Keely! A dozen pair of eyes that had been focused upon Mr. Keely's, suddenly turned upon each other in mute amazement. But why doubt? If the force is what Mr. Keely describes it to be, and if it is generated as he claims, there is not a doubt of the correctness of his response; for if once drawing the bow will generate force enough to turn a locomotive wheel once around, it is evident that a small fraction of that force could readily be switched off by which to keep the bow in motion, if needed, just as the motion of the main piston of a steam locomotive automatically diverts the power alternately into the opposite ends of the cylinder.

In conversation with Mr. Collier, after the close of the exhibition, we learned that this large engine was especially built for driving a train of cars between these two great cities, and that after Mr. Keely had obtained a few weeks of needed rest and recuperation at Cape May and in the mountains, he would proceed to fit and attach the great engine to a suitable locomotive truck, and that as soon as its practical utility had been demonstrated in drawing a train of cars from Philadelphia to New York, his patents would be taken out in every country in the civilized world.

The stockholders, therefore, will now look forward to this consummation of their hopes with an anxiety more intense than was ever before experienced by investors in any financial enterprise since the world began; for no other project ever before promised even a small fraction of the financial profits reasonably to be looked for from the Keely Motor stock at its present insignificant price, when this first train of cars shall reach Jersey City. The capital stock is now $5,000,000 in 100,000 shares, at the par value of $50 per share, and is owned by about 2000 shareholders located principally in New York and Philadelphia, but scattered also all over the United States and Canada. One wealthy and eminent business lady, now in England, is said to be one of the largest share owners in the company, and has done more than any other single individual by way of financial assistance in holding up Mr. Keely's hands while conducting his numerous and expensive experiments.

We have a personal invitation from Mr. Keely, as soon as he returns from his vacation, to visit his place again, and in the presence of two witnesses (Mr. Hudson, of THE ARENA, and Mr. Collier) to manipulate with our own hands certain sonorous apparatus in which machinery will be driven by the force of sound-vibrations alone, caused by drawing a fiddle-bow twenty feet away! Mr. Keely's design is to be in an adjoining room, with only a hole in the partition through which he can answer our questions or give directions, while we alone shall do the bowing of the sounding instruments, and thus witness results which no man but himself has ever before seen. We need hardly say we look forward with no little degree of pleasurable anticipation to the intellectual treat thus promised, all of which will be set forth in THE ARENA, should Mr. Keely so permit.

P.S.—Since the foregoing was in type we have had two pleasant calls from Mr. Charles B. Collier, of about an hour each, in which we have received the most elaborate information, with explanatory details, of Mr. Keely's remarkable experience in the development of his motor during years past, that we had yet learned. From these conversations we learn for the first time that during the Centennial Exhibition in 1876 Mr. Keely had a "globe motor" in operation, of about two feet in diameter, which had its liberating and generating devices all within itself, and which would run for hours with great power and velocity by means of sonorous force alone as its motive power, from first touching it with the hand and moving it gently in the direction in which it was intended to rotate.

It is enough to make one's head swim to learn of all the various experimental devices contrived and tested during the past fifteen years by Mr. Keely's persistent ingenuity. Yet with all these fluctuations in the forms of his devices, Mr. Collier has remained unfaltering in his faith both in Mr. Keely and in his great discovery. No one, we assert, can converse with Mr. Collier for one minute without being deeply impressed with his sincerity and his full conviction that the "Keely Motor" is all that is claimed for it; and that its final triumph is at last assured by the successful working of his great engine.

TRUTH!

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

One of the striking characteristics of this age is the unbounded faith of many men in approximate, and their limited belief in exact truth. In the field of physical science there is no such thing as the discovery of absolute truth; and there is therefore no such thing on earth as *exact* science; all laws and explanations are merely hypothetical and approximate. Kepler's laws are unproved. The motion of an unperturbed planet only approximates to the form of an ellipse. We cannot prove the existence of perfectly circular or parabolic movement, even if it existed, any more than the eyeless fish of the Mammoth Cave can discern the shape of the stalactites that are above them. Indeed, when we probe the matter to the bottom, physical astronomy is as hypothetical as Euclid's elements. We argue in geometry concerning perfect curves and rectangular figures, when, in truth, if there was a perfect circle we could not perceive it. In all scientific investigation we "see men as trees walking." We talk about inflexible bars and inextensible lines, and deduce from them innumerable beautiful theories, when, in reality, there is no such thing in existence. All instruments of measurement are faulty, and the entire theory of science is based on approximation, and therefore all scientific deduction is but approximate truth; nevertheless, men have unbounded faith in it.

On the other hand, in the realm of spiritual investigation, where we find the only exact truth, human belief is limited. Truth discovered to man by the God of Truth—truth concerning moral condition, divine provision, and human destiny, these truths, supreme in their importance, and most exact in their nature, are, as a rule, of secondary importance to men. *Now, whence arises this possibility of intense interest in approximate, and this superficial attention to exact truth?* We answer, in the fact that *abstract truth is utterly powerless.* This appears, if we consider that truth is nothing more than a statement of what is. One would almost believe truth an entity when we hear Milton saying: "Let truth and falsehood grapple." He speaks as if they were plumed knights, with spurs adjusted and swords in hand. Or when Lord Coke declares that "Truth may for a time be trodden down, but never by any means can be trodden out," we almost see it as a veritable evergreen planted in material soil.

That truth is beautiful does not prove her potential. Truth is ever beautiful, whether winged, moving up and down the Bethel ladder, on which the eye of the lone exile rests; or sitting on Israel's throne, while at her feet lie both sword and harp, ready for battle or for melody; or as a trinity in unity standing unharmed amid Nebuchadnezzar's furnace fires; or sleeping on the prison floor, as the chargered head announces that she has leaped angel-guarded from a prison to a palace celestial; or as "in persons three" she follows the man of seamless coat up the mountain side, and stands bathed in glory where two worlds touch each other; or joining the tramp of celestial armies, as they shout the battle over, and falling in adoration before the blazing throne—in all these positions truth is beautiful, *but inherent beauty is not inherent power.* The rose leaf is beautiful but powerless. *This impotence of abstract truth appears in the history of science.* Scientists themselves have held scientific truth at arms' length for years. The Copernican theory of the solar system met the determined opposition of the astronomers of the age. The theory of gravitation when propounded by Newton strove in vain for recognition by Leibnitz and others. The discovery by Harvey of the circulation of the blood, and by Jenner of the benefits of vaccination was ignored by all physicians. The use of quinine, lightning conductors, the existence of meteorolites, and the use of the steam engine were all rejected by the French Academy in former times.

And the same fact appears in the moral realm. A man may learn the holiest truths and yet these very truths leave him utterly unbenefited by their acquirement. William Arthur spoke wisely when he said, "Abstract truth would be potential, if it had only a community of angels on which to operate. With every heart upright, and every intellect clear, truth would soon be discerned, and then cordially embraced." And we must remember that as moral truth descending to

fallen man comes not among friends, so new scientific truths being presented to scientific thinkers enter "an enemy's land." It must antagonize passions, and habits of thought, and prejudice, and personal interests; and of itself cannot conquer. The dove's foot can only leave an impress on soft clay and not on that which is baked to the hardness of brick.

The power of truth lies in its expression and use by living agents. Truth is but an instrument. Some seed vessels must have appendages which act as wings to waft them by the aid of the winds to distant localities, or as floats to bear them on the tide to destined soil. A sword must have a hand behind it. *It is incorporated truth that wins.* Says Bishop Fowler, "Truths must have feet upon which to stand in the dusty highway; elbows with which to make their way to the front; faces, *luminous* faces, with which to catch the public eye in the general gloom, and hearts warm and throbbing with which to beat their convictions into the hearts of hurrying men. Therefore the Greeks personified and deified their great ideas, and Rome filled her temples with images of her great warriors."

So great principles and ideas in nations are potential in proportion as they are individualized and incarnated, and great doctrines of Scripture become potent among the masses through personal agency. Without παράκλητος (not the Comforter but) "*one called alongside for help*," even the truths uttered by Jesus could not become potential with his followers; and it is only by men set in motion by truth, either humanly communicated or divinely inspired, that truth must win its way in this world.

Now what of all this in its bearing on the Substantial Philosophy? Simply this: A great truth, namely, that there is a field of unseen entities in this world has somehow dawned upon the mind, and has become an inspiration to the life *of a man.* That truth has been published to the world, and the arguments in its favor are utterly unrefuted, and stand like the plates of an iron shield against which all opponents break their spears. Having found a man through which it is expressed, it must, like some other great truths, help to shine away the darkness of materialistic error, and bring in the hour when a belief in "the things that are unseen" will be as general as is now the faith in "the things that are seen." Meanwhile we may perhaps profitably consider the question whether, in view of man's immoral condition by nature, it may not be that because this truth is so nearly *exact*, and bears so *intimate* a relation to the moral and approximates so nearly to the spiritual in its ultimate bearings, therefore men are slow to accept it. It appears to us that we have here an illustration of that familiar proverb —Truth is mighty in pure natures, error in depraved ones; and in the brighter future of the New Philosophy, the world will come to see, not that God has left us to the fitful flickering of law lamps, and the dim light of the tallow dips of nature, but that "the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made;" that after all the *unseen is the real!*

PEEKSKILL, N. Y.

WHAT IS MAN? IN THE LIGHT OF SUBSTANTIALISM VERSUS MATERIALISM, No. 3.

BY PROF. G. R. HAND, A. M.

ACHIEVEMENTS, wonderful, grand, and startling, along the line of man's upward course, give in their testimony in answer to our question, "What is Man?" Some of these have testified in the previous numbers; others are in waiting.

Steam, on the witness-stand, gives convincing testimony to the power of mind over matter in utilizing the potencies of nature. The flight of ages had witnessed the ebb and flow of water in the ocean, nor once suspected the mighty power of steam that lay wrapped in its embrace, waiting for man to bid it leap forth and do his bidding. Water leaped down the mountain sides, laughed in the rivulet, sported over the cascade, thundered in the cataract, and flowed in the majestic river, and gave no hint of the secret power lurking in its composition. Animals drank of it, and men slaked their thirst with the sparkling water, without ever suspecting the magazine of explosive power they were imbibing.

Men had seen water boil and steam issue from the spout of a tea-kettle without suspecting its hidden force long before the lifting of the lid of the boiling kettle attracted the attention of Watt. Then the secret was revealed, and a mighty power was given to the world, a power for good, yet a power for destruction unless controlled by intelligence.

But intelligence lays its controlling hand upon it and binds it to his varied machinery and bids it toil for man, till the rolling wheels of agriculture and manufacture almost make the earth tremble. Commerce, wafted by the winds of heaven, now calls for the new motive power, and a Fulton is forthcoming to make the connection; and now the steamer "walks the water like a thing of life."

Intelligence, restless, active and ever-advancing, calls for improvements, till the perfect model of masterly machinery and mighty power of the Corliss engine in peerless majesty thrills through all the ramifications of a world's exposition; and steamships plowing trackless furrows over the rolling deep waft the world's commerce from continent to continent.

Can these achievements be predicated of anything short of intelligent spirit power, an immaterial, substantial entity, inhabiting and controlling a material body? Animals make no improvements in their methods, from age to age. And this fact should put a quietus upon the absurd assumption that they may develop into man, or that they can *evolve* that which is not *involved* in them.

The printing press, on the witness-stand, bears intelligent testimony that man is not a material evolution.

Man treasures up his thoughts in his store-house of knowledge, and carries on intellectual commerce with his fellow-man, with language as the circulating medium. Then thoughts are crystallized into written language for commercial facilities.

The increasing demand calls forth the invention of the printing press, by which written language is multiplied almost to infinity. Improvement still goes on, and now, propelled by steam-power, the printing press, daily, weekly, monthly, and annually, in continuous streams rolls off intelligence to supply the waiting appetites of countless millions. Behind all this, as a moving power, is the intelligence of man.

Animals make no such improvements as these. If they talk at all, they talk as they did in the zoological garden of Adam, as they marched in procession before the proprietor for inspection, and were graded down as having, in their loving companionship, no companion suitable for man.

If their language is understood by those of their kind, it is the same as that in use when they congregated in Noah's ark.

Then the progress in man, and the absence of progress in animals, should again put a veto upon the unsupported guesses of materialism and the imaginary potencies and possibilities of matter.

Astronomy, on the witness-stand, brings men nearer into companionship with an intelligent creator, where Newton realized the world-renowned sentiment: "The undevout astronomer is mad." The study of the starry heavens, by Israel's juvenile king, on the plains of Bethlehem, qualified him, in his riper years, to photograph the diadem of night in the sublime language: "The heavens declare the glory of God," etc., a thousand years before the Magi were led by the star of Bethlehem to visit the world's Redeemer.

Astronomers constellated the stars, and mapped them out, some four thousand years ago. And now, on a critical comparison of those maps with the starry heavens, it is found that a lapse of forty centuries has seen the stars in one direction gradually spreading, and in the opposite direction drawing nearer together, as the perspective of a landscape, when traveling on a railroad, seems to open before us and close behind us. The inquisitiveness of man is not slow to grasp the idea thus suggested, that we are traveling through space among the stars.

The bare suggestion of the novel idea turns numerous telescopes to the right ascension and declination of the fixed stars along the track of our newly discovered destination. The elements of our solar orbit are placed under careful observation, and the sun, hitherto supposed to be stationary in space, is declared to be revolving around some other center, in a yet unmeasured orbit, carrying with it the whole retinue of worlds composing our solar system. This seems to connect our solar system with the great sisterhood of stellar systems beyond, where each fixed star is the center of a stellar system, as our sun is the center of the solar system, and all revolving around the same great center, which may possibly be the throne of God.

Should that great center of solar and stellar orbits turn out to be in the Pleiades, as now supposed, it may possibly throw additional light or give increasing significance to the saying of the patient man of Uz, and pioneer astronomer: "Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion?" Job xxxviii. 31. And the combined influences of solar and stellar attraction, located in Pleiades, the possible center of divine influence, may seem to be drawing us nearer to the appreciation of an intelligent creator and controller of the universe, through unerring laws, as admitted by the astronomer, poet, prophet, and king: "The law of the Lord is perfect." Ps. xix. 7.

This last quotation, considered astronomically, is corroborated in the discovery of the planet Neptune. The influence causing the aberration of the planet Uranus, the then supposed exterior planet of our system, could not be traced to any known body in the system. Leverrier undertook to solve the problem. He weighed the solar system, in the balances of creation, and found it wanting, to the amount of another exterior planet. He calculated the probabilities and possibilities, and worked out and proved the results, with such accuracy, that he wrote to an astronomer to turn his telescope to a certain point in the heavens, giving right ascension and declination, and discover a new planet, revolving in an orbit twenty-eight hundred and fifty millions of miles from the sun, and requiring one hundred and sixty-five years to make one revolution, and now at the given point in its orbit.

The astronomer turned his telescope as directed, and within one degree of the spot designated, captured the long-sought wanderer, safe, and working up to schedule time.

The testimony of these witnesses lifts man out of the plane of materialism, and places him in the plane of created intelligences.

And now, through the labyrinths and corridors and vestibule of creation, we are ushered into the penetralia, or sanctum sanctorum, of creative intelligence, and rest the case with a jury of enthroned mind, in the hands of the regnant mind of the universe.

THE GEOLOGY OF FLORIDA.*

BY JOHN KOST, M. D., LL. D. (*State Geologist*).

NOT much is to be expected from a paper on the geology of Florida, at this time; because the opportunity for procuring materials is yet so meager. The geological survey of the State is only just begun. Yet there are sufficient data to show that the earlier ideas of the deposits on the gulf coast in Florida have been erroneous. Coral formation is not the entire constituent of the bedrock immediately underlying the great sand deposit, as has been supposed. Nor yet does this material constitute even the *chief* substance of many of the rocks of the State. The chief constituent is shell material; and the coquina rock, which is the only variety of rocks I have yet found east of the St. John's River, is composed almost completely of coarse fragmental shell, cemented, mainly by carbonate of lime, but sometimes by siliceous material, and is in the latter a hard and durable rock.

This coquina is found in various places in great beds, some of which are notably inclined in position.

I was surprised, in my brief preliminary inspection, to find so much variety of materials in the deposits of Florida; and I had my speculations as to the sources of these various deposits. In places, extending for miles, there are deep deposits of clay, though always more or less sand therewith. Iron, in disseminated form, is very common among the clay. Flint, or siliceous material, is abundant in places among the limestone. In spots the flint is so prevalent as to exclude the hope of recovering the land. This flint material has all been in solution, and has conglomerated a variety of fossils—shells, corals, limestone fragments, clay and sand. Beautiful geodes of quartz, agates and chalcedony occur in various localities. These are sometimes nucleated, but oftener clean. Molded among fossils, vegetable and animal, are found most fantastic, and often exquisitely beautiful specimens. Other gems of quartzose material are not rare; and the staining is of iron, manganese, and seemingly of lead or mercury, as well as of more precious metals. Of course these are from the water holding the siliceous matter; but whence came they? One thing is evident: thermal springs have existed, and have given off streams of impregnated waters. Marls of all degrees of comminution are to be found in great beds everywhere that I have visited.

But the most interesting part, by far, in the geology of Florida is what concerns its paleontology; and this State must prove itself a locality of more than common interest in this regard.

It is evident, in my mind, that a broad section, perhaps all the peninsular portion of the State, if not the entire State, had been elevated from a coral-bearing depth to a vast plain, with undulations, to a level with the surface of the sea, permitting its tides to meander vastly about sections slightly higher. This uplift must have been after the deposit of the upper eocene or the oligocene, and very likely was contemporaneous with the earliest of the Rocky Mountain uplifts, as the fossils of the latter seem to indicate. While the larger portion of this vast peninsula was then resting, with surface near the water-level of the gulf, somewhat extensive plateaus, sufficiently high to be free from habitual overflows, must have existed, for there were, most assuredly, fresh-water lakes and streams, as the fossils prove. Lignite deposits are notable, and the distribution thereof is such as proves water margins. The lignites are of miocene character, I believe. That these lignites were deposited in both brackish and fresh waters seems evident by the fossils.

But the fauna and flora are most interesting. There must have continued for a long time, the same horizon; that is, the continuously dry portions must have been long continued to have afforded populations so great as the remains of them prove. Furthermore, the physical conditions admitting of tropical and semitropical productions—animal and vegetable—must have been favorable; as appears from the great variety of animals, especially, that lived then and there. Nor are the localities affording these much circumscribed; they are found in various sections all over the State wherever I have visited. Several species of the elephant and rhinoceros; the lion and other larger carnivora; mastodon, horse, ox, camel, llama, elk, deer, goat, bear, fox, otter, beaver, rat, squirrel, etc., have existed numerously.

There must have been ample scope for various life habits: and opportunities for seclusion; or the numerous great and small carnivorous animals would have exterminated the others. Large birds existed. I found a fragment of a humerus of nearly an inch diameter in its shaft, which was evidently the bone of a bird. Various reptiles, whose habitats were of fresh or brackish waters, also existed abundantly; thus proving the same physical conditions.

Another circumstance proving the comparatively long continuance of a miocene age, is the extent of the physical forces that had interposed. There are valleys or river courses filled with the quarternary or recent deposits, which contain in these deposited materials the remains of eocene fauna, as those of the eocene shark and zuglodon, intermixed with more recent animal remains. These shark's teeth, etc., of the eocene were dislodged by the cutting away of the eocene rock-beds, and were redeposited in these valleys or river-beds amidst the more recent fossils that had been washed in from higher horizons. Thus, I found, in one bed, the teeth of the carcharadon, zugludon, mastodon ophis, paludina and helix. These were in a channel-bed of twenty feet depth.

Thus, in a miocene age of some duration, there were numerous great and small lakes and streams, even as now existing. About these, life was abundant. The lair of the lion and tiger, bear and cougar, near some watering places, where dense vegetation afforded cover; the grazing flats, and the dryer places suited for the squirrel, fox, goats, horse and camel; and the lagoons for reptiles, must have characterized the landscape.

After an indefinite but somewhat long time of this condition of things, there was a subsidence of some considerable extent, to admit of the deposit of the superimposed materials. This deposit, so formed, contains marine fossils in abundance. Great oyster-beds, coral-reefs, marl-banks, sand, clay, iron and other metal; peat, muck, limestone, flint, coquina, conglomerates, all in various orders and manners of deposit.

There must have been physical forces that moved the waters of the sea, and the materials of the land, to a large extent. There are dunes, ridges, hills, valleys, plateaus and declivities, with sharp escarpments along the streams. If Florida be still set down as a long stretch of level sand deposit on a bed of recent coral, there will be a continued mistake. There are hills and dells in more than a few counties, and in divers parts of the State.

It appears to me that the latter subsidence corresponded chronologically with that which preceded the champlain epoch as noted more especially in the northern portion of the continent. But the subsidence was less considerable than the greatest that occurred in the north.

This subsidence must have submerged extended swells or ridges of the Appalachian range that had reached to Southern Alabama, and which occasioned ridges in the Alabama Sea, that came within the power of the surf action, and were cut away when the Gulf Stream passed over what is now the southern third or more of that State.

It is only necessary, for an opinion of this sort, that the materials deposited in Florida be examined. Feldspar is the source of the clay that is deposited in immense beds in various portions of Florida. The iron which is so abundant also has its counterpart in the material of the Appalachian range, as is notable in Georgia and Alabama. Mica is disseminated among all the later Florida deposits. Whence, otherwise, all these materials that could only come from almost direct erosions of land? There are no great river channels, either filled or open, that could have brought these materials and given here, then, their character of deposit. Besides, several of the more notable rivers have their course in a contrary direction, as that of the St. Johns, Oclawaha, and Wichlocoochee.

The sands of Florida are not so notably water-worn as are those from offshore sources, but are more angular, as they appear under the microscope; and all these, with some other facts that cannot come into this paper, convince me that Florida is indebted to Alabama mainly for its geologically recent deposits.

The limestone of Florida is remarkable for its open consistency. Disintegration is its characteristic phenomenon. From the favosoid and granular appearances to the rugged, cavernous escarpments, and the enormous sinks, and subterranean channels that send off rivers, and raise the mighty springs that would support a fleet in their basins, we note this characteristic.

Elevations, all over Florida, have stood higher than as now. Almost everywhere that rocks appear at surface—and they are abundant—they show themselves *out of place*. The supporting clays, sands, and marls which they had antecedently, were washed away and were deposited elsewhere in leveling up the country, and thus occasioning the extended flats in the State. These facts are just such as a correct theory would suggest: and what—according to all analogies—did take place. Thus these rocks lie scattered over the lands; and in many places ruinously to agricultural uses.

It is remarkable that the fossils of some of the rocks of Florida possess the characteristics of the lacustrine tertiary of Nebraska and other localities of the eastern slope of the Rocky Mountains, as also those of the marine tertiaries of France and England; and the fauna and flora of this portion of our continent are exceedingly interesting to the paleontologist. I have no doubt but that from the various characteristics of the deposits and the peculiar order of them, more thorough examinations of them may discover new species; for while the same latitudes and horizons usually present somewhat uniform characteristics in their fossils, or species, yet special localities have their special characteristics also. I can but believe that the geological survey of the State that is now begun will not only accrue greatly to the material interests of the State, but will add something to the great collection of the materials of science. But it will require great care to determine the facts correctly; for while the tertiary deposits are ever found to be characterized by sudden changes of local conditions, the Florida tertiary seems most so. Besides, the great bodies of overlying sand and other materials of recent deposits make the labor of the geologist difficult; and the absence of exposures of the undisturbed rocks in many places adds to this; while also the cuts for railroads and other secular improvements seldom go below the recent sands, clays and marls.

ADRIAN, Mich.

(* Read before the American Association for the Advancement of Science at its recent meeting, and furnished to THE SCIENTIFIC ARENA by request.)

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IS THE EARTH A GLOBE? No. 2.

BY THE EDITOR.

FIG. 1.

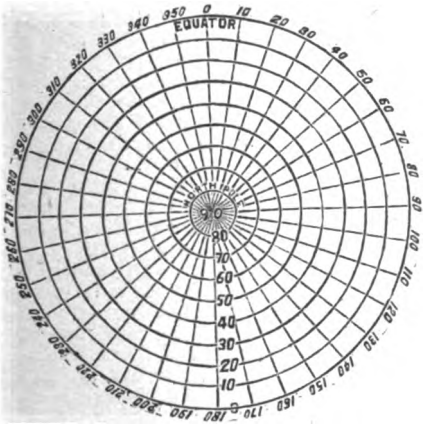
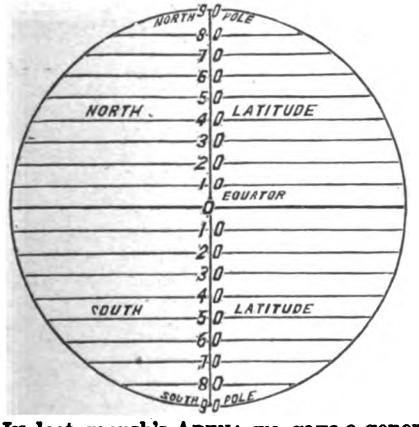


FIG. 2.



IN last month's ARENA we gave a general outline of the zetetic system of astronomy introductory to a series of papers on the subject. When we wrote that article we had seen as yet but a few small pamphlets by Hampden, Carpenter, and one or two others, and we are now free to confess that we knew but little of the zetetic philosophy, except from newspaper reports, and consequently had a very limited conception of the amount of labor, study and research that had been bestowed upon the theory by its founder and his adherents. Hence, at the time of writing that first paper, we now cheerfully admit that we had formed altogether too contemptible an estimate of the strength and ingenuity of arguments that had for the past forty or fifty years been employed to sustain the flat theory and disparage and weaken the Copernican system of astronomy.

Since that article was in print we have received, through the kindness of Mr. John Lingren, of Brooklyn, N. Y., who is a firm believer in the zetetic theory, the loan of three bound volumes of considerable size, all of which are devoted to a critical examination of the various phases of this apparently ridiculous theory of astronomy. The chief book of the series, however, is one of more than 400 pages, by a Mr. Rowbotham, who signs himself "Paralax," and who is regarded by his followers with no little veneration as the founder of the zetetic philosophy. We learn from Mr. William Carpenter, of Baltimore, another of his most ardent disciples in this country, who recently called at our office, and told us that Paralax died in England some three years ago at the advanced age of eighty-nine, after devoting the last forty years of his life to the zealous propagation of the zetetic system of astronomy.

We thus speak of the founder of this doctrine because his book, false as his theory evidently is, evinces no common ability or learning. The book, which is an exhaustive treatise on the subject, contains more than one hundred engravings of fine execution, making the entire work a masterpiece of scientific criticism and literary composition. Hence, in attempting to overturn a theory supported by such unquestionable ability and extended physical research, bearing on every proposition discussed, and aided by such a fund of general scientific knowledge as that author possessed, we are frank to confess that we have a much larger contract on our hands than we supposed at the start. And we say here if any of the over-confident followers of Newton and Copernicus are inclined to doubt what we say, and sneer at this "flat" nonsense, let them send to the London publishers and obtain a copy of this work by Paralax, and read it, and they will wake up to the fact that it is no child's play to demonstrate the globular form of the earth by any of the arguments yet employed, every one of which has passed under the searching, and very frequently scathing criticism of Paralax. Our first argument, therefore, upon which our promised "ten million proofs" depends, is, fortunately, new to the scientific world. And hence, as good luck would seem to have it, we have nothing to take back in our introductory paper of last month, Mr. Carpenter admitting that it fairly presented the salient points of the zetetic theory.

In introducing the present paper we reproduce Fig. 1, showing the zetetic or flat view of the earth as far as to the equator, and add Fig. 2, representing the globular form, with the parallels of north and south latitude, and a single meridian line running from the equator to the north and south poles respectively. Instead of a circular, plane surface, as in Fig. 1, with the north pole in the center, and the flat earth extending indefinitely beyond the equator to perpetual ice, as explained last month, we show the earth as a globe in Fig. 2, of about 24,000 miles in circumference at the equator, which is a line passing east and west around its center, equidistant from its poles, thus showing the earth with a northern and southern hemisphere of about equal mass and extent, and rotating diurnally around its axis, as also revolving in an annual orbit about the sun. Our Fig. 2 represents this globe as split through its center from pole to pole, and as if looked at from a distance directly toward the equator.

Notwithstanding the profound ingenuity of Paralax, we maintain that every fact or observed phenomenon known to astronomy, as well as every appearance in nature relating to the heavenly bodies, can only be explained rationally on the hypothesis that the earth is a rotating and revolving globe, and that not one single fact, phenomenon, or appearance in the entire system of the universe, when rationally interpreted, goes, even in the remotest degree, to favor the flat theory of the earth; and consequently that the pretended array by Mr. Carpenter of Baltimore, Md., of "one hundred proofs that the earth is not a globe" either misunderstands or misrepresents the facts in every instance, thus amounting to one hundred proofs of childish incapacity to grasp the real facts and truths of physical philosophy.

By reference to our two diagrams it will be seen that in Fig. 1 only the north latitude is represented, extending in parallel circles, equidistant apart, from the equator to the north pole, since the flat theory of course denies the existence of the southern pole of the earth altogether. But in Fig. 2 we represent both north and south latitudes with their parallels drawn in straight lines, also equidistant apart, and from the equator, becoming shorter toward the poles. Let us, however, discard for the time the southern hemisphere entirely, and confine our present argument to the facts upon which both theories are agreed. These facts are the following: that there is an equator around the surface of the earth of about 24,000 miles in circumference, equidistant in all its parts from the north pole; that this circle is divided into 360 degrees of east and west longitude, from which corresponding meridian lines run due north to the pole; that whenever the sun passes over any one of these meridian lines (whether by its actual movement from east to west or its relative movement by the rotation of the earth) it is noon at that place, and that the same is true of every intermediate meridian line north and south, and however close together such lines may be drawn.

Both theories further agree that there are ninety degrees of north latitude from the equator to the north pole, represented by the parallel lines with their intermediates, numbered in both figures from 0 up to 90, but shown to be circular in Fig. 1, to represent the flat earth, while hey are straight in Fig. 2, to represent sections of a globe. Both agree that in order to go due east or west, we must follow accurately one of these parallels (or some intermediate parallel), as drawn in both figures, keeping always the same distance both from the equator and from the north pole, or at right angles to the direction of the magnetic needle, thus keeping the north or polar star on the left in going east, and on the right in going west.

Thus far the two theories are in accord, but here they part company, never to come together again. In order to go due east, for example, on one of these parallels, considering the earth as a globe, we are obliged constantly to curve vertically to correspond with the globular form of the earth, but to keep in a perfectly straight course so far as any deviation to the left or right is concerned, thus circumnavigating the earth if we go far enough; but to go east according to the flat theory, while there is no curvature vertically, we are obliged to keep up a constant curvation to the left, increasing that curvature more and more abruptly as the degrees of latitude extend north and the circles become smaller. But this fact, with the overwhelming argument growing out of it against the flat philosophy, will be reserved for a future paper. In that paper we will show that a man can no more circumnavigate the earth or any portion of it by going around the North Pole on a plane or flat surface than he can be said to circumnavigate the earth

by circling around his hat placed in the middle of a flat cornfield!

We are now prepared for one of the main facts upon which our present argument is to rest, and let us here move slowly and be sure of every step we take, as upon this single fact hinges the entire question at issue with the zetetic philosophy. That fact is, that *there is a vast difference in the distance the sun has to travel in a given time in passing over the earth's surface at any given degree of north latitude, as measured according to the two theories.* In other words, while at the equator alone the two rates of the time and distance of the sun's travel over the earth's surface are the same, calculated according to either theory, or about 1000 miles an hour, the difference between the two systems becomes very marked the moment you pass even one degree north from the equator, measured first as a flat earth (receding just that much directly away from the equator), and then measured as a globe, in which the difference in circumference is scarcely perceptible! This difference in circumference, however, between the two systems of measurement, compared with the sun's time of travel, becomes more and more marked as the distance northward increases, every such degree or fraction of degree *taking just that much away from the earth's diameter;* while every such degree, measured around the surface of a globe, *causes but a small fraction only of such diminution*, as will be instantly apparent by applying the dividers to the parallels of our two diagrams.

For example, at 35° north latitude, as at Memphis, Tenn., the difference between the two measurements has increased from *nil* at the equator to *one-third*, in other words, the earth at that parallel is one-third larger in circumference or diameter, measured as a globe, than if measured according to the flat theory. There can be no mistake in this. Take your dividers and rules, gentlemen of the flat philosophy, and begin at once to measure out the inevitable doom of your theory. Don't take our word for it, but do a little sober, solid thinking, and you will see the handwriting on the wall which will require no Daniel's interpretation to make you understand it.

Then journey on nearer the North Pole with your dividers in hand, and stop over one train at the thirty-ninth parallel of north latitude running through Baltimore, and passing right by Mr. Carpenter's door. Let him assist you in measuring the diameter of the earth with his accurate dividers on this parallel, according to the two theories, as shown in our two diagrams, and he will find that instead of a difference of one-third in favor of the globular form, the disparity has largely increased.

Now let Mr. Carpenter, with his "hundred proofs that the earth is not a globe," join the party of exploration and go with them to the fifty-fifth parallel running through the north of England. Let them there halt and apply their dividers to our two diagrams once more, and they will see to their astonishment *that the earth, measured as a globe, is just twice as large in diameter or circumference as if measured on the flat theory; while at 80°, touching the north of Spitzbergen, the earth is just four times larger in diameter or circumference, measured as a globe, than if measured as a flat earth!* Let every believer in the theory of Paralax, before reading a single paragraph further, first satisfy himself fully as to the correctness of these facts by actual measurements, then come with us to the argument based upon them which will forever annihilate the zetetic philosophy.

Here it is, namely: that every accurate survey or measurement of a line running east and west ever made and recorded on the North American Continent, with the true surface distance as chained off compared with the time of the sun's travel over the same surface and distance, corresponds precisely with the globular size of the earth at that particular parallel of north latitude, and as flatly contradicts the flat theory by the very disparities in distances which we have just pointed out!

There is no escape, gentlemen of the zetetic theory, from this crushing conclusion. Take one overwhelming example, as an illustration out of a thousand that could be readily named. Cincinnati and St. Louis are almost due east and west of each other, and nearly on the thirty-ninth parallel of north latitude, at which distance from the equator the earth is very nearly 20,500 miles in circumference, measured as a globe, but less than 13,000 miles measured as a plane or flat surface. Hence as the sun passes around the earth at this latitude as it does at all others, in twenty-four hours, it must here pass over fourteen and a quarter miles of surface a minute, reckoned as a globe, but over only nine miles a minute reckoned on the flat theory. Mark this well.

Now the difference in time between those two cities, as the best time-tables show, is exactly twenty-three minutes, and hence their true distance apart, east and west, should be—$23 \times 14\frac{1}{4} = 328$ miles if the earth is a globe, but only $9 \times 23 = 207$ miles if the earth is flat.

There is no mistake about these figures as being substantially correct, as any one can determine by a few minutes' calculation.

But here comes the climax of our argument, with its crowning culmination against the flat theory. The Ohio and Mississippi Railroad, directly connecting these two cities, runs nearer a due east and west course than any other road of the same length in the United States, and its unquestioned timetable makes the measured distance between the two cities just 341 miles.

Now allowing thirteen miles for diagonal variations from a straight line, which is a fair estimate as nearly as can be calculated from the best railroad maps, and the actual surveyed distance, measured by the best engineers scores of times between those two cities, *corresponds exactly with the earth's form as a globe, namely, 328 miles;* whereas, if the flat theory be true, all the surveyors and engineers who have ever assisted in laying out that road, and in since measuring it over and over, always agreeing in their results exactly, have blundered in their record to the extent of more than one-third of the entire distance, or more than 120 miles! Is such a mistake possible or supposable? We answer most emphatically *no;* and we believe that such must be the response of every honest zetetic philosopher who has intelligence enough to understand and repeat our calculations. Such an honest man must furthermore admit, with this absolute demonstration before him, that every regular survey east and west of every mile of railroad, as well as of every county, state, and township line in any part of North America, or Europe, that has ever been measured by proper instruments, must in like manner correspond exactly with this law of the sun's distance of travel in a given time, keeping it in harmony with the globular form of the earth at the latitude of each and every survey made, and that each one of such surveys must be in direct contradiction to the flat theory. Is any other conceivable view than this possible?

Then, as a few only of our promised proofs of record, we may triumphantly point first to every mile of the boundary lines, running east and west, of every state, nation, and country in the civilized world. Then, also, we point to the thousands of counties in the United States and Canada, and to the tens of thousands of townships, all of whose east and west lines are a matter of record, and every one of which has been surveyed according to the direction of the magnetic needle, and its chained distances made to correspond with the sun's meridian at the beginning and end, or its rate of travel at that particular latitude. In this way it is infallibly demonstrated that every such recorded survey stands as a separate corroboration of the fact that the earth is a globe, since no surveyor or civil engineer, with brains enough to know how to handle his field instruments, would fail to detect even as small an error as one foot in a mile from the true distance of the sun's meridian travel in a given time at a given latitude, to say nothing of his failing to detect a discrepancy of from one-third to three-fourths of the whole distance measured, an error which would constantly occur if the flat theory were true! Hence, in these surveyed and recorded lines alone, so often repeated, we have hundreds of thousands of positive proofs that the earth is a globe.

But how about your promise of "10,000,000 separate proofs of record that the earth is a globe"? asks the inquiring reader! We have not forgotten it, nor have we for one moment lost sight of our great responsibility as editor of the most trustworthy scientific journal in the world, in making such a stupendous promise. Hence, we now come directly to the fulfillment of this seemingly extravagant pledge:

In the first place, there are not less than 40,000 miles of railroads running substantially east and west in the United States alone, to say nothing of similar roads in all other parts of the world, every mile of which has been surveyed and measured according to the compass-needle and the sun's meridian rate of travel in relation to the surface distance chained off, and every mile of such road when finished has been over and over again proved to bear the test of corresponding in distance and the sun's meridian with the globular form of the earth, the same, exactly, as just demonstrated in the case of the Ohio and Mississippi Railroad.

This, however, is only the entering wedge to our 10,000,000 proofs. Every steel rail thirty feet long is ordered by the engineers of the company for each road with the definite and calculated view that it will require just 176 of such rails to reach a mile along its track, as thus surveyed, measured, and recorded, and each of such rails manufactured at the rolling-mill is there measured and cut off to the sixty-fourth of an inch in order to meet the recorded measurement of the track; and this exact length of each rail thus turned out is also placed on record in the books of the rolling-mill company, so that, if necessary, the fact can be sworn to by the foreman.

Now it is unanswerably true, if the earth is flat, according to the zetetic philosophy, *that each of these thirty-foot rails would be from ten to fifteen feet too long for the track, according to the various latitudes where the roads run!* But as every rail turns out to be exactly the right length, taking 352 of them for a mile of single track, or 704 for a mile of double track, it demonstrates that every steel rail thus manufactured and recorded is a separate and very solid proof of record, as much so as the entire road would be, that the earth is a globe. And as there are more than 20,000,000 of such rails now in use in this country alone, on the roads running east and west, and more than two millions more manufactured annually, we have no doubt the intelligent reader will cheerfully accept the result as fully covering our promised "ten million proofs of record" that the earth is a globe.

In view of the character and conclusiveness of the foregoing argument, we have not the slightest doubt, from reading the writings of Paralax, that had it been presented to him before his death he would have publicly and at once renounced the flat theory as a physical fallacy. We now appeal to

every intelligent man who claims to be a disciple of that able and no doubt honest investigator, that he proceed at once, if he still have doubts, to look into and grasp the full force and bearing of this argument. We urge him to invest money enough to employ a good surveyor for a single day, and have him measure off accurately, due east and west, *one minute* of the sun's travel, verified by true meridians, at any convenient latitude: and we now assert, with our reputation in the balance, *that this chained distance will correspond exactly with the globular form of the earth, but will exceed the true measurement for the flat form by more than one-third if the latitude be that of Baltimore or higher!* Will Mr. Carpenter act upon this suggestion? It will be cheaper for him than printing thousands of dollars' worth of pamphlets for gratuitous circulation.

ERRATA:—In our first article, "Is the Earth a Globe?" last month, page 42, third column, thirty-fifth line from top, for "24,000 miles in diameter," read *circumference*. Again, twenty-four lines from top, same column, for "plain" read *plane*. Also the same correction for "plain" in the first column of that page at the thirteenth line from bottom.

SKETCH OF DR. LOWBER.

BY THE EDITOR.

THE subject of this sketch, whose excellent likeness appears on the first page of this ARENA, was born in Nelson County, in the State of Kentucky, August 30th, 1847, and like a majority of men who become distinguished in the walks of life, Dr. Lowber had the good fortune to be the son of poor parents, thus throwing him, early in life, upon his own physical and mental resources to determine his future status among men when the responsibility of manhood should come to levy and collect its tax. That tax-gatherer, when he called upon young Lowber at the age of sixteen, found him ready to respond with something better than money, namely, a brain already stored with original culture up to that date, and burning with ambition to make his mark in the world, with a heart full of courage, and will-power to achieve whatever the most extravagant aspirations of a sanguine temperament could paint.

Nine times out of ten poverty is the greatest earthly blessing that could befall a young man, bitterly as he may feel its biting inconvenience, and such was the fact in the case of the young man whose career we are endeavoring to sketch. The want of means in his budding ambition which forced him, even at the age of twelve, to the necessity of working on a farm in lieu of more congenial and profitable employment, ground his high-strung nature between the upper and nether millstones till the superfine flour of his intellect was seen and read even when between the plow-handles. It was there that he formed the high resolves which have since proved the guiding-star of his mature manhood, and which then and there so wrought him up to earnestness of purpose that his after successes and prosperity could never efface from his memory the inestimable value of those trying ordeals of his youth, and which really made him what he has since proved to be.

When necessity had finally forced a partial reconciliation to his fate, he would carry his school-books with him into the fields of that old Kentucky home, and as the only revenge possible for what he regarded as the fatal star of poverty under which he had been born, while his team was resting would devour the pages of such elementary literature as the home library afforded, as a hungry horse would attack and annihilate the commercial end of a sheaf of oats. It is needless to say that the horses were frequently permitted to rest, and were generally given plenty of time to get their wind again before starting. And when the nights would come to put a stop to the daily plowing, and to give the tired animals a longer rest, to which our hero scarcely ever objected, the tallow dip and the old-fashioned wood-fire were made a substitute for daylight till the midnight family clock, which he had forced himself to heed, drove him reluctantly to bed.

At length the crisis came when he determined to go to college, poor as he was: for his toil had so far only managed to pay his way and clothe him. His friends endeavored to dissuade him from such an undertaking, but he saw deeper into the purposes of Providence in his own case than did those who had not passed through the disciplinary stripes of brain-cudgeling which he had experienced in his early years of farm labor. He went, and with a will to achieve triumphs which no difficulties could circumvent.

It is needless to relate the details of how numberless cords of cord-wood and days of perspiration in the harvest and hayfield brought their precious dollars to subserve the demands of the college boarding-houses, till at last the sunburnt Kentucky plow-boy stood at the very head of the graduating classes in every separate branch of the curriculum. It can now be truly said that very few persons of his age in this country have ever taken a more thorough and varied course of study than has Dr. Lowber. In keeping with the fact that he left no study till he was pronounced perfect in it by his professor after rigid examination, he has made it a rule of his life to do nothing by the halves, but to make his work complete in whatever his hand or brain should find to do. When only in the junior class, he was selected by the president of the college where he graduated to teach a class in Greek, as the Greek professor had recommended him as the most thorough in that language of any student in the university. Dr. Lowber did not study the languages for the special purpose of speaking them, but for the advantages of linguistic science which was almost a mania with him from his youth up. He has studied seventeen different ancient and modern languages, and can write and speak several of them with fluency.

Dr. Lowber is a graduate of Butler University, Indianapolis, Indiana, having taken there both the degrees of B. A. and M. A. He is also a classical graduate of the College of the Bible of Kentucky University. He studied as a post-graduate in a number of eastern universities, and took the post-graduate course in nearly every department. In 1880 he passed the examination for the degree of doctor of philosophy in Syracuse University, N. Y. The examination lasted twenty-five hours, and his examiner, Dr. Bennett, thus speaks of him: "The examination was thorough, and revealed a thoroughness and comprehensiveness of scholarship which justly entitles him to this high honor."

As soon as his various courses of college study had been completed he commenced teaching, and has spent twelve years of his life in the classroom. He has taught every branch from those of the public school up to filling the presidency of a college. His popularity as a teacher is shown in the fact that since he has given his entire time to the ministry he has had several calls to the presidency of different colleges. For a number of years he has delivered an annual address at some institution of learning.

The subject of our sketch has also been successful in the lecture field. He has been connected with nearly all the temperance movements of the day, and his addresses have been highly complimented by Francis Murphy and other great leaders. He has received an invitation from England to enter the lecture field, and devote his time to the subject of temperance in that country. He is at this time associate editor of the *Worker*, a vigorous temperance paper published in Louisville, Ky. He is also a member of the executive committee of the Prohibition party in Kentucky. Dr. Lowber has also been quite successful as a popular lecturer, having lectured in many of the leading cities of this country, and has always received high compliments from the press.

To show what a young man can accomplish without means, we may state that the Doctor has also been a successful writer and an editor of several religious publications. In 1882 he and W. L. Butler became equal editors and proprietors of the *Apostolic Church*. They published this magazine with great success till they were invited to become members of the Guide Printing and Publishing Co., and associate editors of the *Apostolic Guide*. They consolidated the *Apostolic Church* with the *Apostolic Guide*, and the subject of our sketch is now one of the editors of that large weekly.

He has also written for a number of magazines, and his articles have been extensively copied by the press.

While Dr. Lowber has been providentially led into these different fields of usefulness, he feels that his principal mission is to preach the Gospel. In early life he became a member of the Christian Church, and like the late President Garfield he has always remained warmly attached to the cause of that denomination. Few ministers, during the same period of time, have been more successful as evangelists than the Doctor, so much so that he is constantly in receipt of calls for evangelistic work from distant parts of the country—so distant that it is impossible for him to accept them.

As a public debater he stands so high that the churches where he is known are willing to risk their cause at any time in his hands, such is the general confidence in which he is held. Still, with all his immovable firmness in and devotion to the cause and principles of the church of his choice, he is no narrow sectarian in sentiments, but holds and teaches a theology as broad as humanity itself, and so liberal as to be in marked contrast with the over-conservative sentiments of many of the ministers and churches of this country.

He is now pastor of the First Christian Church of Paducah, Ky., one of the largest and wealthiest congregations in the State, and by his popular efforts he has increased the membership, as we learn, fully one-sixth during a single year.

But the special interest which THE ARENA takes in Dr. Lowber, is in his wide-reaching grasp of things philosophical. Indeed THE MICROCOSM, in past years, has had no contributor so ready at all times to compare, contrast, and illustrate the various features, phases, and peculiarities of the philosophies of the ancients, and even those of the modern school, as Dr. Lowber. This bent of his mind was no doubt originally acquired under the instruction of that great master in philosophy and sound reasoning, Dr. O. A. Burgess, president of Butler University. Dr. Lowber's great lecture, for example, on "The Skeptical Tendencies of Philosophy," illustrates this, and has justly excited profound interest wherever it has been delivered; and hence it is not surprising that he should easily have been led to accept the principles of the Substantial Philosophy, calculated as they manifestly were at first sight to combat and weaken this very skeptical tendency so evident in most other philosophical systems.

He became an early contributor to THE MICROCOSM, and his terse and elegantly written philosophical papers we are proud to point to still as among the finest specimens of logical reasoning to be found in those volumes.

Dr. Lowber has delivered many lectures

on Substantialism with telling effect in his various lecturing tours in the South and West, and, as he informed us in his recent visit to New York, he expects in the future to make the Substantial Philosophy a special feature of his lecture work, as he intends prosecuting it before lyceums and other literary bodies.

And we may add in conclusion, that there is little wonder that his lecture halls are overcrowded wherever he goes with delighted audiences, when, in addition to the interest of the lecture itself, each entertainment is brought to a close with an exquisite reading by Mrs. Lowber, one of the most graceful and finished elocutionists we have ever seen or listened to.

A REWARD OF MERIT.

BY THE ASSOCIATE EDITOR.

WE find special pleasure in calling attention elsewhere in this issue to two valuable works published by A. S. Barnes & Co. The books will "speak for themselves." We regard A. S. Barnes & Co. as the best publishing and bookselling house in this country! Why so? When the writer of this article was a little preacher in a little parish, with a little salary ($500 per year), it happened that he very much desired to obtain a certain work on "China and the Chinese." Several booksellers were applied to, but "*out of print*" was the monotonous reply. Finally a line was sent to A. S. Barnes & Co. What did they do but search the land until a second-hand set, in fine condition, was discovered, and sent it on with a *bill* so *small* that it seemed it must be a mistake.

And once again, when several friends had assured us that "Shimeall's Chronology" could not be obtained for love or money, a postal-card to Barnes brought the book by return mail. We are *sure* that the readers of THE ARENA will find the firm of A. S. Barnes & Co. all that can be desired of a publishing house.

This is *not* a paid reading-notice advertisement, but a free-will and unexpected acknowledgment of high merit.

DR. REDDING IN THE PHYSICO-MEDICAL JOURNAL.

OUR readers will remember an allusion to the above named writer which we made in the July issue of THE ARENA at page 31. In that allusion we mildly hinted that it would have been more in keeping with a high sense of honor had Dr. Redding, in framing his series of papers against the wave-theory of sound, given due credit to the "Problem of Human Life," to which he was plainly indebted for his arguments. We expected to receive from Dr. Redding a personal and courteous explanation, with an apology for the omission of such due credit, and that of course would have ended the matter so far as we were concerned; for we were only too glad to see our arguments given to the readers of the *Physico-Medical Journal* even without credit, if necessary, knowing that every intelligent reader who had seen our book would instantly recognize the arguments.

But to our surprise, instead of receiving such a just apology, the July Journal was sent to us containing a most bitter and abusive article from Dr. Redding's pen, charging us with deliberate falsehood and slander, and denying in the most positive manner that he was in any way dependent upon our writings for the arguments he employed against the wave-theory of sound! In introducing this abusive letter Dr. Redding justly declares that if our indictment against him in the July ARENA be true "*then he deserves the most withering contempt of an enlightened public and of all honest men.*"

We cheerfully accept this judicial gauge of the offense as determined by Dr. Redding himself.

Owing to the fact that some one (probably unthinkingly) carried the early numbers of the *Medical Journal* from our office, we were obliged to send to Dr. Hasty, the editor, for a new set after reading Dr. Redding's reply, in order to see carefully just how far we were justified in our original complaint. The abusive bluster of Dr. Redding made us fear either that we might have done him injustice or else that this pretense of injured innocence was a dodge to obscure the real fire with his vituperative smoke.

THE new set of *Journals* kindly sent to us by Dr. Hasty came, however, too late to permit our reply in this number of THE ARENA. Next month, however, if we live, we shall reply, and we will prove that Dr. Redding is not only a plagiarist, but a thoroughly dishonorable man in abusively charging us with falsehood and slander when he knew himself to be guilty of all we had charged against him. We are sorry for Dr. Redding, but it is all his own fault. He might easily have saved himself from the exposure which has now got to come upon him, since we are coerced by his own foolish and abusive impetuosity to give the proofs publicity.

Our Book Shelf.

"MARMONDALE, AND OTHER POEMS."—Of the thousands of volumes of miscellaneous poems issued from the press almost annually, this one, by Mr. Sheldon S. Baker, deserves more than a passing notice. For beauty of rhythm, rhyme, and general smoothness of versification much of it is unexcelled by the productions of the brightest poetical names in our literature; and although the book has been out but a short time, it has become enshrined in the affections of many families on account of its sweetness of sentiment, and to a degree which few new authors have achieved in so short a time.

The writer of this is not an enthusiast for poetical effusions as a rule, barely tolerating them for the sake of those who have a more refined taste for that branch of art; and hence the fact that this is the only work of the kind he has ever read through twice, and that, too, without becoming tired, ought to commend the volume to those who know him anything as he knows himself.

The chief poem of the collection, and from which the volume gets its title, is laid in the Southern States, and is woven from real life-incidents from a very natural plot of plantation scenes, in which figure two wealthy families, a widow-waif of unknown history and character from England, involved in much mystery and fascination; loved by and loving a wealthy slave-owner; a discovery of her early life and misfortunes, including a conspiracy to prove her insane, which led to her flight to America; the breaking off of the love alliance on the part of the wealthy Southerner, and his acceptance and marriage of a wealthy young lady as her rival; the desperation of the heart-broken widow, and her terrible resolve to murder the whole family by poison and fagot; and her final ending of the scene by suicide from a cliff, all combine to form a tale of startling incident and exciting expectancy from the opening to the close of the narrative. In addition to the story proper, this central current of chief excitement is constantly shaded off with by-play incidents of the plantation happiness among the slaves, with numerous religious and ridiculous songs interspersed, such as were common in slavery times.

Mr. Baker is a natural-born poet of no mean talent, and had he begun his calling in early life (this being his first effort at the age of seventy-three) he would, no doubt, have won an enviable reputation among American readers long years before this poem was written. The book is superbly bound, and printed on excellent paper. Price, $1.50. Address the author, Saratoga Springs, N. Y.

THE PENDULOGRAPH.—We have received from the Rev. John Andrew, of Belfast, Ireland, a very artistic little volume called the "Pendulograph." The book takes its title from an apparatus consisting chiefly of two pendulums with pens attached, and so adjusted as barely to touch paper as they swing. The result is, that the most remarkable and beautiful drawings ever seen by human eye are produced on this paper by the various manners in which these two pendulums oscillate together. Just how the apparatus operates mechanically to effect such results, is not described in the book, and concerning which for the present we are left in the dark. Possibly we may in the future some time be able to obtain this information, when we will try to describe the device to our readers.

The idea as well as object of the invention is, as Mr. Andrew tells us, to show the undulatory curves of the air-particles in the generation of various tones, on the supposition that sounding instruments vibrate by the same law that controls the pendulum swings. Possibly this may all be true, but how the air-particles can be shown or even imagined to cut such wonderful figures as here formed by the combination curves of these two pendulums swinging in their diverse relations to each other, is a mystery we shall not try either to explain, admit, or deny till the "pendulograph" itself shall be placed in operation under our inspection. If Mr. Andrew will send us electrotypes from two or three of the cuts representing his most marvelous figures as printed in his book (some twenty of which appear), we will present them to the readers of THE ARENA, with such explanation of the mechanical working of the machine itself as he will enable us to give.

THE FURNACE.—This is a pamphlet of about sixty pages containing a discussion of several subjects, including "Total Depravity," "Soul Capacity," "Divine influence of the Spirit," "Call to the Ministry," etc., and is put by the author in the form of a dialogue between a "Methodist" and a "Campbellite." Of course Mr. Nichols conducts both sides of the discussion and puts his Campbellite opponent into numerous predicaments by the answers he is made to give. It would no doubt have been altogether more exciting had there been a live Campbellite present to have shaped his own part of the dialogue in his own way. Still Mr. Nichols shows remarkable tact and skill in framing his argument and weaving together texts of Scripture in such a manner as to entangle his opponent; especially is this true where he discusses the substantial character of the soul, from page fifteen to twenty-five, in which he shows the personality of the "inner man" with some of the most convincing Scripture arguments for Substantialism we have yet read. Published by the author. Rev. J. H. Nichols, Bethel, Giles Co., Tenn. Price, 10 c.

THE KINGDOM.—We have received a copy of this new monthly journal devoted to "Full salvation and the deep things of God." It will not be necessary for us to say anything more in regard to its editorial management than that it is edited by Capt. R. Kelso Carter, our old and reliable contributor to THE MICROCOSM. It is neatly gotten up, and those who are interested in such reading matter cannot make a better investment of $1.00 than by sending it to The Kingdom Publishing Co., Chester, Pa., for the magazine for one year.

LAW AND ATONEMENT.—It is positively refreshing in these days to find a book in the theological field that is worth the reading. The stale religion and false science clumsily tied together and sent not by the long-eared

servants of Balaam are so plentiful, that when a work of real merit and value appears we are rejoiced to give it wide mention.

And when we state that we have been charmed during the *dog days* by a profound theological work, the reader will only need to know that the book is known as "Atonement and Law," by John N. Armour, to go and do likewise. The field is new, the thoughts original, the arguments able, the position sound.

A book of only 236 pages, divided into two parts, "Law—Moral and Natural," and "Atonement," respectively.

The chapters on "Motion, Force, and Life," and "The Latest Idol," are the best things we have ever seen in print.

If only the "Concord School of Philosophers" could only read, we would gladly ask them to consider "the thingness of the Here" of this passage: "The day for the worship of images of gold on plains of Dura has gone by. . . . The idol for the present age must not be one that is constructed by cunning workmen, at the bidding, and by the munificence of monarchy. The idol of the present day, the only idol, the only *kind* of idol that men in this age can be induced to worship, is one that is devised and fashioned by the 'best modern thought.' And even this idol must be set up on a plain so high, so distant, so inaccessible that the worshipers shall see it but dimly and afar off. So also other notes than those of cornet, flute, harp, sackbut, psaltery and dulcimer must be relied on to call the millions in our day to fall down and worship. Axioms, truths, principles of natural and moral law, or 'the nature of things,' self-existent and independent of all else, furnish the fine material for the image. The best modern thought, at the bidding of science, constructs the image." But we cannot show the beauty and strength of such a work by many extracts. Every soul interested in truth delightfully put should possess "Atonement and Law." The Christian Statesman Pub. Co., 1520 Chestnut Street, Philadelphia. $1.50.

BARNES' COMPLETE GEOGRAPHY, and a NEW PHYSICAL GEOGRAPHY are the titles of two most excellent text-books by the eminent scholar, James Monteith.

The geography is certainly the most "complete" work of the kind we have ever seen, including many features wholly new, but of great value to such a work. The student is led by what he has observed up to and along related facts by attractive steps. The illuminated maps afford at a glance more information about the general character of the earth than could be otherwise gathered from long study.

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Publishers' Department.

Public Opinion.

Accept my hearty thanks for sample copy of THE SCIENTIFIC ARENA. I have carefully looked over it, and from No. 1, together with your "Prospectus" for the remaining numbers, conclude that it will be a very valuable journal. The articles are all thoughtful and good, several of permanent value, and—to make a long story short—I want it.—R. H. GILBERT, pastor Grace M. E. Church, Williamsport, Pa.

As the wise men of the East hailed the appearance of the Star of Bethlehem, so do I receive THE SCIENTIFIC ARENA, and believe that the philosophical arguments in favor of the Christian religion which appear on its pages will . . . overthrow the infidel strongholds.—J. L. BRIGHT, M.D., New Castle, Ky.

Yesterday I received a copy of THE SCIENTIFIC ARENA, and I have fed from its bounties until every page has been read, but I am hungry for more.—W. A. HENNEGAR, Francesville, Ind.

After a careful reading, I am of the opinion that it is a first-class literary journal; indeed, I think it is *the* religio-scientific periodical of the age.—J. W. TROTMAN, Hertford, N. C.

Have read with great delight the first number. I regard it one of the most important and useful additions to our literature.—REV. G. DUEBENDORF, Mound Prairie, Minn.

There is more good reading matter in one number than some other scientific journals that cost five times as much have in a whole year.—JACOB BAKER, Swanton, O.

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Our friends are doing well in getting up clubs. The Rev. Dr. Swander has already sent us the names of more than sixty subscribers of his own soliciting, and promises to push the work to the end of the year. Dr. Swander is one of the Substantialists who have come to stay, and we are rejoiced to know that there are a good many of the same kind.

Our Flat-Earth Series.

As a justification for this discussion, ridiculous as the zetetic philosophy may appear to students of astronomy, we see it announced in our city papers as an item of foreign news that a company has been organized in London for publishing a magazine devoted entirely to proving the earth to be flat and for overturning the globular theory as taught in the Copernican system. A letter also just received from a correspondent as we go to press, informs us that Mr. Proctor, the eminent astronomer and lecturer, in a paper in the new *Encyclopedia Britannica*, has admitted that the *flat theory* fairly accounts for every appearance of the solar system! This surprises us beyond measure. We shall look it up before our next issue, and if that distinguished disciple of Sir Isaac Newton has made any such concession to the flat theory as here intimated we shall consider that we have a foeman worthy of THE ARENA'S steel. So look out for astronomical fun for the patrons of THE SCIENTIFIC ARENA.

Our Portrait Gallery.

NEXT month we will give the portrait and sketch of Dr. John Kost, M. D., LL. D., Chancellor of the Florida State University, and whose interesting paper on the "Geology of Florida" appears in this number. The following month's ARENA will contain the portrait and sketch of Rev. F. Hamlin, D. D., Ph. D., whose paper on "Truth" in this number will no doubt be read with pleasure by every subscriber.

A Valuable Hint.

LET those who think, and who want something worth thinking about, and who would wish to lay up a store of knowledge based on facts which can never grow dim by years, but which will shed floods of light on surrounding nature as age creeps on and the frivolities of life become evanescent—let all such subscribe for THE SCIENTIFIC ARENA, and induce their friends to go and do likewise.

Articles Crowded Over.

SEVERAL papers which we desired to print in this number of THE ARENA were crowded over till next month for want of room. Among these was one from Dr. J. W. Lowber on "Modern Science and Substantialism," and one by Eld. Thomas Munnell on "The Two Hemispheres." Also two important editorials.

Answers to Correspondents.

WILLIAM WILLIAMS.—If you know of any intelligent man who "holds that the devil is part of the Godhead," don't disturb him, only to urge that he hold on to his idea, and not let it escape him.

G. W. PARNELL.—Mott's lecture on Sound is published by Wiley & Sons, New York. Price, 50 cents.

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A MONTHLY JOURNAL

Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph. D., L.L. D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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IS THE EARTH A GLOBE? No. 8.

ZETETICISM AGAINST ITSELF.

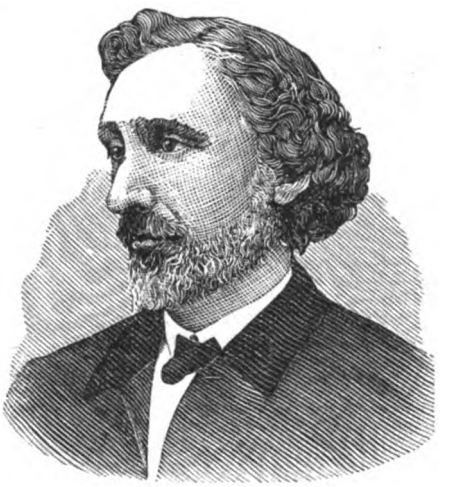
BY THE EDITOR.

IN our last month's paper we showed by *millions* of direct proofs that the earth was a globe—that method of demonstration being unquestionably new to the scientific world. In the present paper we purpose to turn the zetetic philosophy against itself, and, by another class of arguments and facts equally new to science, to demonstrate from "Parallax," Carpenter, and Hampden that nothing is needed except the flat theory itself with which to annihilate it.

The chief hobby of these philosophers, upon which their reasoning and claimed experiments are most prolific of defiant assertions and weak misapprehensions, is the assumption that the surface of all standing water is perfectly *flat;* whereas, if the earth is a globe the surface of all still water should be convex or oval, to correspond with a segment of a spherical surface 24,000 miles in circumference. As intimated in our first article, so confident was Mr. John Hampden that no convexity would be found to exist on the surface of still water, being a firm believer in the published experiments of Parallax, that he wagered $2500 with Alfred Wallace in 1870 that experiments on the Bedford canal in England over a distance of six miles would show no convexity. The details of this famous contest are given in the published writings of Parallax and Carpenter, and although Mr. Hampden lost the wager, it is the firm belief of every zetetic adherent in the world that he was cheated out of his money by an unjust decision. Be this as it may, we will not waste time by going over such experiments to prove that Mr. Hampden was fairly defeated, but will now examine the facts and appearances which occur on the surface of still water with the admission of flat theorists as our guide.

It is well known to every one who has been out at sea, or even along a sea or lake coast, that the hull of a distant ship seems to sink out of sight; and as it passes still farther away the lower sails disappear, until finally the top sail, 100 feet above the water and twenty miles away, will disappear below the surface to an observer standing on the deck of another ship ten or twelve feet above the water's level. This well-known fact is admitted by Parallax and other believers in the flat theory; but it is urged most ingeniously and elaborately that this sinking of the distant ship below the horizon is not owing to the curvation of the water's surface at all, but is accounted for by a law of perspective by which the angle of vision is contracted as the ship recedes till we lose sight of it, and it thus appears to sink below the surface.

Now it was not our intention to stop here and refute this reasoning, which can be done



CHANCELLOR J. KOST, M. D., LL. D.

[For Sketch, see page 75.]

by the single statement of fact that nothing can ever disappear below the horizon of a perfectly flat or plane surface so that it will not come into full view by the aid of a telescope powerful enough. An object may become apparently too small in the distance, by perspective, to be seen with the naked eye, but instantly a good telescope will bring it into full view if the intervening surface be not convex, so as to obscure the line of sight. But no telescope, however powerful, can bring a ship in sight after its top sail has disappeared below the horizon, even with the water perfectly calm; whereas, if the water's surface were flat, as the zetetic philosophy teaches, a ship might go a thousand miles away and be lost for days to the unassisted vision, but would be instantly brought into full view by a powerful telescope. This is in the very nature of things, and stands alone as a wall of adamant against the flat philosophy.

But this is not what we are aiming to discuss in this paper, and have only referred to it as a preparatory step in turning the theory against itself. Let us here digress for a moment to bring in another feature of the theory before using this fatal assumption that all disappearances of vessels over the surface of water is by the law of perspective alone.

Parallax, Carpenter, and all other defenders of the flat theory teach that the daily travel of the sun around the earth *is not around the earth at all in the sense of passing below it or underneath us,* but that the sun simply circles around the north pole, keeping all the time at one uniform distance (700 miles) above the flat surface, and that it only rises and sets by disappearing in the distance according to this same law of perspective by which a ship is made to disappear in the distance, and that the observed setting of the sun below the surface of the ocean, when out at sea, has nothing to do with the supposed rotundity of the water.

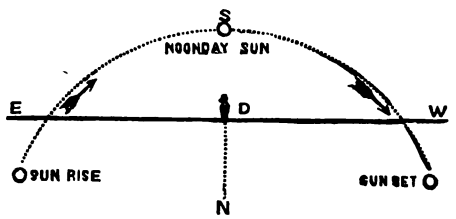
The flat theory further teaches that the annual travel of the sun north of the equator 23 1-2 degrees to the Tropic of Cancer (June 21st), and its annual travel south of the equator the same distance to the Tropic of Capricorn (Dec. 21st), consists simply in alternately enlarging and diminishing the circumference of its circles spirally around the north pole, keeping all the time at the same elevation, or about 700 miles above the earth's flat surface. That is to say, when its circles are contracted to the smallest diameter on June 21st, it is vertically overhead at noon to the observer on the Tropic of Cancer, which line passes through Havana, Cuba. There it stops circling northward or inward, and at once begins to increase its circles outward or southward, which become spirally larger and larger daily till on Dec. 21st an observer at or near Rio Janeiro, Brazil, on the Tropic of Capricorn, again sees the sun precisely overhead at noon. Parallax, the founder of the zetetic system, and the highest authority on the subject, says in his book, at page 104: "Hence it is demonstrable that the distance of the sun over that part of the earth to which it is vertical (the Tropic of Cancer, for example, June 21st), *is only* 700 *statute miles,*" "and that all the visible luminaries in the firmament are contained within a vertical distance of 1,000 statute miles. From which it unavoidably follows that the magnitude of the sun, moon, stars and comets is comparatively small—much smaller than the earth from which they are measured, and to which therefore they must of necessity be secondary and subservient."

Now for a little serious amusement at the expense of this unfortunate law of perspective, which *alone,* remember, causes the top sail of a ship 100 feet high to disappear or sink below the surface of the water in a distance of twenty miles. Admitting this disappearance to be caused alone by the decrease in the angle of vision, according to this zetetic law of perspective, *how far would the ship have to go to cause its top sail to sink out of sight by the same law of perspective, supposing the said top sail to be* 700 *miles high, and as luminous as the sun?* Let the zetetic advocate who reads this take his pencil, and in one minute he will see that such top sail, the height of our sun, according to zeteticism (700 miles), would have to travel straight away over the flat ocean more than 339,000 miles from the observer in order to do what a common ship sail does—that is, disappear by the law of perspective in twenty miles! Yet the sun, 700 miles directly overhead at noon in the latitude of Havana, Cuba (June 21st), *sets and disappears by perspective alone in going less than* 1000 *miles away, if there is any truth in zeteticism.*

Shall we give the proof? Here it is: The

whole circle the sun has to travel around the north pole in twenty-four hours on June 21st, according to Parallax and the flat theory, is less than 6000 miles in diameter, as that would be the diameter of the flat earth twenty-three and a half degrees north, or inside, of the equator. Now, a segment of 1000 miles of travel by the sun around this circumference could easily be seen to swerve to the north of the observer as it would sweep from its overhead position in its circuit around the pole. But what is the fact? Why, it is an absolute and well-known fact, as all zetetic advocates will admit, that to an observer on the Tropic of Cancer, June 21st, *the sun does not vary northward, from its noon position vertically overhead in the slightest degree, till it sets below the water's surface exactly west of such observer!* Hence, as the sun shows no perceptible segment of its claimed circle around the north pole, it cannot, therefore, travel but a very trifling fraction of 1000 miles before this prodigious law of perspective so contracts the angle of vision as to bring the sun below the surface of the flat ocean, though, as just shown, it ought to stay in sight when 339,000 miles away by the very zetetic process that keeps the top sail of a ship, 100 feet high, in sight for twenty miles! If this is not turning zeteticism against itself, then we fail to grasp the meaning of such a process.

But before bringing this *perspective* phase of the argument to a culmination, it will be necessary to copy one of the diagrams of Parallax, from his book, page 106, by which he aims to present ocular proof that the sun swings concentrically around the north pole, all the time 700 miles above the flat earth, as we have stated, and that it sets by merely diminishing the angle of vision in the distant part of its perfectly horizontal circle over the horizontal earth. Here is the cut:



In explaining this diagram, Parallax remarks:

"The following simple experiment will be interesting as demonstrating the fact that the sun's path is concentric with the center of the earth's surface. Let the observer . . . draw a line due north and south, and a second line due east and west across the first. Now stand with his back to the north (at D). Being thus at his post and ready for observation, let him watch carefully for the sun's first appearance above the horizon; and he will find that the point where the sun is first observed (*sunrise*) is considerably to the north of east, or the line drawn at right angles to north and south. If he will continue to watch the sun's progress until noon, it will be seen to ascend in a curve southward until it reaches the meridian (S); and thence to descend in a westerly curve till it arrives at the horizon, and to set considerably to the north of due west as shown in the diagram (*sunset*)."

Having thus prepared the way by quoting Parallax, let us begin the work of demolition. In the first place we cheerfully concede that the diagram represents the true appearance, somewhat exaggerated of the sun's apparent movement as observed in the northern latitudes, but which exactly, as every one knows, corresponds to the stationary sun and the globular earth turning on its axis, with the observer, say, forty degrees north of the equator. Parallax does not pretend to deny but that such a revolving globe and stationary sun thus observed would give exactly the appearance his diagram sets forth; but he insists that the flat theory gives the same appearance, while the latter, being much simpler and in perfect accord with the teachings of Scripture, ought to be preferred. Let us see if the diagram can be made to conform to the flat theory. To test and explode it thoroughly, so that a beginner in science can grasp it, let us start south with our diagram before us, and every degree we travel (making our observations all the time on the twenty-first of June, when the sun is farthest north), we will find the point of sunrise and sunset constantly approaching nearer and nearer to the east and west line, with the sun's inclination decreasing in like proportion, till at last we take our stand on the Tropic of Cancer, twenty-three and one-half degrees north of the equator, and, to the utter confusion of zeteticism, the point of sunrise and sunset, as already hinted, occurs exactly on the east and west line with all circling of the sun's path southward abolished, its course being from due east vertically overhead at noon, and finishing by going due west from this vertical point and sinking out of sight at W. without the slightest curve toward the north!

Now, will Mr. Carpenter tell us why the sun behaves so outlandishly as to quit circling northwardly around the pole the moment we happen to get perpendicularly under it at noon, and instead of disappearing by the law of perspective in the far northwest as it travels 700 miles above the flat earth around the polar regions, let him try to tell us why our great luminary loses its head, forgets that it is curving in a horizontal circle northward, and thus keeps on due west till it drops out of sight? No possible explanation of this state of facts can be given by the flat theory, while it is perfectly simple and consistent with the globular form of earth, revolving as it does both on its axis and around the sun, with its axis inclined twenty-three and a half degrees toward the plane of its orbit.

Now we are in deep earnest at this point, with the whole fraternity of flat philosophers, as the diagram here copied is their own standard argument, and their own ocular proof that the earth is flat, and that the sun merely circles horizontally around the north pole every twenty-four hours, instead of actually going around the earth, and that it only appears to rise and set at a distant part of this circle, where we lose sight of it by the angle of perspective. We assert that a man with education enough to make a straight mark east and west in the dirt, and then hold his hat on a pole vertically above his head, thus representing the sun at noon on June 21st, at the Tropic of Cancer, would know positively, if he moved his hat directly over the line pointing west, that such motion could be no part of a horizontal circle northward. Yet we are actually obliged to reason with zetetic philosophers to make them see this absurdity, even after they admit, as they do, that the sun does rise exactly in the east, pass vertically overhead, and set exactly in the west at the latitude named on the 21st day of June!

In the name of all that is science, where should the sun be, where can it be at *midnight* except on the opposite side of the earth directly under our feet, after thus rising exactly in the east, passing vertically overhead, and setting exactly in the west? Yet zeteticism dares to teach, in the face of such facts, that this sun at midnight is due north 700 miles above a horizontal earth and less than 6000 miles away from the observer, even when its own perspective law, by its own illustration of a distant ship, should keep the sun above the horizon and in plain sight when more than 339,000 miles away! Will these philosophers, we now ask, persist in stultifying their reason and thus meriting the contempt of all educated or thinking people by not at once admitting in the columns of this journal the destruction of the last hiding-place of the flat theory by this proper application of their own diagram?

But the self-annihilation of zeteticism by its maladroitly introducing the facts set forth by this unfortunate diagram, has only fairly commenced its work by going as far south as to the Tropic of Cancer. Let us travel on southward a few degrees farther toward the equator, still watching the diagram, and making our observations as usual on the 21st of June, when the sun is still vertical over the Tropic of Cancer; and now, instead of its rising due east and setting due west, to the consternation of zetetic philosophers, it rises south of east and sets south of west, while, instead of passing directly over head, as when observed on the Tropic of Cancer, it now begins to incline northward at noon, and increases this northern inclination more and more as we journey on south, till finally, before we have passed Brazil, the diagram of Parallax has become entirely transposed, the sun rising as much south of east and setting as much south of west as it did north of these points when we started from New York City! And by still continuing on southward into Chili, or to the same degree of south latitude as New York is in north latitude (about forty degrees) we will there find the same short days and long nights on June 21st, when the sun is vertical over the Tropic of Cancer, that we experience in New York on the 21st of December when the sun is vertical over the Tropic of Capricorn, and *vice versa*, all phenomena and appearances of the heavens in that southern latitude, including the southern pole with its circling stars, being precisely the same in astronomical effect as at the same degree of north latitude, and when gazing northward.

Thus culminate our first terrific examples of zeteticism against itself. The very diagram and argument by which Parallax demonstrated the earth to be flat and the sun to circle horizontally around the north pole have proved conclusively the opposite state of facts by simply taking the same diagram on a trip for its health to the sunny South.

The truth is, if the apostles of zeteticism would take the trouble to write down to the professor of astronomy or mathematics in the American College at Concepcion, Chili, 36 deg. S. lat., and get him to measure accurately one minute of the sun's travel due west, they would end all their talk about the earth being flat by learning to their edification that old Sol passes over the same territory in one minute there that he does at the same degree of north latitude, and not a single acre more.

REVIEW OF PROF. DRUMMOND'S BOOK

BY H. F. HAWKINS.

WE are aware that it is not considered judicious for one to combat the views of those who disagree with him. The result would be a constant warfare. Many things appear in our best publications that in some cases we regard as next to absurd, but we hold our peace and thus save a war with good writers. Quite recently, however, we have been so deeply impressed with the fearful consequences that may, and logically do follow a late English book that we cannot refrain from at least sounding a word of alarm. Especially as the work comes in the name of Science and Christianity, from high authority. We are acquainted with two able divines who have accepted its teachings unreservedly, and from some references to the work by contributors of THE MICROCOSM, we apprehend others have done likewise. The work to which we refer is from the pen of Prof. Henry Drummond, F. R. S. E. and F. G. S., entitled "Natural Law in the Spiritual World."

We enter upon the criticism of this work

with a full knowledge of the greatness of our opponent, and with a full knowledge of the fact that he is held in high regard by many of your readers. Hence, it becomes us to guard our language and prove every charge. We do not assert that Prof. Drummond intended any evil results to follow his book, quite the contrary. In many respects it is a wonderful production, but like a box of glass, it should be labeled "Handle with care." Prof. Drummond is an out and out evolutionist. Not only so, but he out evolves evolution itself, and carries the doctrine further than any materialist has yet ventured. It is to show the ruinous effects to Christianity, that unavoidably follow every attempt to reconcile it with what is known as Theistic evolution that this criticism is chiefly written. As a believer in religion and the authenticity of the Scriptures, as well as a Substantialist in the scientific field, we now have little patience with any theory of evolution. We must either believe that "God created man," and all things else as Moses declares, or we must flatly deny it. There is no possible middle ground upon which to stand, and with one eye turned upward toward where we imagine Heaven is, accept the Holy Scriptures as the authentic word of God, while with the other eye we gaze upon the phalanx of literary magnates and court their friendship and the applause of the so-called scientific world, by accepting either wholly or in part their doctrine of evolution. Here are the two poles of human belief upon this subject. It is either yea, or nay. The first is the simple and reasonable statement of Moses, and our consistent Christian belief. The second is purely atheistic and destructive to all our religious ideas.

There is no consistency, nor anywhere in nature can a warrant be found for saying: A part has been created and a part evolved. If evolution has produced one thing it has produced all, and nothing is the result of creation. No Substantialist can for a moment accept any theory of evolution, no matter by what name it is called. All these different theories, though they appear to differ much, like the radii of a circle or the spokes of a wheel, when we begin on the surface and trace these lines back, they all lead with unerring certainty to a common center. So evolution in any place in the end logically dispenses with a God. We propose to show in our criticisms that Prof. Drummond has delivered himself and his cause which he sought to defend into the hands of materialists, and that the only hope for him is to call a sudden halt, return to the simple statement of Moses, accept the Substantial Philosophy, and forever denounce and renounce all fellowship with evolution, in any shape, manner, or form.

We therefore propose to prove that the Professor is an evolutionist; not only so, but he includes man as a creature of evolution, and even carries the doctrine into the spiritual kingdom. We know one minister who has ventured to deny that Drummond taught the "evolution of man," having carefully read the work as he said, and pronounced it "very fine." So it is perhaps best to prove it abundantly, as few will be so ready to accept it so freely when they realize that such is a prominent doctrine taught therein. We first quote at length from pp. 405 and 406: "Evolution began, let us say, with some primeval nebulous mass, in which lay potentially all future worlds. Under the evolutionary hand, the amorphous cloud broke up, condensed, took definite shape, and in the line of true development assumed a gradually increasing complexity. Finally, there emerged the cooled and finished earth, highly differentiated, so to speak, complete and fully equipped." Now mark, that here he accepts the nebular hypothesis, and that this was the very first, the beginning of evolution, and it "began with some primeval nebulous mass—an amorphous cloud." "And what followed?" he asks. "Let it be well observed—a catastrophe. Instead of carrying the process further, the evolution, if this is evolution, here also abruptly stops. A sudden and hopeless barrier—the barrier between the inorganic and the organic—interposes, and the process has to begin again at the beginning with the creation of life. Here then is a barrier placed by science at the close of the inorganic similar to the barrier placed by theology at the close of the organic. * * * Any objection, then, to the catastophe introduced by Christianity between the natural and spiritual kingdoms applies with equal force against the barrier which science places between the inorganic and the organic." Yes, if the barrier between the natural life and the spiritual life is sufficient to cause a break in evolution, then the similar barrier in the way of science causes another break. Well, we don't care if it does. There ought to be a dozen breaks, if that number would cause it to be abandoned.

But, proceeding he says: "What then becomes of evolution? Do these two great barriers destroy it? By no means. But they make it necessary to frame a larger doctrine." Ah, indeed! According to Prof. Drummond's own logic these breaks do not give him any warrant for assuming that God or Christ comes in to fill the breaches by creating life, for they only strengthen it. On page 407 he says: "However paradoxical it seems, it is nevertheless the case that two barriers are more easy to understand than one—two mysteries are less mysterious than a single mystery. For it requires two to constitute a harmony." Again, on page 28. he says: "Had no place remained for mystery, it had proved itself both unscientific and irreligious." Nothing, then, is more natural than to expect a mystery in connection with evolution. In fact, if it had no mysteries, then it would be "unscientific." For he says: "A science without mystery is unknown. A religion without mystery is absurd." (Page 28). That mysteries do exist, and that they do so necessarily, are very different propositions. The first is true, the second is not true If, however, he is right, then these mysteries are only the evidence that evolution is scientific, and he has no right to call in God's creative power or any other theory to explain or solve them. In fact, he should not attempt to solve them, for, if he should succeed, then evolution would become "unscientific." Let us turn aside for a moment to consider this remarkable statement. Science is simply perfect knowledge. But according to Drummond, science depends for its scientificness upon a mystery—*something unknown*. Hence it follows: that all true science—all perfect knowledge, is based upon something unknown, and "unscientific" *because it is unknown*. How is that for a scientific magnate of Europe? Science is unscientific, and perfect knowledge is not thoroughly understanding. Then there is no such thing as true science. But, again, whenever we learn so much of anything that the last mystery is solved, and all the "whys and wherefores" are thoroughly understood—reduced to a state of absolute knowledge, then it becomes "unscientific." When Christ was here upon earth, He certainly understood perfectly His mission. There was to Him no mysteries whatever in connection with our religion and the plan of salvation which he established. But, understanding it all, it was to him "both irreligious and unscientific." Then Christ being an "irreligious" man might be a very poor example for us to follow. We should naturally conclude that God was the greatest of all scientists, but it now turns out if Prof. Drummond is right, there is nothing either scientific or religious about Him, seeing there can be no mysteries with an *all-wise God*. The truth is, modern scientific theories for the most part are living upon mysteries, and as soon as they are solved, many of the theories will be exploded—among them evolution. We forbear to trace these thoughts any further, but leave the Professor to the sympathy of the reader, and in his behalf we quote a sentence from his own book, p. xvi., pref.: "When I began to follow out these lines, I had no idea where they would lead me."

Next, we propose to show that he teaches the "Evolution of Man." In treating upon the subject of degeneration, he refers to the fact brought out by Mr. Darwin, that if a flock of tame pigeons, of all colors and tints, be turned loose upon an uninhabited island, in a few years their descendants would all be of one color, and adds: "It is as if the original bird, *the far remote ancestor* of all doves, had been blue, and these had been compelled by some *strange law* to discard the badges of their civilization, and conform to the ruder image of the first. The *natural law* (not so very *strange* then), by which such a change occurs, is called *the principle of reversion to type*. (Last italics his.) A garden is planted, let us say, with strawberries and roses, and for a number of years is left alone. In process of time it will run to waste. But this does not mean that the plants will really waste away, but they will change into something else, and, as it invariably appears, *into something worse*. If we neglect a garden plant, then, a *natural principle* of deterioration comes in, and changes it into a worse plant. And if we neglect a bird, by the same *imperious law* it will be gradually changed into an uglier bird. Or if we neglect almost any of the domestic animals, they will rapidly revert to wild and worthless forms again.

"*Now, the same thing exactly would happen in the case of you or me.* Why should man be an exception to any of the laws of Nature? Nature knows him simply as an animal—sub-kingdom, vertebrata, class, mammalia, order, bimana. And the law of reversion to type runs through all creation." Pages 97, 98, 99.

Now, clearly, this means that man would revert to the "far remote ancestor" of all animals, from which he, together with them all, has been evolved, just the same as the bird, garden plant, and domestic animals revert to their original stock. There is no escape from this conclusion, and, if there was not another sentence in his book pointing in that direction, this, alone, would fasten upon him the evolution of man. But let us prove it again. On page 402, speaking of the wonderful works accomplished by evolution, he says: "Man, her most rich and finished product, marvelous in his complexity, all but Divine in sensibility, etc." Surely this is enough, but let us prove it again. On pages 409 and 410, treating of the differences between man and other animals, he says: "The only question is whether they (the differences) are of such a kind as to make it necessary to classify man in a separate kingdom. And to this the answer of science is in the negative. Modern science knows only two kingdoms—the inorganic and the organic. A barrier between man and animals there *may* be, but it is a different barrier from that which separates inorganic from organic. But even were this to be denied, and in spite of all science it will be denied, it would make no difference as regards the general question. It would merely interpose another kingdom between the organic and the spiritual, etc.

"Any one, therefore, *with a theory to support* as to the exceptional *creation of the human race*, will find the present classification elastic enough for his purpose." We could multiply these quotations, but cannot believe a man on earth, who possesses his reason, could ask any more. While the Professor grudgingly allows those *with a theory to support as to the creation of man*, to believe it, he shows most emphatically that he does *not* believe it. These quotations are so clear

and pointed that to comment further upon them would be to insult the intelligence of your readers. So we pass to the third and more important point, to wit: that he embraces the spiritual kingdom within the scheme of evolution.

[*Concluded next month.*]

MAN'S RELATION TO HIS MAKER.

PRES. J. M. SPANGLER.

If through some economy of nature, such as "natural selection" or "survival of the fittest," one race of animals owes its existence to some inferior race, then there ought not to be such a world of difference between them. The writer of this article once saw a sow that had among her litter of pigs, one that was not a pig, but was, in every essential, excepting size, an elephant. While the sow was white, and the rest of the pigs, five in number, were white, the elephant-pig had the bluish color of all elephants—was hairless, thick skinned, had a perfect trunk, two miniature tusks, large legs, and toes instead of hoofs. If this is an argument in favor of evolution, then I say that nature has made an egregious blunder in separating the life of a hog from the life of an elephant by such an impassable gulf.

Now I assert, in the very face of popular belief, that no such wide gulf of separation exists between man and his Maker. How do we get our ideas of God? The brute, with an eye often more keen and piercing than our own, looks upon the universe, and the great panorama, to us filled with unutterable glory and wonder, is to him a complete blank. *Kindred minds alone can have a commutual understanding;* and I assert without fear of contradiction, that we obtain our whole ideas of God, and are able in a measure to comprehend his glory, only in proportion as he has revealed himself in us, and we are *like him* in possessing his attributes. How do we know that God is a being of love? How? Simply because he has implanted within us the divine attributes of love and wisdom that enable our higher or spirit nature to comprehend his own wonderful nature. How do we know of God's goodness, his mercy, his wisdom, unless it be that we have implanted within our souls, in vastly less measure of course, these same attributes of moral perfection? And possessing these attributes of the divine mind and character of God, have we not within us the seeds of immortality, and the tracing of infinity, that separate us entirely from the brute creation, and mark us down with a surety as belonging to God's own family? Were the inspired writers mistaken when they declared that "as many as received him, to them he gave power to become the *sons of God*," and "as many as are led by the spirit of God, they are the *sons of God*?"

Again, I claim that the *capabilities of the human mind* are such that they, of themselves, classify man as belonging to the order of beings found in heaven. The monkey, that exalted creature of evolution, is about as wise when ten days old as he is when ready to lie down and die full of years. If we imagine him endowed with an immortal nature, so that his monkeyship could live and develop forever, what is there to develop? Without a tracing of the Divine Nature within him, such as love, justice, mercy, goodness, all that could develop would be his animal nature—appetite, passion, cunning, hatred; and as these would continue to grow, he would become a terrible demon of appetite and malignity. But when we consider the unlimited capacity of the human mind to develop, and become more and more like God, I, for one, cannot restrain the hope that it awakens within me. I forget the cares, worries, and disappointments of life in the thought that I shall rise above the earth and its circumscribed conditions, to forever develop the tracings of God's own character, now feebly outlined in my own distinct existence. Dr. Channing, in speaking of the wonderful growth of the human mind, says: "I apprehend that the distance between the mind of a Newton and a Hottentot may have been as great as between Newton and an angel. . . . This Newton, who lifted his calm, sublime eye to the heavens, and read among the planets and stars the great laws of the material universe, was, forty or fifty years before, an infant, without one clear perception, and unable to distinguish his nurse's arm from the pillow on which he slept." But if that majestic mind could so develop in the short space of fifty years, what must be its outcome? What can it be even now, since it has ever gone on developing in the abode of the blest? And what will it be in ten thousand times ten thousand years? Oh, the glory and the hope such a thought awakens! In the true dignity of the great relationship he has with Heaven man can rise in his might, and shout that he is a son of God, created in His own moral likeness, and that with Him he shall possess and enjoy the universe forever and forever.

Now, if anything approaching this kinship can be shown to exist between man and the lower animals, extending from man all the way down the line of descent until we reach Haeckel's supposed first creation, the moneron, then there is, without doubt, solid philosophy in evolution. But in that case I would cast my lot with believers in spontaneous generation, and declare that *nothing* got ripe, went to seed, and produced life; and that from that diminutive speck of animated gelatine, the moneron, there arose all the forms of higher life up until we reach the angels and God. For if there is a grain of common sense in evolution, why did the refining process stop with such an imperfect being as man? Why did not natural selection and survival of the fittest evolve from man the angels of heaven, from whom should have been evolved the only perfect, adorable Being whom we call God?

INDEPENDENCE, Cal.

THE LIFE PRINCIPLE.

BY CHANCELLOR JOHN KOST, M. D., LL. D.

That the life principle of living organic bodies is not simply phenomenal, but that it is a distinctive entity, is a proposition that has so may proofs in nature, and goes so far in explanation of other facts, that it seems remarkable that a contrary assumption could be held by scientists. But still it is set forth by biologists as simply a resultant of organization and the play of chemical force, like as growth is the result of assimilation, and combination that of affinity.

This latter assumption is incidental to efforts in other directions, and comes not from any intelligent conclusion, when the subject of life is made that of primary or specific investigation. It is wonderful what vagaries men will fall into when they are fanatically disposed, or intent in theorizing.

The preservation of species cannot be satisfactorily accounted for other than by reference to the distinctiveness of the life force, which controls and conditions assimilation and development. Nor is the growth of the plant, or body of the animal alone thus conditioned; the seed and ovum are so as well.

When all allowance is made for modifying circumstances, which occasion varieties in species, there is yet found a boundary, up to which alone any encroachment can come; and, as soon as the modifying causes are removed, a relapse takes place and the sharp characteristics of the species are again established. This tendency to relapse has been the subject of battling effort with hybridizers.

While, on the other hand, we observe the various life processes to be very *similar*, the results are very *dissimilar*. The food of animals, and their life habits may be identical; yet their specific characteristics are absolute in distinctness. The *man*, the *dog*, and the *cat*, may eat, and live on precisely the same food; and be subject to the same life habits; but yet how distinct are their specific characteristics? Hybridizing efforts superadded will avail nothing in breaking down the distinction. Away back of all the forms in the development is to be found the cause of this distinction. It is in the life principle, which is resident in the seed or ovum. When a cell is nucleated, as a condition of new being, this nucleation is not accidental, nor yet the result simply of favorably disposed surroundings, or force of habit. As a condition precedent there *must be a life principle.*

This communication will not admit of, *a priori*, speculations regarding the character of this life principle antecedent to conception, or the vitalizing of the ovum or cell. Whether this is a co-ordinate of electricity and the distinctive atmospheric and interstellar ethers, and thus universally present in their myriad specific individuality, or whether a special interposition of creative power is concerned at this point, cannot be discussed now. But that distinct life principles exist, as determined by *a posteori* researches, alone is intended to be presented here. The obvious absence of distinctive modifying power of *nidular* surroundings and fosteral care, seems really presumed upon by the instinctive habits of the cuckoo, and the troupial birds, which lay their eggs in the nests of other birds. This is not a difficult point in this inquiry. But in the viviperous animals, where the distinctive vitalized cells form, a male of one variety of species may find its lodgment upon the intra-uterine mucous surface of the female of another, and here become developed by the nutriment of the blood of the latter, and yet be still persistent in the characteristics of the male, is where the greater difficulty is found in matter of comprehension.

The fact that in this latter case there are modifications imposed, in the intra-uterine state, is simply in accord with such modifications as are imposed by the after extra-uterine life, and it is known that the specific distinctions are not thus obliterated even by long persistence in crossing. The nice question of fertility in crossing or hybridizing of species is not intended to be discussed here, nor is it necessary to precipitate the present assumption upon this crucial test. The more simple phases of the question are in place for popular reading, or at least are more proper for a casual communication; and the scope here will now be made complete with a plain formula of the more obvious life processes, with very brief reflections on these latter.

It must be assumed, primarily, that, as a condition precedent to all the life processes and functions, a distinctive life principle must exist independently; that inherent to this is the molding power that defines and preserves the species. Thus, as cited in the outset, the same food will develop the different species. If a human eats bread it develops and sustains a *human;* if a dog eats the same food it makes *dog* structure; and, whether or not raw meat and rural exposures tend to ferocity, and improvements in culinary arts tend to civilization, still the integrity of specific types is not destroyed by life habits.

The formulating power of the life principle is wonderfully peculiar. It has instincts—so to speak—which contemplate possibilities and probabilities alike readily and meets all contingencies. If one organ of sense becomes mutilated, another is made to act

vicariously. If a forecast of variation of conditions in future life is to be imposed, then the entailed endowments are accordant. Definite nerve or brain matter is necessary for special sense; and it is amazing how varied the forms are that characterize this substance in the low types of life. The first rudiments of a nervous system are found in the low types, in ganglionic *points*. Then, higher up, there are *lines* of nerve matter; then *rings*. Next a system of nerve *centers;* then a *spinal cord*, followed by a *cerebellum;* and, finally, a *complete brain and nervous system*.

If we call all this progress simply *development*, it changes the fact in no degree. What is it that *makes* the development and preserves the identity of species? Evidently something beyond: a molding and preservative power or principle, which is the distinctive *life principle*.

Some animals have the power to reproduce entire members of their bodies when, by violence, these are broken off. All animals and plants possess a conservative power—"*vis conservatrix natura*," which heals and restores the body in part or in whole. This healing is not a result of special co-ordination of circumstances, nor yet force of life habits. It is owing to the peculiar *life principle* of all animals, as also of plants. How singularly exact the healing power manifests its tendency to perfect the image of the original. A cicatrix may form in the healing of a wound, and be more or less persistent, but the tendency is to obliterate even this; and to establish the original form and character.

The more our histological studies and researches are continued, the more fully is the distinctive molding and conservatory power manifest. Even provisions of *expediency* are exemplified. Coffer-dams are constructed around the fractures of bones for the purpose of holding the new materials that are thrown in for reconstruction. Similar coffer-dams are formed around obtruded substances, which otherwise would be a cause of mischief. Such also are formed around localities holding pus, when it cannot be ejected, and which is thus held until, by piecemeal, it can be absorbed and thus carried off in a safe way by vascular action. And it always appears that the greater the danger is of discharges of pus into provinces where immediately fatal results follow, so also is the greater certainty that the pus will become imprisoned thus.

Pus in the liver, discharged into the peritoneal sack, will occasion fatal peritonetis. What will "*Nature*"—as the physiologist calls it, do in such case, not unfrequently? She—for they have it in the feminine—proceeds in some cases of pus in the liver, to contract adhesive inflammation; and by virtue of effused lymph constructs a channel through the diaphragm, and pleura into the lungs, so that the pus may be removed from the latter by expectoration. Here is manifest what is akin to intelligence! Who, that understands these facts properly, would say that all this comes of favorable co-ordinations? Who, that understands it, will fail to recognize a superintending power, or principle, having just such wonderful endowments or characteristics?

A poisonous or disturbing substance may be taken into the stomach, injected into the bowels, or otherwise thrown into the body; and we discover immediate efforts for its elimination by "*critical discharges.*" If such are not sufficient or practicable, then a fever sets in, which will have for its object the neutralization of the cause of disturbance, by setting up new availments, in *concoctions* and *effusions*.

When, by local infliction, as by a snake-bite, or other virulent poisonous local obtrusion, an enemy is thus menacing the life force, no time is lost by useless parley. Immediate action takes place; for no sooner do the sensatory nerves give the intelligence of invasion than do the motaries set up defense. The part impinged is at once injected with fluids from the vessels, and becomes swollen. This swelling acts as a cordon of defense. If this defense prove successful, the mischief continues to be local: and in pathology the case is called an "inflammation." If the boundary be broken over, then general battle in the entire system takes place and this is called "fever." Now when in the local character the battle proves too great for successful defense of the injected or fortified place, the most wonderful seeming sagacity follows. *Nature's forces* retire to a short distance and there is a new line of defense thrown up, and the part retired from is left to perish—this state is called "*gangrene*" or "*mortification.*" In cases of such new cordon or line of defense being set up this line is wonderfully distinct. Even the unassisted eye detects a well-defined blue line. Next to this is a red line, and against this red line is thrown another impaction that swells the part. The retreat is never further than is necessary for a new defense.

No wonder that the medical philosophers of mediæval times who were possessed of a knowledge of these marvelous facts, should have come to the conclusion that a divine intelligence was inherent in the tissues of the body, whose office was the building up and defense thereof.

ADRIAN, Mich.

DR. JACOB REDDING IN THE PHYSIO-MEDICAL JOURNAL.

REPLY TO HIS REPLY BY THE EDITOR.

LAST month we promised our readers, unpleasant as the task would be, to ventilate the matter alluded to in the above heading, and we now proceed to do so.

In the July ARENA we intimated in the most gentle and inoffensive language we could command that it would have been but journalistic courtesy had Dr. Redding, in his series of articles in the *Physio-Medical Journal* against the wave-theory of sound, acknowledged the source whence he obtained his arguments, namely, the "Problem of Human Life," instead of presenting them as entirely original with himself. Our very amiable admonition, which was merely intended to elicit a private apology from the Doctor, seems to have had an effect similar to that of fluttering a red rag in the arena of a Spanish bull-fight. Instead of writing us a gentlemanly letter, explaining the neglect, he immediately proceeded to send a communication to the *Journal* containing a bitter and most abusive denunciation of the editor of THE ARENA in these words: "I demand a public retraction of the charges preferred against me; and failing this, *I denounce the author thereof as a willful falsifier and vile slanderer.*"

At the beginning of this terrific denunciation he denies that he had depended upon our writings for a "*single idea in adversely criticising the wave-theory of sound*," but asseverates in a tone of injured innocence that his arguments are "*new and original*" with himself. Of course such a statement and denunciation as here presented by a prominent physician and published to the world in a widely-circulated medical journal, makes it imperative that we should give the facts to the public much as we would regret to harm even a hair of the doctor's head. His attempt, however, to screen himself from public condemnation by covering up the sin of plagiarism by the worse crime of charging *falsehood* and *vile slander* upon the one who had gently reproved him, is such an unjustifiable outrage upon journalistic decency as to merit the severe punishment which we are sorrowfully compelled to inflict.

In the first place, in order to ascertain the impression Dr. Redding's articles would make on the minds of disinterested readers, we loaned the numbers of the *Journal* to several intelligent gentlemen who were familiar with the "Problem of Human Life," and without hesitation they all pronounced his principal arguments against the wave-theory of sound substantial plagiarisms from that book adroitly obscured by a running effort to put them into his own language so as to prevent readers who might have the "Problem," as much as possible from detecting the fraud. Here is a specimen of what is thought of the matter. Prof. Henry S. Schell, A. M., says:

NEW YORK, September 2d, 1886.

Dr. A. Wilford Hall:

DEAR SIR,—I have carefully read the articles in the *Physio-Medical Journal* written by Dr. Redding against the wave-theory of sound, and I regard all that is valuable in them as having been suggested by studying your monogram against the wave-theory as published eight years ago in the "Problem of Human Life."

Very respectfully yours,

H. S. SCHELL.

Dr. Henry A. Mott, Ph. D., LL. D., of this city, also writes:

Dr. A. Wilford Hall:

DEAR SIR,—As requested, I have read Dr. Jacob Redding's articles against the wave-theory of sound in the various numbers of the *Physio-Medical Journal*, and I am clearly of the opinion that the main line of attack against that theory is practically taken by Dr. Redding from the "Problem of Human Life," for which you should have received credit. I am surprised that Dr. Redding should have done such a self-evident act without crediting your book.

Yours respectfully,

H. A. MOTT, JR.

To show at the very start of his discussion of the subject of sound that it was his studied effort to avoid putting any one on the scent of the rich lode from which he had stealthily dug his numerous nuggets of information against the wave-theory, he refers barely twice at page 215 to the "author of the *corpuscular theory*," but, so far as his readers know, this remark might refer to himself in some previous publication, since his own pretended "*molecular* theory" would be regarded, from the mere name employed, as meaning about the same as the "*corpuscular* theory." Mr. Rogers, our office editor, at once remarked on reading this ingenious reference to the "corpuscular theory" that Dr. Redding had intentionally imitated the Irishman and shot at his game hidden in the bushes, so if it was a *deer* he would hit it, and if it was a *calf* he would miss it! If this was not the case, why did he so studiously avoid the slightest reference to the name of this author of the "corpuscular theory," or to the book in which that theory was published? Honest, straightforward manliness would have required no such covering up, when the very quotations he was making from the authorities on sound were taken bodily from the "Problem," *typographical errors* and all! Indeed, this fact alone demonstrates that Dr. Redding did not possess the writings of either Helmholtz or Huxley, and we challenge him to show to any reader of this article the books named from which he quotes—that is, before he has had time to procure them after reading this exposure.

Now let us follow him for awhile, and see how the case bears out our charge. In the opening sentence of his first paper he gives the keynote to this very "original" effort by carelessly linking together the names of the three authorities on sound—*Tyndall, Helmholtz*, and *Mayer*—so familiar to every reader of the "Problem," but found in no other book so linked together. Why did not this highly "original" writer see the importance of transposing these three names somewhat, by putting Mayer first, for ex-

ample, or, what would have been still better, of going to some encyclopedia and searching for some other names as a part of the trio, and who would have had the weight of authority attaching to them on the sound question? No; the Doctor had started out on a scientific still-hunt to fight the wave-theory of sound, and he knew of no other source from whence to draw his arguments, ready-made, except from the book which had elaborately reviewed the works of "Tyndall, Helmholtz, and Mayer." Hence the linking of the three names in the order given.

And now, in attempting to give specimens of the absolute plagiarism of our arguments, and many times of our very language, we know not where to begin or end, as his papers are crowded with the baldest instances of the kind we have ever seen. In his first paper, for example, after some introductory paragraphs, he proceeds to copy our quotation from Mayer's article on sound in *Appleton's Encyclopedia*, which he found in the "Problem" at page 110: "If air were incompressible, a motion produced at any point of its mass would instantaneously be transmitted to every other point of the atmosphere."

On this passage we comment at length in the "Problem," referring to the incompressibility of water, and for the first time in any scientific work on this subject introduce the property of "*mobility*" as an essential factor in determining the compressibility of a fluid by the action of a body passing through it. We show that this property of *mobility* necessarily prevents any condensation of the free air by the passage of a tuning-fork's prong slowly through it, and to prove this we refer to the way in which *mobility* in the ocean enables the fins of a fish to displace the water and thus make headway through it without producing compression of that fluid.

It is too long to quote satisfactorily, but any one who will read three or four pages of the "Problem," beginning at 110, and then read Dr. Redding's first paper, with his repetition of the "mobility" feature a dozen times in that and other papers, will see the substance of our argument flatly plagiarized, and often in our very language: though, as before observed, he struggles as hard as his limited originality will permit to avoid this more glaring phase of that contemptible crime, and we may add, as instantly observed by those to whom we have shown his papers, his very effort to steer clear of our exact language frequently so muddles the pith of our arguments as to render their salient features almost unintelligible. But lest the reader may think we are too severe on the doctor's "originality," let us quote a few sentences *verbatim*, first from the "Problem," then from Dr. Redding. Here is the "Problem:"

"As recently remarked, he (Mayer) here ignores in toto the *mobility* of the air, and overlooks one of the plainest principles of science, that even if the atmosphere were wholly 'incompressible,' it still might possess extreme *mobility*, and thus compensate for any 'motion' and neutralize its effect by the disturbed portion moving around the disturbing body and thus establishing an equilibrium without the motion being transmitted more than a few inches from the center of disturbance. Instead of recognizing this elementary fact of science, he makes no reckoning of this principle of *mobility* at all, and teaches that if the air were incompressible a *fly*, by moving its wings and thus stirring the atmosphere, would actually continue the same displacement, even carrying this same motion around the earth. . . . Now we have just such an element as he supposes in water, *which is practically incompressible*, though possessing the same *mobility* in proportion to its density as the atmosphere. . . . And here we are compelled to note the surprising fact, that while these writers on sound are constantly calling our attention to the *elasticity*, *density*, and *compressibility* of the air and its consequent spring-power in conveying a pulse or atmospheric condensation with great velocity to a distance, they never even name the *mobility* of the air, one of its most important and persistent characteristics. Is there any meaning in this astonishing fact, or any way of accounting for such a remarkable oversight in scientific writers? I will not say it is an intentional suppression of a well-known scientific fact, but when we come to consider that should the *mobility* of the air be recognized in their arguments on wave-motion it would in every instance overthrow the wave-theory of sound, the coincidence becomes at once startling and suggestive! . . . If the air were really *incompressible* while at the same time possessing *mobility*, as seen in the case of water, this very condition would prevent such transmission instead of encouraging it. . . . According to the teaching of this savant (and it is impossible for his language to be misunderstood), if a *moneron* should move its body at the bottom of the ocean, four miles below the surface, supposing the water to be incompressible, or should it thrust out one of its *pseudopodia*, the *mobility* of the water directly around the little creature counts for nothing at all in the scientific estimation of this physicist, since he wholly ignores it; but in lieu of this he tells us the motion would absolutely be transmitted to every other point of the ocean, or in other words, that the *entire ocean would be displaced bodily to the aggregate extent of this movement*. . . . I have thus far spoken of water as *practically incompressible*, which it is so far as any ordinary motion producing an appreciable effect is concerned, since its utmost compressibility, which mechanics has been able to demonstrate, amounts to but one part in 22,000 for each atmosphere, or fifteen pounds pressure to the square inch. . . . I again assert that it is upon this very kind of scientific reasoning that the wave theory rests; and it is these very misapprehensions about the possible velocity of the transmissions of condensations and rarefactions of the air, while ignoring its *mobility*, which have led physicists into the monstrous errors already exposed of the assumed propagation of air waves at a velocity of 1120 feet a second *sent off by the aggregate movements of a tuning fork's prongs but seven inches.*"* etc.

Now let us turn to Dr. Redding's argument, in which he did not depend on Wilford Hall for *one "single idea"* "in *adversely criticising the wave-theory of sound.*" After copying our quotation from Prof. Mayer's article, in the encyclopedia, he says:

"Then a correct use of language (in accordance with the above proposition) would dictate the following rendering: 'Water being *practically incompressible*, a motion produced at any point of its mass would instantaneously be transmitted to every other part of the ocean.' Just think of it: the play of the fins of a fish, *even the projection of pseudopodia from the moneron*, the prehistoric ancestors of the genus homo, the evolutionary god of animated nature, any movement whatever, *would instantaneously be transmitted to and displace the entire volume of water contained in the ocean's basin to the precise extent of such movement*. . . . I insist that the above assumption is vital to the wave-theory of sound, and hence it shall not escape a careful and candid analysis at our hands, since our author refuses to subject it to the test of experiment. The only important difference, then, between air and water, so far as the present question is concerned, is that water *is wholly incompressible except by the most refined and powerful means*. . . . If the air were incompressible, *then the flopping of a bird's wings in its flight* would instantaneously cause a flopping of, not only the entire atmospheric shell surrounding the earth, but the contents of this shell also. . . . Our sense of the *ridiculous* grows upon us! [What a pity his sense of *honor* had not elbowed its way in just at that point!] . . . *Remember, not one word about the property of mobility!* They seem to have utterly ignored its very existence, but attribute all the phenomena to the fact that air is so *elastic!* . . . The flight of a swift-winged bird is certainly fast motion as compared with the vibrating prongs of a tuning-fork, *which only accomplishes an aggregate movement of about eight or ten inches a second*. . . . To what shall we ascribe the disposition to blot out from the memory one of the most important and *well-known properties of the air?* . . . Seeing, therefore, the great difficulty in generating a sonorous wave or sound pulse in air, even by a fork, the whole function of which is to carve the air into such supposed condensations and rarefactions, and the utter impossibility of generating a sound-wave in water, we are in accordance with the rule of logic already stated [quoted *verbatim* from the problem at page 325!], forced to reject the undulatory hypothesis, or else to ignore the property of *mobility*, as also the property of *incompressibility* in not a few cases," etc.*

These verbatim quotations are a fair specimen of his first six papers in opposition to the wave-theory of sound. His entire stock in trade was to take our extracts from Tyndall's book, on which we based our original arguments against the wave-theory, and then to use our objections and criticisms, often employing our very words though he generally tries, as before intimated, to change our language sufficiently to prevent superficial readers from detecting the plagiarism, even if they should happen to possess the "Problem." In this manner he treats the supposed law of sound-interference, criticizing the double-siren fiasco and Tyndall's acknowledgment that he had "exceeded the truth" in claiming the absolute extinction of both sirens, almost in the very language we had employed. We ask any one who has a file of the *Physio-Medical Journal* to turn to Dr. Redding's fourth paper, October, 1885, and read his argument against the wave-theory based on the experiments of Tyndall and Helmholtz with the double-siren, and then, if he wants to become utterly disgusted at Dr. Redding's charges of "falsehood and vile slander" against the editor of THE ARENA, let him turn to the "Problem of Human Life," beginning at page 286, and there read precisely the same criticisms, with the wording slightly changed to avoid detection, and with their point and force often obscured in exact proportion as their language, unfortunately, was departed from. We are sorry we have not room for these extracts to illustrate the cool hypocrisy evinced in Dr. Redding's vituperative reply charging us with deliberate falsehood and vile slander.

Similar to these double-siren criticisms are his stolen thunderbolts hurled against Prof. Tyndall's experiments with a long tin tube and the clapping of two books together at one end, by which to drive a "sound-pulse" out of the other end, thus to "blow out a candle" without a "puff of air," etc., etc. Let us close this unpleasant exposure of vaulting ambition which has so signally o'erleaped itself, by quoting a few sentences, first from the "Problem of Human Life," and then from Dr. Reding's highly "original" fourth paper on the long tin-tube fiasco. After copying the description of the tin-tube experiment from "Tyndall on Sound," page 12 (see entire extract, "Problem," page 271), and expressing our surprise, with some serious objections, we add:

"As proof that it was 'not a puff of air' which produced this result [of blowing out the candle when the books were clapped] but a 'sound pulse,' look at the ocular demon-

* "Problem of Human Life," pp. 110-114.

* First article on the "Molecular Theory of Sound," pp. 214-219, of *Journal*.

stration which the lecturer had ready at hand, and which seemed to be such a clincher as to silence, and literally overwhelm any scientific doubting Thomas who might happen to be in the assembly! 'I fill *one end* of the tube with the *smoke of brown paper!*' Which end, professor? Why of course he was too shrewd and skilled a public lecturer and experimenter to fill the wrong end of the tube, the one nearest to the candle; for he well knew (or if he did not know it he is to be pitied) that if he had filled the small end [next to the candle] with the smoke, instead of the large end, fifteen feet away, a visible '*puff*' would have greeted his audience every time the books came together, and would thus ingloriously have exploded the whole deception. Hence he was cautious enough to put the smoke into the large end of the tube so it would be compelled to travel fifteen feet before it could pass out at the small end, which would have required *five or six powerful claps of the books* to carry it that distance! Of course this was purely accidental, as we must charitably suppose, since it never occurred to this able and authoritative investigator of science to fill the *entire tube* 'with the smoke of brown paper' (and then see whether it would 'puff'), *which would have been more easily done than filling 'one end' of it, because special care had to be used* not to let the smoke creep ahead too far into the tube, or too near the outlet, lest an accidental 'puff' should undeceive the audience, etc. . . . It is true, it seemed impossible to suspect a trick of prestidigitation, or anything wrong on such an occasion, especially from the apparently frank and candid style of the lecturer. He did not hesitate to tell his auditors in the plainest language that it was '*one* end of the tube' only which he filled with the smoke of brown paper, and they saw distinctly when he put the lighted brown paper into it which 'end' of the tube he meant; so there was apparently nothing unfair or disingenuous in the performance. Then, after filling this particular 'end of the tube,' he honestly clapped the books together in front of the bell-shaped mouth without a 'trace of the smoke' being 'ejected from the other end'! After such a conclusive demonstration (!) is it any wonder that he should have so triumphantly added? 'the pulse has passed through both smoke and air without carrying either of them along with it.' But now I ask seriously, how did Prof. Tyndall know that no air was carried out of the small end of the tube when he clapped the books? Evidently in the same way exactly that he knew that no *smoke* was carried out—he did not *see* it! . . . Smoke being a *visible* substance, it was absolutely essential to the success of the experiment that it should not pass out when the books were clapped. . . . But the air being entirely *invisible*, no difference if the tin tube was full of it, as it necessarily was, and it mattered not a whit if the air puffed out at the small end every time the books came together, as it manifestly did . . . he knew very well that the most argus-eyed scientific student present *could not see a 'puff of air,'* even if it did pass out! etc. . . I here undertake to suggest a few practical scientific tests in connection with this experiment of the tube, each one of which is worth a thousand such shallow legerdemain tricks as filling 'one end of the tube with the smoke of brown paper' . . . 3 Leave the candle as before, and instead of clapping the *naked books* together *so as to cause a report, let their sides be cussioned*, or rather, which is better, let them be *prevented from coming entirely together by an intervening piece of soft rubber*, and although no audible sound will be produced yet such a noiseless 'clap' will 'blow the candle out' exactly the same as in the former case," etc.*

Now what says our amiable and original friend Redding, who vociferates in the most denunciatory style that we are guilty of willful falsehood and vile slander for mildly suggesting that it would have been a matter of courtesy had he allowed his readers to know from whence he obtained his arguments? After referring to the experiment of Prof. Tyndall, he says:

"The result is given in his [Tyndall's] own words: 'That it is a *pulse* and not a *puff of air*, is proved by filling *one end* of the tube with the *smoke of brown paper*. On clapping the books together no trace of the smoke is ejected at the other end. The pulse has passed through both smoke and air without carrying either of them along with it, thus extinguishing the light of the candle.' Just how he could so confidently assert in the presence of intelligent human beings, without fear of successful contradiction, that the pulse had passed through both smoke and air without carrying either of them along with it, is beyond my comprehension, *seeing that particular pains was taken to have the smoke in the end opposite that at which the candle was placed, and that the books were only clapped once together.* . . . And hence, as puffs do not constitute sound waves, as can easily be demonstrated *by simply clapping the books in the above experiment almost but not absolutely together and thus extinguish the light*, in his judgment he found it convenient to *place the smoke of brown paper in his end of the tube*, and thus prove *in the absence of visibility* or visivalized (?) air at the candle-end of the tube that it was a sound pulse and not a puff of air. So mote it be. He may construct a clapper of marvelous perfection, and of any degree of rapidity, and let it clap from now until time shall cease to be, *and unless he so adjust it as to secure contact of the two surfaces he can never convert* the puffs generated thereby into sound-pulses or sonorous waves. . . . If you honestly believe that the discontinuous puffing of the siren does actually generate sonorous waves *why not fill the entire tube with the smoke of brown paper* and then clap your books *firmly together*, etc. . . . The additional expense of *filling the entire tube with the smoke of brown paper* would be but a trifle, and would be more than counterbalanced by the *labor and worry thus saved over and above that involved in the effort to confine a small quantity of smoke in one end of the tube. You* need have no fears but that the puffs will actually occur in regular sequence, and the sound will of course be heard at the same time. Nevertheless you must constantly remember that the puffs will occur even though a sound should not be produced, hence it will be well *to exclude all pads or other contrivances from between the books*, as they would seriously interfere with the generation of the sound, while at the same time the puffs would be just as forcible and just as visible as ever. Should such an event happen, the audience might justly be led to doubt the sonorous wave or sound-pulse character of these puffs, etc. Had Tyndall happened to have put the smoke of brown paper in the end of the tin tube nearest the candle—which he was just as liable to have done as otherwise—the sonorous pulse would have proved a mere wind-puff."*

But we shall extend this exposure no further, out of compassion for the Doctor, and even out of sadness at being forced from self-defense to do what we have here done. Dr. Redding made the greatest mistake of his life in thus forcing this reply from us, when he knew himself to have been guilty of all we intimated in our July reference. Strangely, too, he, himself, has judicially fixed the penalty to his crime. He declares that if he had used our arguments as charged by us: "Then he deserves the most withering contempt of an enlightened public, and of all honest men." So say we all.

* "Problem of Human Life," pp. 272-274.

* Dr. Redding in *Physio-Medical Journal*, pp. 309, 310, 311, 369.

MODERN SCIENCE AND SUBSTANTIALISM.

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

WHILE the greatest philosophers lived in ancient Greece, and the Greeks made many important scientific discoveries, the present age is eminently the scientific age of the world. The most important discoveries have been made within the past four hundred years. Among the ancients, a knowledge of the sciences and arts was confined to the few, and the masses were overshadowed by the grossest ignorance and superstition. Since the invention of printing everything has changed; for, through the medium of the printing press, knowledge can very rapidly be disseminated.

During the middle ages, kings and nobles were almost totally ignorant of literature. Many of them were unable to write their names. The revival of classic literature in the fifteenth century changed the whole face of things. When Constantinople was taken by the Turks, Greek scholars were forced West, and they gave an impetus to the cause of civilization, and to the advancement of letters. The inventive powers of man were thoroughly aroused, and a glorious age of invention and discovery dawned.

The old school of scientists became very much alarmed at the new awakening. They could readily see what would, in the near future, be their doom. So they made use of the civil and ecclesiastical powers to check the progress of the new doctrine. Such men as Copernicus and Galileo were rushed away to prison, and Luther was met with the most determined opposition. The excitement became so great that the fanatical rulers established that infernal court—the Inquisition. Racks, chains, scourges and thumb-screws filled its execution rooms, and the work carried on in the chambers of this horrid tribunal was calculated to strike terror to the bravest hearts. No tortures invented by untutored savages could compare to the blood-curdling horrors perpetrated by these inhuman monsters upon their victims. All Europe was, for a time, drenched with blood, but "truth crushed to earth will rise again."

The cruelties of the Inquisition could not stop the scientific progress of the age. Inventions and discoveries were being constantly made. America was discovered, and a new field for liberty and progress was opened. The invention of the telescope gave a new impulse to the science of astronomy. The old Ptolimaic theory fell to the ground, and the truths advocated by Tycho Brahe, Galileo, Copernicus, and Kepler were fully established, and believed in by all thinking persons. The moon, with its rugged mountains, was seen coursing around the earth. Venus, the beautiful starry queen: Saturn, with his brilliant rings; Jupiter, with his belts and resplendent moons, were seen traveling round the sun. The sublime scenery of the heavens filled the mind of man with wonder and astonishment, and the reformation in both science and religion went hand in hand.

Not only did the religious reformers suffer persecution, but the workers in the fields of science were equally persecuted. Galileo, when an old man, was brought before the Inquisition. The tribunal pronounced him a deluded teacher and lying heretic. They intended to subject him to the severest torture and death. Galileo was an old man, and could not endure such a terrible death. He knelt on the crucifix, with one hand on the Bible, and renounced all. When he arose, however, it is reported that he whispered to one of the attendants: "The earth does move for all that."

Secular science will not fortify a man for persecution, as will religious science. Martin Luther did not retract, as did Galileo. Nothing could have forced him so to do. Religion develops manhood as nothing else will. We cannot endorse the conduct of Galileo, for he should have died for his convictions. The martyrs of the Reformation did much to advance the cause of truth. Religious and scientific reformation have always gone hand in hand. In fact, religious science is superior to any other science. As Christianity is the pure religion, which contains the truth of all the rest; so it is the highest of the sciences, for it represents the development of the highest faculty of the human mind. Christianity represents the highest culture to which it is possible for man to attain.

While there has been a great reformation in science as well as in religion, it has only been a reformation in part. As the early reformers retained many of the dogmas belonging to the papal church, so in the scientific reformation many of the dogmas belonging to the ancient pagan world continue into the present day. Among the ancient Greeks there was a tendency to materialism on the part of scientists; and nearly all the arguments used by modern materialists were employed by these early Greeks. Modern materialists write against religion as if their theories were new, when, in reality, they were perfectly familiar to the Epicureans who encountered Paul on Mars' Hill.

Materialists are trying to reduce all natural and spiritual forces to merely vibratory movements of matter. There is now a tendency on the part of religious science to carry the war into Africa, and to insist that all the forces of nature are substantial. At the head of this movement is Dr. Hall, of New York, author of the "Problem of Human Life, Here and Hereafter." It is maintained by this new school of philosophy that there are both material and immaterial substances, and that the immaterial, which includes the spiritual, is as real as the material itself. It is admitted that odor and electricity are substances, and why is not the same thing true of the other forces or phenomena-producing causes in nature? No one denies the vibratory movements of matter connected with sound, but they are only incidental, and cannot be identified with the force itself. Substantialists insist that the forces of nature are something, instead of being nothing, as their opponents often maintain. Those who thus oppose Substantialism may be called nihilist in a sense, for they make the forces of nature substantially nothing. It is useless for any one at this late day to scoff at the Substantial Philosophy, for it has come to stay. The other day I asked the eminent Dr. Deems, president of the American Institute of Christian Philosophy, what he thought of Dr. Hall's proposition in regard to Substantialism. He answered that he thought well of it, and that its truths were worthy of careful attention. He informed me that the leading advocates of that philosophy with Dr. Hall, had been elected members of the institute and it is expected that the founder of Substantialism will read a paper on that philosophy before the institute at its next meeting the coming winter.

The Substantial Philosophy is in complete harmony with the philosophy of Paul, which teaches that there is an inward as well as an outward man. Paul makes the inward man more substantial than he does the outward man. In fact, the great apostle insists that unseen things are more durable and substantial than the things which we can see. I am satisfied that this reformatory movement in philosophy will continue until all the sciences point to God and immortality.

☞By arrangement with Mr. Collier, we will soon present our readers with Mr. Keely's portrait and sketch.

THE TWO HEMISPHERES.

BY THOMAS MUNNELL.

I HAVE a small machine, with dial and three hands, moved a certain distance by successive pressures of the finger upon a button. The first hand travels a hundred times faster than the second, and the second a hundred times faster than the third. The first goes forward upon the dial one-sixteenth of an inch at each impulse of the finger; the second, therefore, moving a hundred times more slowly than the first, travels only one-sixteen-hundreth (1-1,600) of an inch in the same time, and the third hand only the one-hundred-and-sixty-thousandth of an inch at a time. Now the edge of an ordinary razor is about the one-thousandth of an inch, and the distance of this last hand is equal to the one hundred and sixtieth part of a razor's edge. This line, though inconceivably short, is yet a real space passed over by the said index.

The greatest magnifying power of the microscope yet attained, with any reasonable degree of clearness, is 8000 diameters, the square of such, 64,000,000, is the magnifying power of such lenses; that is, an object that is 64,000,000 times smaller than one that can be seen with the natural eye may be brought up from their inconceivable littleness into visibility. In other words an object that is barely able, of itself, to make an image on the retina may be divided into 64,000,000 parts and yet one of these parts is discoverable by the microscope.

The first of these illustrations presents infinitesimal motions over infinitesimal spaces produced by the meshing of cogwheels with pinions in certain ratios by the interaction of which the mind is aided in knowing that to be true which it can neither see nor conceive. That a pinion of ten cogs must revolve ten times to move a wheel of one hundred cogs round once is a relation established in the nature of things and is as true on the planet Mars as it is on the earth—a relation laid up in Nature from the first, calculated to help conception and understanding.

The second illustration shows what God had laid up from the foundation of the world in the reflecting and refractory powers of light to help the natural eye whose unaided vision was never intended to be the limit of our optical discoveries. God intended that we should look down into the depths toward nothingness at least 64,000,000 times further than with these little eyes we can ever peer.

Nor is the ear left without the same kind of extraordinary help, as seen in the wonderful abilities of the microphone and telephone, the one developing the most inaudible sounds into perfect audibility, and the other revealing the miraculous powers long ago laid up in the arcana of nature for the rapid and distant transmission of sound.

Even the muscular powers of man have been provided with supplementary strength first realized in the bone and muscle of animals, then by the lever and other mechanical contrivances, then by gravitation as utilized in the waterfall, then steam, the winds; and the various explosives developed in modern times—from all of which it appears that God intended from the first to supplement all the natural powers of man, extending indefinitely the might of His eye, His ear, and His arm.

But would it not be strange neglect in the Creator had he thus provided supplements to all our physical finiteness, but none for our feeble spiritual faculties? Was it not to be expected, *a priori*, that He who would provide potential telescopes for the physical eye would be just as thoughtful as to the eye of "the inner man," and by revelation elongate "the eyes of our understanding" and furnish us with visions of the distant future and of things unknown through "holy men of old who spake as they were moved by the Holy Spirit?" "We have received the Spirit of God that we might know the things that are freely given us of God!" Our own spirits, like the naked eye, cannot see far into the deep blue above us, but the Spirit of God, supplementing the strength of our spirits as the telescope does the natural eye, carries us forward to behold the "deep things of God," which "eye hath not seen, nor ear heard, nor have entered the heart of man." The "natural man"—the positivist—who depends solely upon his five senses as avenues to his mind, and rejects revelation altogether, no more receives the things of the Spirit of God than the naked eye receives the things of the telescope, for the one is "spiritually discerned," and the other is telescopically "discerned." So when the telescope is rejected and the spirit of revelation is rejected, the eye and the human mind are both left in their incipiency and incapacity to avail themselves of any aid from above. The natural eye can see one or two thousand stars, but the artificial eye added to it can discover a hundred millions of them. The human mind unaided knows a few moral principles applicable in sociology, but by the Divine Spirit it is enabled to know God, what will please Him, and what course of conduct here will be good for it a million years to come.

The hose is attached to the plug that it may conduct the water to its distant uses, which the plug itself, without this elongation, could never reach; an electric dash can be made from cloud to cloud, a few yards, but the wire could instantly conduct it clear round the world with its wonderful intelligence, if it only had a medium of transmission. Electricity always possessed this power, and could have done the same in the days of "Enoch, the seventh from Adam," but lacked the opportunity as well as the necessity of such action; and so the soul of man always was capable of exaltation through inspiration, could always handle the telescope of faith and see "the deep things of God." The spirit of man is the stem to which these extensions of spiritual insight and foresight can be attached, just as the eye is the indispensable beginning of the telescope. Such stem not being put into the organization of animals, is the reason that neither revelation, nor moral responsibility, nor immortality belong to them. Their eyes form no physical basis for the use of the telescope, nor their understandings a spiritual basis for revelation, but man's organization fits him for both.

"Eye hath not seen nor ear heard, neither have the things which God hath prepared for them that love Him entered into the heart of man." Whether these be "things" physical or "things" spiritual the same is true. We imagine we know much of things physical because several thousand nebulæ—or universes—have been discovered and described by astronomers, about one third of which the spectroscope says consist of organized globes, and the rest still in a gaseous state. But all these may be but a speck in God's physical domain. Besides, this space may not yet be half full of solar systems, constellations and universes, and Paul says, "All things are yours, things present and things to come," and surely, not knowing what worlds are yet to be created, the things which God has "prepared for them that love Him," the value and extent of our possessions, have never entered into the heart of any man.

The development of God's treasures is gradual like that of a mine, no one knowing how much he should ask for his shares. When human domiciles were to be supplied with artificial light, the tallow candle sufficed for awhile, then the blubber of whale, then petroleum, then gases, electricity an endless supply. Heat has been supplied successively by grass which is "cast into the oven," wood, coal, gas-flame, electricity, and

(*Concluded on page 76.*)

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

A. WILFORD HALL, Ph., D., LL. D., Editor.

PASTOR HENRY B. HUDSON, ASSOCIATE EDITOR.
ROBERT ROGERS, - - - OFFICE EDITOR.

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THE PLAIN DEALER ON SUBSTANTIALISM.*

BY THE EDITOR.

AFTER our last month's comments had been written, being all there was room for in a single number of THE ARENA, we received another copy of the Cleveland *Plain Dealer*, containing a column of attempted explanation of the unfavorable predicament in which our letter and that of Dr. Mott had placed Prof. Avery. This column of reasoning, though aimed to accomplish the best possible result in shielding its author from the charge of scientific cowardice, contains about the poorest specimen logic we have ever seen crowded into that much space, and only confirms our previous conviction that the scientific editor of the *Plain Dealer* is absolutely afraid to print even one of our arguments against the wave-theory of sound.

He admits having received our letter, asking for space to present only two arguments against that theory; but instead of presenting one shadow of scientific or manly reason for not granting our request, he goes into a labored effort to show that the whole question is not one of argument at all, but ought to be determined by the testimony of his eighteen living witnesses, who assert their belief that the wave-theory is correct. Was ever a scientific position met and demolished in advance more effectually than was Prof. Avery's by our reference to Copernicus and Galileo in last month's reply? Should he read that reference, with our application of it, he will blush to the roots of his hair if there is any scientific shame in him. Instead of presenting such a trifling plea, as that the truth of any theory of science is to be determined and forever settled by the opinions of a few men who teach it, he should have frankly declared—"I am afraid to print Hall's two arguments against the wave-theory of sound, lest neither myself nor any of my symposium friends will be able to answer them," and he would thus have penned the exact truth, as most of his intelligent readers already know.

It is difficult to conceive of a more pitiable effort than that of Prof. Avery in deliberately vindicating the correctness of the wave-theory of sound by a class of evidence which has proved the correctness of every false, absurd and ridiculous theory since the world began. Yet the scientific editor of that great daily has demonstrated himself to be just far enough behind this age of logical progress to believe that the proper method of proving a theory true is to array a few of the names of those who happen to believe in it, and that scientific facts and arguments, bearing on the questions involved, have nothing to do with the public!

Why, Professor, a thousand of the best scientific mechanics in the world, about the year 1807, could have been got to testify that Robert Fulton could never make his steamboat stem the current of the Hudson River. Of course their *exparte* certificates would have settled it conclusively in the estimation of just such logicians as this intrepid exponent of physical philosophy in the *Plain Dealer* office. Had Prof. Avery lived at that time he would, no doubt, have formed a symposium of some eighteen scientific mechanics to certify that the steamboat man was a crank of the first idiosyncrasy; and even after the boat had made the trip to Albany he would still have declared, in the face of the demonstrated fact, as he now does, that the only evidence on the matter worthy of credence is the written opinions of his eighteen symposium bigots that the old, and now exploded, theory of steam must be true!

Had our professor lived in the time of Harvey, he could easily have framed a symposium, to include the name of every doctor in Europe, to certify that the discoverer of the circulation of the blood was also a crank; and then he would triumphantly have shut out all argument and evidence on the subject, simply because, in his egotistical judgment, the *ipse dixit* of the living doctors must be correct. With this symposium organizer, established authority in favor of a theory of science, outweighs any number of facts and other demonstrative considerations against it. This same ruinous estimate of established authority in physical philosophy has prevailed in all ages among prejudiced and narrow-minded scientists whenever any new discovery happened to be announced by which to elevate mankind to a higher plane of intellectual achievement; and every original discoverer, thanks to just such *Plain Dealer* investigators, has been forced to fight his battle against bigotry and stupidity to the bitter end, before the most self-evident truths, as they have often turned out to be, could gain a foothold in the world. So it is now, and so it is likely to be as long as there are Prof. Averys in control of the press.

If the scientific editor of the *Plain Dealer* were half as enterprising in reading up the recent evidences we have printed against the current theory of sound as he is in organizing symposiums of professors to certify in favor of it, he could easily have learned that the wave-theory long ago has been demolished in half a dozen different ways. If he has not yet learned this fact, let him wake up from his Rip Van Winkle slumber and rub his eyes against the recent volumes of THE MICROCOSM, and he will see "men as trees walking."

* For two successive months this conclusion of the *Plain Dealer* controversy has been in type and crowded over for want of room. EDITOR.

SOUND, LIGHT, HEAT, ODOR, FLAVOR, ETC.

CLAYPOOL, KY.

Dr. Wilford Hall:

DEAR SIR,—I have read some extracts from your "Problem of Human Life" on the subject of Sound, but do not know that I perfectly understand you: hence, I would be pleased to have your definition of sound—what is it, and what relation does it sustain to aural beings?

Do you mean that it has any real, extrinsic existence? Or, in other words, do you mean to teach that it has any existence apart from that particular condition of matter found in the structure of the ear? It has occurred to me that sound is only a sensational phenomenon, and, like all other sensations, dependent upon *nerve* matter; but if I perfectly comprehend you I have an incorrect idea of it—that is, if you are correct. Hoping that you will take pleasure in answering my questions, I am very respectfully yours,

W. S. JONES, M. D.

REPLY BY THE EDITOR.

Sound, as well as any other of the sensation-producing causes in nature, must of necessity be one of the physical *forces*, and consequently must first exist outside of our sensations before it can act upon the sense-nerves to produce its characteristic effect.

Sound, in its primary sense or signification, is not at all the sensation in our consciousness, as Dr. Jones thinks, which we call *hearing*, and is only used in that sense by accommodation of language, or by metonymy of speech, the effect being put for the cause. Still, the use of such metaphors in our language is both common and proper. The true and unfigurative meaning of scientific terms, however, should always be preferred in our philosophical discussions to any form of trope.

Sound, strictly speaking, is that *force* in nature which by entering the ear, and by contact with the auditory nerve, produces in our consciousness the sensation of hearing. *Light* is that *force* in nature which by entering the eye, and by contact with the optic nerve, produces in our consciousness the sensation called seeing or sight. *Heat* is that *force* in nature which by entering our tactile nerves, which are distributed all over the body, produces in our consciousness the sensation called warmth, and metaphorically also called heat. *Odor* is that *force* in nature which by entering the nose, and coming in contact with the olfactory nerve, produces in our consciousness the sensation we call smell. And *flavor* is that *force* in nature which by contact with the palate and gustatory nerve produces in our consciousness the sensation we call taste.

If there is no such thing as sound in nature outside of our ears and auditory nerves, then there surely is no such thing as light outside of our eyes, no such thing as heat outside of our tactile nerves, no such thing as flavor outside of our gustatory membranes, and no such thing as odor outside of our noses. Are the old theorists, who wish to confine sound to our sensations in order to avoid Substantialism, prepared for the application of their logic to light, heat, flavor and odor? If not, let them do a little sober reflecting before making their points. Let us now put the matter in the form of a few very simple questions and see how it will hold together.

If there is no sound as a physical force outside the ear, is it not plain, as just hinted, that there is no light as a physical force outside the eye? But would not the sun shine just the same if all eyes were put out? Suppose all sensuous beings should shut their eyes at one time; would that extinguish the light of the sun? If all light (like sound is claimed to be) is in our sensations, then what produces the chemical effect on a metallic plate, changing it into what we call a daguerreotype? Has that inert, inanimate piece of metal an optic nerve? Would not the same chemical effect have taken place by the action of light under the same conditions, if there were no eyes in existence? Then again: If heat (like sound is supposed to be) is only in our tactile sensations, and not a physical substantial force outside of them, how does it burn down a building? Does a frame house possess tactile nerves and a conscious sensation?

Then, coming right home to the question in hand, if sound is only in our sensations, and not a real, substantial force in nature outside of our conscious being, what is it

that sets a stretched string into sympathetic vibration? Has a steel wire got ears? Does a tensioned chord possess an auditory nerve? and animal consciousness? Would not that stretched wire be thrown into action by sympathy all the same, under the same circumstances, if there were not an ear in existence? If so, what could do it but the external, physical force called *sound*? And how could sound do it, if sound exists only in conscious sensation?

No, Doctor, we may rest assured that the lightnings would flash, and the thunders would roar, and the windows would rattle all the same if there were not an eye nor an ear in the universe to take cognizance of them; and that the wild rose would continue to "*blush unseen* and waste its *fragrance* on the desert air" all the same if there was not one olfactory nerve on this earth to recognize it.

We feel sure, judging by the candid spirit of Dr. Jones' letter of inquiry, that he is honestly desirous of information concerning the teaching of the new philosophy. And we believe there are hundreds of others in the same state of mental suspense. We have, therefore, taken particular pains to make the answer clear.

It is impossible, however, to elucidate everything involved in the great philosophy of Substantialism in a few paragraphs, or even in a few numbers of THE ARENA, and which has taken us more than a decade of years to elaborate. Had Dr. Jones, and many others who make similar inquiries, read our five volumes of THE MICROCOSM, beginning with the "Problem of Human Life," they would have found all such inquiries fully answered in advance. We give due notice to all new readers of THE ARENA that they can, at this late date, scarcely ask a question relating to the elementary laws and principles involved in Substantialism, that has not been discussed and answered in some portion of our previous writings. Still, this is not to forestall inquiries. We desire to receive candid questions on all proper subjects, and we will endeavor to answer all such as have an important bearing on the current discussions in THE ARENA.

ANOTHER SOUND DIFFICULTY.

JAMES M. CAMPBELL, Esq., of Boulder, Col., not having read our previous solutions of difficulties on the sound question, like many others, puts a stunner to us by the question, "If sound is a substantial entity why cannot the housewife can music for future use as she does fruit?"

Of course Mr. Campbell extends the application of his query to all the other forces of nature, since we can no more *can* and hermetically seal up light, heat, gravity, electricity, or magnetism, than we can sound, with the exception possibly of the storage of electricity and heat temporarily, by suitable insulation.

And further, Mr. Campbell must be also a materialist, denying that the soul, mind, or life is anything substantial or entitative; for it is surely just as impossible to bottle up mind, life, or spirit outside of the living organism as it would be to bottle up sunshine or to can music.

The whole trouble with such superficial objections, lies in the want of a knowledge of the great classification of substances into *material* and *immaterial* entities which we have so frequently made and emphasized, and which lies at the very basis of Substantialism. Keeping this classification in view, it is easy to see how impossible it is to confine permanently an immaterial force-substance, which, as a rule, defies material conditions. Light, sound, and magnetism, for example, though substantial forces, only have an instantaneous existence in their transient forms or passing manifestations; and as instantly are converted into the force-element, or fountain of nature from which they had emanated. Their apparent long-continued manifestation is only a continued re-supply of these various forms of substantial force. Electricity and heat, so analogous to mind and life, can be partially stored by careful insulation to prevent their conduction and dispersion, just as life and mind, by a beautiful scientific analogy, can be stored up for a time in the living and thinking organism.

The truth is, adherents of the wave-theory of sound are the only people who really claim to believe in the possibility of *canning* or *bottling up* sound. Look at Prof. Tyndall's experiment of sending "sound" through a long tin tube, by clapping two books together at one end, and thus blowing out a lighted candle at the other. (See "Lectures on Sound," page 12.)

This highest authority on acoustics in American and English colleges declares that it is not a "puff of air," nor anything else, but the "*sound*" itself which goes through the tube and puts out the candle: yet if we tie a paper bag over the far end of this tube, having the air all pressed out of it, one single good clap of the books will fill the bag with *something*, as we have proved repeatedly in the presence of public assemblies. What is it that fills this bag, since no "air" passes? The wave-theory unmistakably tells us it is the "sound" sent off from the two books. And as this paper bag, thus filled, can be sealed up and thus preserved and transported full of what Prof. Tyndall calls *sound*, we insist that no wave-theorist has a right to raise the difficulty about canning substantial music until he settles the question in his own scientific household.

"A POSITIVE CONCEPT."

CORTLAND, N. Y., 1st June, '86.

EDITOR OF THE ARENA.—Most opportune is your invitation to send questions. Thank you truly. If the one I send deserves no notice give it just what it deserves.

In THE ARENA for June, page 13, second paragraph, these words occur. (The same thought is presented in the "Substantialist's Creed," p. 7.)

"Every thing of which the mind can form a positive concept is an objective entity," etc.

The difficulty with me is to know when the "concept" reaches my mind.

I bring before it two nouns, one of which is an entity, the other a nonentity, as

Gravitation (entity),
Shadow (nonentity).

I find that my mind conceives of one about as readily as it does of the other. All the guidance my mind has leading to a concept is the effect which they severally produce. The one pulls two things together; it is something therefore. Who can doubt it?

The other scares a colt, as may be seen when a cloud casts a shadow upon the meadow where the colt is.

It is not long since the wisest of the schools held that gravitation was a mode of motion. As they could not form a concept of gravitation and so make it an entity, can we be assured that Substantialists can do so? Since both the entity and nonentity produce their respective effect, how are they referred to two classes by a common mind?

H. LYMAN.

REMARKS BY THE EDITOR.

Mr. Lyman should be very careful to consider the language on which he bases his difficulties. There is a distinct difference between *positive* concepts and *negative* concepts, the former being entities and the latter nonentities, or the absence of entities. We can form a mental concept of the one, however, as readily as of the other. Mr. Lyman's "difficulty" to know when the concept reaches his mind has nothing to do with this subject of the positive and negative character of concepts, as to their entitative or non-entitative nature. He knows that a concept reaches his mind, just as he knows that he *thinks* any thought whatever. He knows evidently when he *thinks* of *darkness* just as readily as when he thinks of *light*. But darkness is a negative concept, being the name by which we designate the absence of the positive or substantial entity, light.

It was not a *nonentity*, however, which frightened the colt, but the less quantity of light. This caused a sudden change of mental concept on the part of the animal from a positive to a negative mental state, and this change of concept caused the alarm. Thus a person can sleep in a roar of sound, but even let the sound instantly and entirely cease, and he is awakened, not by the nonentity *silence*, but by the same sudden change of mental concept from a positive to a negative condition which frightened the colt. An absolute nonentity can effect nothing in the very nature of things; yet, as we can form a concept of a negation, or of an absolute vacant space, as well as of an entity, we can be affected by our own mental actions or states, let them be caused as they may.

A SCIENTIFIC PROBLEM.

NOTTAWAY C. H., VA.

To the Editor:

DEAR SIR,—Yourself, or some of your learned mathematical correspondents, could doubtless settle the following question, about which we have had some discussion: Imagine a hole made from the surface through the center of the earth and continued through the earth still in a straight line to the outside again; and a weight, say a cannon ball, dropped in. What we want to know is, how far would the ball go, and what would be the character of its movements, and where would it first stop? Some argue that the momentum acquired would carry it clear through the earth and out into space. Others that the rate of speed would, after a certain distance had been traveled, be gradually diminished, owing to the back attraction, and that the ball would come to rest at the center. And yet others that it would go nearly through, then come back through the center, then return, and so on, a less distance every time, till, like the swinging of a pendulum, it would gradually come to rest in the center. Now, what is the answer to this problem?

Yours respectfully,

GEO. DUNN.

[The last supposition is undoubtedly the correct answer to the problem.—EDITOR.]

A YOUNG SCIENTIFIC LECTURER.

BY THE EDITOR.

WE are no little gratified to announce to our readers the advent of a new lecturer on Substantialism *versus* Materialism, and kindred subjects, who is destined, as we believe, in the immediate future to create a sensation in the scientific lecture-field. This young man is Robert Rogers, our office editor, and is without question the youngest scientific lecturer in the world, being just nineteen years of age. We have heard him speak, and have no hesitation in predicting a grand career of fame and usefulness for this eloquent and talented young lecturer. He will be ready for engagements in any part of the country, commencing on November 1st. Lyceums, clubs, Y. M. C. Associations, churches, etc., that wish to get up benefits, and increase their revenues, can communicate directly with Mr. Rogers, or with the editor of this journal, for dates,

terms, etc. He is needed at THE ARENA office, but the publishers cheerfully consent to his taking the lecture-field for the greater amount of good he is thereby capable of doing.

SKETCH OF THE REV. J. KOST, M. D., LL. D.

(FOUNDER AND CHANCELLOR OF THE UNIVERSITY OF FLORIDA).

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

THE materials for this sketch have been somewhat difficult to obtain, owing to the reluctance of the subject thereof to afford any sufficient statement or contribution. The writer was therefore obliged to gather essential historic facts through some other channels of information. These sources and channels of information have been limited to personal knowledge of the subject, his various writings, public works and personal acquaintances. The cut found on the first page of this ARENA is furnished at our own expense, and upon our own responsibility; being taken from a steel engraving made by the publishers of the "Biography of Eminent Men of Michigan," which also contains some information of great service to the writer in the performance of his present agreeable task.

From a distant relative of Dr. Kost it has been learned that in 1751 Herr George Kost registered his name as a passenger for America on the ship Edinburg—James Russell, master—which sailed from Rotterdam, *via* Cowes, England, and arrived in Philadelphia on the 16th of September, of that year, with 345 passengers. This was the great grandfather of the subject of the present sketch, and from which fact it appears that Dr. Kost is of German extraction. Herr George served as a commissary in the Revolutionary war, and was intimate with General Washington and other prominent officers of the army. Having come to this country with some means, and with the intention of making it the home of his descendants, he purchased several plantations near Carlisle in Cumberland Co., Pa. On one of these farms a branch of the Kost family lived, extending the ancestral line through several generations to the birth of the present individual, who was born on the same place, April the 11th, 1819.

Of the early life and education of Dr. Kost we know little; but conclude from his rank in his chosen profession, and usefulness to society, that his educational attainments were equal to his natural abilities. At an early age he selected and began to follow medicine as a profession, in which he seems to have gained considerable eminence. When the cholera prevailed in Cincinnati, he proceeded thither to obtain a practical knowledge of the epidemic and its proper treatment. He appears to have remained, continuing his practice in that city for twelve years. Before that period of his life, however, he had been one of the professors, for some years, in a medical college located in Worcester, Mass.; and had published his first work on the practice of medicine—a volume of 500 octavo pages, a book which has gone through several revisions, and, we learn, was translated into German, but the German was not published in this country. The early English editions of this work were used as text books in several medical colleges. In 1849 appeared his second medical work—an octavo volume of some 800 pages—on materia medica, which was also used as a text book. In the same year or soon after, H. Barnard published a popular work by this author, entitled "Domestic Medicine." This was an illustrated work of some size, and appeared in many subsequent editions. It is said that 100,000 copies of this work were sold in this and other countries.

In 1858, More, Wilstach, Keys & Co., of Cincinnati, published a beautiful edition of a work from the pen of Dr. Kost, entitled "Materia Medica and Therapeutics." This is a work of 829 pages, octavo, and, by those competent to judge, is pronounced a book of great merit. It contains many original analysis of medical plants; as also the discovery of various most important medical agents as podophyllin, leptandrin, and other new and peculiar medical substances. The articles of materia medica are treated with reference to their physical appearances, chemical forces, medical qualities, therapuetic application and officinal character. The work is extensively and beautifully illustrated, and a credit as well to the publishers as to its eminent author.

The prolific pen of this author appeared in two additional works: one on anatomy and Phisiology, published by H. Rulison, of Cincinnati, and the other on obstetrics, published by Ellis & Hart of the same place. These works were large and well illustrated. In 1871, Melick & Bunn, of Chicago, published a volume written by this author on the "Diseases of Women and Children." This work is not so voluminous, but yet it contains several hundred octavo pages. His last published work appeared lately, and since he has changed his tastes and pursuits somewhat from medical to literary and scientific labors. This work is of "Jurisprudence," and is intended as a text-book for law and medical colleges. The writer of this sketch has also had the privilege of reading numerous magazine and newspaper articles appertaining to a vast variety of subjects proving the varied mental resources of this good, great, and useful man.

In 1862 Dr. Kost, in company with his wife and a private student of his, made an extended tour of Europe and other countries for observation and science researches, and collected a vast amount of literary and professional materials. During this trip, over one hundred communications to American papers appeared, many of which were copied into other prints on account of their interest. Upon his return, he entered upon the labors of the Chair of Geology and Chemistry in Adrian College, Mich., in which position he continued seven years, and was ever esteemed for his scrupulously exact formulas and the thoroughness of his teaching. His college labors were mostly didactic. Before he had entered his literary and natural science career, Dr. Kost had occupied professorships in various medical colleges, and his entire labors in teaching comprised perhaps over sixty or seventy college terms, or forty years of professorial life.

In 1883 he became the founder of the State University of Florida, of which he is still the honored chancelor. He is now also under a commission from the Governor of the Peninsular Commonwealth to conduct its geological survey. This work he has just recently commenced. A specimen of its fruit appeared in the September ARENA in the form of a paper read in Buffalo before the American Association for the Advancement of Science, of which he is a member. No one better qualified for the duties of Florida's state geologist could have been chosen.

Dr. Kost is a member of various science and literary associations, and has received quite a number of testimonials from abroad, as well as at home, consisting of *diplomas* and *medals*, showing the esteem in which he is held by his compeers. As a scientist he takes rank with that minority of advanced thinkers of the nineteenth century whose lead it is safe to follow. His nature and the erratic tendency of the age prompt him to be progressively conservative and radically right. He has given science, as viewed from the Christian standpoint, the noblest efforts of his intellect and the richest contributions of his versatile scholarship, even as he is now giving it the crowning labors of his useful life. While feeling his way with commendable caution, he is an avowed Substantialist in wealth of principle and warmth of sympathy. Evidence of this is amply furnished in his paper, found elsewhere, in this number of THE ARENA.

As a philanthropist Dr. Kost is liberal, and has made several important gifts of appliances, libraries, cabinets, and museums of natural history. One of his donations to Adrian College—the first literary institution in which he labored—amounted in value to many thousands of dollars, and comprises a collection of 60,000 specimens, constituting one of the best educational museums in the country. This, it has been the pleasure of the writer to visit recently. He also contributed largely to the library and cabinets of the University of Florida.

As a companion, Dr. Kost is the very embodiment of social, literary, and religious entertainment. In his presence the hours are never permitted to drag sluggishly along. While he artfully invites a candid expression of opinion from others, he is disposed to do his full share of the talking.

In religious faith and association he is a Methodist, and at the same time remains as broad and as Catholic as the everlasting gospel. He has held some important positions in his church—the Methodist-Protestant. Ordained to the ministry in 1844, he has since held ecclesiastical and pastoral relations in Cincinnati and elsewhere. For several years he traveled the West Michigan Conference of his church.

The writer has heard Dr. Kost preach several unctuous and edifying sermons. He is lucid in his exposition of the Word and happy in its practical application. At times he shows a profundity of thought and wide range of biblical scholarship. He generally keeps himself in sight of his audience, but occasionally passes away in his pulpit periods until he steps beyond the stars and soars away in lofty flights beyond the sidereal heavens. As a preacher he is not eloquent in any mere artificial mode of elocution, but rather in that undefinable relation to the dynamic power of truth which puts the speaker's heart into his mouth. Solemn hesitation accompanied by a corresponding gesticulation constitute the most impressive parts of his address. In this peculiar and happy style of delivery his whole being seems charged with spiritual electricity from the upper clouds of heaven, while his very arms and fingers appear as conductors of sacred lightning to his enraptured audience.

In his domestic life, Dr. Kost is true to that peculiar trait of the German character which manifests itself in an ardent love for home. He married young, and has had a family of six children, only two of whom remain. An only son in whom he had centered his fondest affections died about twelve years ago, from the effects of an accident, and which event has occasioned an abiding sadness in his paternal heart.

Dr. Kost's crowning glory is his Christian manhood. A personal and intimate acquaintance with him has impressed the writer with this most agreeable conviction. He is conscientious and consistent in his professed discipleship at the feet of the great "Teacher sent from God." Here his intellectual greatness seems constantly subordinate to these higher attainments which enrich and give perennial beauty to his ethical and spiritual nature.

FREMONT, O.

TO "THE MICROCOSM" SUBSCRIBERS.

BY THE ASSOCIATE EDITOR.

THE MICROCOSM suspended with the March number. THE SCIENTIFIC ARENA was started in June. In July we agreed with THE MICROCOSM Pub. Co. to send our journal to their subscribers, *number for number*, thus assur-

ing to all the old readers as many numbers of THE ARENA as they should have received of THE MICROCOSM had its publication been continued, *i. e.*, April, May, June, July, Aug., and Sept., six numbers of THE ARENA. Having begun with June, this will include the November number. This offer was made and is now being carried out in good faith by us, *gratis*, simply for the sake of the cause of which THE MICROCOSM was, and THE ARENA now is, the exponent.

The fact that the subscribers had paid for THE MICROCOSM in no wise lessens the fact that THE ARENA is sent by its publishers *gratis* for six months to complete the time for which such subscriptions had been paid. Whence, then, is our remuneration? The conviction that Substantialism has not lost a single friend, but is daily gaining many by the greater circulation of THE ARENA, furnished at a price within the reach of the reading *masses*. We doubt if ever a similar change was effected in journalism with so slight a loss of old patronage, and so large a gain of new. This statement is penned only as an explanation to the former subscribers whose subscriptions will be *completed* with the next or *November* ARENA; that is, you will then have received for your year's subscription, six MICROCOSMS and six ARENAS, making a year's numbers of a monthly publication. We are already receiving intimations of an intention to renew from many of the old subscribers, and we hope *every name* will be continued on our books. But better yet; why should not the *veteran legion* double itself? If they shall respond to this suggestion the circulation of the organ of Substantialism will attain the largest figure it has reached since its foundation in 1881, and will be on the high road to the greatest circulation of any religio-scientific journal in the *world*. Every month this little organ of a *mighty truth* makes a *tour of the earth*. Into every state and territory of the United States, across to the British Isles, thence to South America, Africa, India, Australia, and the far off isles of the sea, it is a regular and valued visitor.

Ministers and communicants of all denominations, men of no communion, doctors, lawyers, teachers, students, scientists, and laborers in every field of human activity constitute its readers and friends, while the results constantly springing from its teachings are well indicated by the extract from a personal letter published on another page of this issue, under the caption "Known by our fruit."

As an assurance that the present publishers of THE ARENA will second every effort of the old subscribers to extend the field of their favorite journal, we make this proposition: Every former subscriber to THE MICROCOSM, who will, within the next sixty days, send in one new name with 50 cents, need send only 25 cents for his own renewal, or if *two* new names with $1.00 are sent his renewal shall be free. Shall we not by our prompt and combined efforts raise the circulation to the 50,000 notch before the new year dawns upon us?

THE TWO HEMISPHERES.

(*Concluded from page* 72.)

finally by friction which may, now in the near future, displace every kind of fuel except what may be necessary to run the friction engines. Now, if "The kingdom of Heaven is like unto" this and that, these various facts in Nature are also "like unto the kingdom Heaven," and we might expect the spiritual blessings of both time and eternity to be developed gradually and infinitely to meet the ever-increasing demands of the soul. Hence the joys of genuine repentance, of the pardon of sin, a good conscience, the hope of immortality, "the peace of God which passes understanding" in this life will ripen and expand in all who are pure in heart until they shall see God; and when we shall stand on the observatory of the New Jerusalem and look out for the periphery of all physical creation, we will begin to know "what God hath prepared for them that love him." We may find out that the nebulæ are but solar systems, that our solar systems are but compound satellites, that our earth is but a molecule and the moon an atom, all traveling round the throne of God. As for the upper hemisphere of spiritual entities, we know them only through the telescope of faith, while the treasures of that world are described as "incorruptible, undefiled and that fadeth not away," as "a crown of glory," "all created things" and "everlasting life."

Physical science has developed all these aids to our senses and all our physical wants, and moral science develops all aid needful to the mind and heart. The principles of moral science are as universal and as inexorable as those of chemistry. Joy is strictly a scientific result, proceeding inevitably from certain fixed antecedents. Heaven will never be gained only in conformity to this science of morals, of which the Bible is the great textbook. The thinking of all positivists along this line is most fragmentary. They have never *seen* the other side of the moon, and therefore swear there is no other side. They care little or nothing for what eye has not seen. They are all like little Zaccheus, who could not see Jesus over the heads of others till he climbed a sycamore tree. They each one ought to find them a sycamore, and not conclude there is no Jesus nor spiritual world from which he came, merely because their own eyes are blinded. The truth is, moral science is the original science, which has been the pattern after which all material things were framed, as shown by all the parables of Christ.

MT. STERLING, Ky.

Encouraging Figures.

BY THE ASSOCIATE EDITOR.

THE friends of Substantialism may point with commendable pride to the result of their labors to spread the truth, as shown in the circulation of THE ARENA for the four months of its existence since succeeding THE MICROCOSM.

Twenty-seven thousand two hundred and twenty-two copies monthly represents, at the usual calculation, 81,666 readers. A grand total of 326,664 people reading the truth as expounded by the Substantial Philosophy in four months, is a matter for gratulation, and sufficiently justifies the effort to bring this journal within the reach of the masses.

The credit of this happy result belongs largely to the friends of Substantialism who have seconded our efforts with such zeal.

Clubs have been sent to us by college professors, students, judges of supreme courts, bishops, doctors, and laborers; and already there are signs of a vigorous campaign with the opening of the reading season. If every lover of the truth will secure a few names for his favorite paper, the past four months will have been but the dawn of the next four.

Known by our Fruit.

As one of many testimonies constantly coming to us that show the *fruit* of Dr. Hall's writing (he was the founder and editor of THE MICROCOSM, and continues as editor of THE ARENA, which succeeds THE MICROCOSM), we take the liberty of making the following extract from a personal letter, in the simple hope that others now in the darkness of skepticism and unbelief may be led by THE ARENA into the light of Christ.—[Associate Ed.]

CANASTOTA, N. Y.,
March 26, 1886.

Dr. Hall:

SIR, * * * My mind is growing clearer on religious subjects. Your books and THE MICROCOSM have been the means of changing my belief from mere *nothing* to *God*; and then I was not satisfied to stop there. Faith in Christ came later, and now I have taken a public stand, and am trying to be one of those physicians who *live* religion as well as profess it.

Publishers' Department.

Save Your Money.

SUBSCRIBERS to any of the following fifty-one leading publications, who will send *the regular price* of their favorite journal to Hudson & Co., 23 Park Row, New York, will receive the publication ordered, *together with* THE SCIENTIFIC ARENA *one year*. No one need say, "I cannot afford to take THE ARENA."

American Agriculturist.	The Critic.
Education.	Woman's Journal.
Journal of Education.	The Advance.
Medical Journal.	Christian Instructor.
Medical and Surg. Journal.	Christian Standard.
Arthur's Home Magazine.	The Churchman.
Atlantic Monthly.	Congregationalist.
Century Magazine.	Episcopal Recorder.
Decorator and Furnisher.	Evangelist.
Eclectic Magazine.	Golden Rule.
Forest and Stream.	Good Words.
Godey's Ladies' Book.	Independent.
Harper's Monthly.	Interior.
Harper's Bazar.	Observer.
Harper's Weekly.	Presbyterian.
Littell's Living Age.	Princeton Review.
Leslie's Illustrated Weekly.	Watchman (Baptist).
Magazine of American History.	Engineering Magazine.
Magazine of Art.	Engineering News.
Mother's Magazine.	Manufacturer and Builder.
North American Review.	Popular Science Monthly.
Peterson's Ladies' Magazine.	Scientific American.
Phrenological Journal.	Scientific Am. Supplement.
Puck.	Golden Days.
	St. Nicholas.
	Wide Awake.
	Youth's Companion.

Delay.

ORDERS for binders are filed as they come in, and will be filled soon as the stock is received from the manufacturers.

THE entire edition of the August ARENA was exhausted so quickly that, before we could get a second edition printed, a large number of subscriptions accumulated. At length we sent along the June, July, and September numbers, thinking it better to delay but *one* number than to hold the entire four. We trust each subscriber has received the absent number before this.

But this explanation will make our readers all happy in the knowledge that prosperity not adversity occasioned the delay.

Webster's Unabridged Dictionary Free!

HAVE you read our club rates and premium list on page 77 of this issue?

No other journal of the size, value, and *price* of THE ARENA offers such desirable premiums. Any person who will give a few hours' time may readily secure one of our valuable offers.

Let the clubs be sent in now. We will send sample copies to any address that may be forwarded to us.

Keely Motor—Correction.

LAST month we alluded to a wealthy and eminent business lady now in England, as the largest share owner in the Keely Motor Co. We have received a letter from that lady requesting us to make this correction, and to state that she does not own a single share of that stock in her own right, and that all her purchases of shares from time to time have been for the purpose of making pres-

ents to friends; that her purchases were nearly all in small quantities, only a single purchase having reached as high as 1000 shares. The great wealth of this lady, as we infer, precluded any necessity or desire on her part for a speculative investment except to benefit her friends, believing, as she did, that a few shares thus donated would, in the end, be equivalent to a small fortune.

She writes us that she still has the utmost faith in the near triumph of Mr. Keely's invention, and she is supposed to know more of the real wonders and inner merits of his discovery than any other person, the inventor alone excepted, her large donations having given her *entree* to many demonstrations from which the outside world have been excluded.

As we are frequently in receipt of inquiries from persons at a distance as to the price of the Keely Motor stock and how it can be obtained, we would say that any such, inclosing stamp to the editor, will receive information free of charge.

LET every former subscriber to THE MICROCOSM read our letter to them on page 75 of this issue. Then let the "Veteran Legion" move up to the front in the next sixty days.

WE are constantly receiving inquiries for premiums and club rates. Agents find such ready welcome accorded to THE ARENA, that they are anxious to get terms for clubs and take the field at once. One illustration—Dr. Swander, of Fremont, O., with the care of a large church, and amid the press of exacting literary work, has sent in over EIGHTY subscriptions for THE ARENA!

We append our club rates as follows:

ARENA PREMIUM LIST AND CLUB RATES.

Names and cash to be sent at one time.

1 Subscriber with 50c., Elementary Studies for Beginners in Music. Price 15c.

2 Subscribers with $1.00, Immortality of the Soul Proved by Science. Price 25c.

4 Subscribers with $2.00, ARENA for one year. Price 50c.

6 Subscribers with $3.00, Reading Case for ARENA. Price 85c, or, In Health, Price $1.00.

8 Subscribers with $4.00, Universalism Against Itself. Price $1.00.

10 Subscribers with $5.00, Problem of Human Life. Price $2.00.

25 Subscribers with $12.50, Vols. 1, 2, 3, and 4 of MICROCOSM, bound in cloth. Price $6.00.

50 Subscribers with $25.00, Webster's Unabridged Dictionary, latest edition. Price $12.00.

(The last two sent by nearest express at expense of agent.)

For a description of the books offered for 8, 10, and 25 subscribers, see last outside page of THE ARENA, and for the Reading Case, see advertising columns inside.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

PERIODICALS.

"The Missionary Review," bi-monthly, $1.50 a year; The Princeton Press.

"Christian Thought," bi-monthly, $2.00; clergymen, $1.50 per year; Charles F. Deems, Ed.; Wilbur B. Ketcham, Publisher, 71 Bible House.

"The American Kindergarten and Primary Teacher," monthly, $1.00 per year; Emily M. Coe, Editor; Fowler & Wells Co., Publishers, 753 Broadway.

"The Physio-Medical Journal," monthly, $1.50 per year; Geo. Hasty, M. D., Editor and Publisher, Indianapolis, Ind.

BOOKS.

"The Battle of Gettysburg," by Comte de Paris; size, 9x6 1-4; 315 pages; $1.50; Porter & Coates, Philadelphia.

"Cause and Cure of Disease," by H. B. Philbrook; 7 1-2x5 1-2; 302 pages; Office of "Problems of Nature," Publishers, New York.

"In Health," by A. J. Ingersoll, M. D., Corning, N. Y.; 7 1-2x5; 220 pages.

"Footprints of the Redeemer," by L. A. Dunn, D. D., President of the Central Univeraity of Iowa; 7 1-2x 5 1-4; 309 pages; $1.50; Mills & Co., Publishers, Des Moines, Ia.

MISCELLANEOUS.

Count de Boudry's Devotional Cards, one for each day of the month; plain, 35c.; gilt, 50c.; E. D. Scott, Publisher, 917 Race Street, Philadelphia.

"One Hundred Proofs that the Earth Is Not a Globe" (pamphlet), 25c.; by William Carpenter, 71 Chew Street, Baltimore, Md.

IN "THE FOOT-PRINTS OF THE REDEEMER," Dr. Dunn has wrought a service which every student of the Bible will appreciate. It is not a book of travel, but an exceedingly lucid attempt to clear away the rubbish of doubt cast by lazy and ignorant travelers, upon the identity of Scripture localities. We cannot too highly commend the ability, learning and research brought to the successful accomplishment of this much-needed work.

Students will find this volume a most gratifying handbook of the *Word*, in the study of sacred geography.

A most opportune aid to the discussion going on about the great battle of Gettysburg, is the reprint of the three chapters descriptive of that battle, from the Comte de Paris' CIVIL WAR IN AMERICA. The work is made still more complete by the addition of an Itinerary of the Army of the Potomac and co-operating forces in the Gettysburg campaign, June and July, 1863, which was a feature in the appendix to the first edition of the comte's great work, but now carefully revised and enlarged from documents in the possession of the War Department, giving the most complete organization of the Army of the Potomac, and detailing the name of every general and subordinate commander on the field, with a return showing the casualties by regiment and battery in the Union and Confederate armies, July 1-3, 1863, and gives to this book an official character possessed by none other relating to the battle. It is fortunate that, amid the din and confusion of bitter polemical warfare, there is one historian to whom the general reader can turn with confidence. This account of the battle of Gettysburg is acknowledged to be the fairest and most graphic description of the battle ever written.

The current number (July and Aug.) of CHRISTIAN THOUGHT came to hand heavy laden with fresh thought conveyed by Christian utterance. Dr. Deems, the editor, leads off with an article as timely as it is profound, entitled "A Defense of the Superstitions of Science." Then follow "The Apologetic Value of Paul's Beliefs," by Dr. Buttz, Pres. of Drew Theological Seminary, "Evidences of Design, Drawn Chiefly From Anatomy and Physiology," by Andrew H. Smith, M. D., "Embryology," by Judge William A. Cocke, of Florida, etc. The number is an important contribution to the currency of thought.

THE MISSIONARY REVIEW for September and October brings its ever welcome freight of fact and force for Christ. The leading article, by James Johnson, entitled "A Century of Protestant Missions," should be studied by every minister of God, and its main facts embodied in four sermons—one for each quarter—and given to the churches. Shall we hear such a record read from the Book of Remembrance at the last day? The best possible way to keep posted about mission work is to read the *Missionary Review*. It is peerless in its field.

THE AMERICAN KINDERGARTEN AND PRIMARY TEACHER, Emily M. Coe, editor, is a valuable addition to our current literature.

Devoted to the "interests of parents and the teachers of young children," it meets a great need. Every mother, nurse, and teacher in the land should *study it regularly*. There are two blots upon American domestic life that should be promptly erased: disinclination for children, and an inexcusable ignorance of what to do with and for such as come, welcomed or unwelcomed.

The *American Kindergarten*, read and heeded, will do much toward erasing the last-named blot.

THE EARTH.—Last month we named the fact that a new paper was about to be started in England as the organ of the flat earth theory. We have received the first number of that paper (bearing the title at the head of this article), from the hand of Mr. John Lingrin, 90 South First Street, Brooklyn, N. Y., who is agent for that publication in America; price per copy, three cents. It is edited and published by that enthusiastic flat philosopher, Mr. John Hampden, and is full of the same defiant challenges to the disciples of Newton and Copernicus that have characterized all Mr. Hampden's previous writings. May we be permitted kindly to commend to Mr. Hampden's careful consideration the paper "Zeteticism Against Itself," beginning on the first page of this number?

THE PHYSIO-MEDICAL JOURNAL.—This is a bright and most excellent journal in the line of literature indicated by its title, now in its 12th volume. Dr. Hasty has a number of excellent contributors to his magazine, and we frankly confess that we have never read a more interesting scientific article than one now before us, which we would copy into THE ARENA had we room. We should not object to number Dr. Byers among our own list of contributors if we could entice him away from the *Physio-Medical Journal* honestly. But as we cannot do that, we will only congratulate Dr. Hasty for his good fortune in possessing such contributional talent.

Mr. William Carpenter's pamphlet is an ingenious effort to prove that the earth is flat, circular, and stationary, based on the zetetic philosophy as founded and set forth by Parallax—a Mr. Rowbotham of England. Mr. Carpenter's "100 proofs," are a brief synopsis of the main arguments of Parallax in support of the flat theory, and as Mr. Proctor expresses it, they are 100 important difficulties for young students of astronomy.

When Mr. Carpenter was at our office recently we requested him to check off what he regarded as one dozen of the very strongest of his "100 proofs that the earth is not a globe," as a fair specimen of the whole, which he did, and which we agreed to copy and reply to as soon as our regular series of papers now running on that subject shall be finished. This we intend to do: in the meantime those who wish to tackle the 100 proofs themselves, and try to answer them, can do so by sending to the author for his work.

Dr. Ingersoll strikes a line of much needed instruction in his unique book, IN HEALTH. The Divine phase of our sexual life is stated with a calm positiveness, that at once arrests the reader's attention. As a religio-physiological plea for purity and integrity in sexual life, IN HEALTH surpasses any other work that has come to our notice.

ALL our subscribers should have one of our Common Sense Binders for the convenient handling and preservation of THE ARENA. It will hold twenty-four numbers easily, and when its price and practical utility are taken into consideration, no one should fail to purchase it. See advertisement elsewhere.

☞ We shall give, in our next issue, a report of a wonderful experiment witnessed at Mr. Keely's shop too late for this number.

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COMPLETE SETS OF DR. WILFORD HALL'S BOOKS.

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2. The same set bound in *leather*, in excellent condition, $35 cash, or as a premium for an order for $50 worth of our books. Original cost, $96.

3. The same set bound in half-morocco, very fine, price, $40 cash; or, as a premium on an order for $55 worth of our books. Original cost, $112.

4. The same set bound in full Turkey morocco, superior paper, gilt edges, entirely new, and of magnificent get-up and finish, $50 cash; or, as a premium on an order for $65 worth of our books. Original cost, $160, or $10 per volume.

The above-named books will be sent by express, safely packed, on receipt of the price as above. Persons desiring a set of either binding for cash, or as a premium for our books, but who are not prepared to send for them at once, can have a set reserved for a time by so requesting.

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MESSRS. HALL & CO.,—I have received the $50 worth of your books and the beautiful set of 16 volumes of Appleton's New American Encyclopedia as a premium. I am exceedingly pleased both with the purchase of the books and with the set of Appleton. I have long desired this Encyclopedia in my library as an almost indispensable help in my ministry, but never found myself prepared to possess it till I chanced to see your remarkable offer. The books came in prime condition notwithstanding the distance.

Let me suggest that those ordering books with a view of securing the Encyclopedia as a premium should not fail to include a liberal supply of the "Problem of Human Life," and of the five bound volumes of *The Microcosm*, to be transmitted to posterity as heirlooms. Their providential appearance marks the grandest epoch in science and philosophy the world has ever witnessed. To be an appreciative possessor of these volumes will be a distinction of which any man may well be proud in the coming ages. In those ages no name will stand higher in science than that of the author of these works. Substantially yours,

RUFUS H. MOSS, Pastor of the Christian Church.

CLEARWATER, Kansas.

MESSRS. HALL & CO.,—* * * * * * The books came all right. I am much pleased with them, and would not take $50 for the set of Encyclopedia alone. With sincere thanks, I remain yours, etc.,

D. T. BOGARDUS.

DARLINGTON, S. C.

MESSRS. HALL & CO.,—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the Encyclopedia. I am more than satisfied with the books, and feel well paid for my labor. I would not take $50 for the Encyclopedia alone. You have my thanks for your kindness.

REV. A. MCA. PITTMAN.

HYDETOWN, Pa.

MESSRS. HALL & CO.,—The $50 worth of your valuable books have arrived. The sixteen leather-bound volumes of the Encyclopedia also came in good order, and I would not take $60 for the set. I told my people about your great offer in *The Microcosm*, and they at once urged me to go to work and secure the Encyclopedia for my library. They subscribed for your books and paid me in advance, so I could send the $50. Many thanks to the people on the Hydetown charge for their liberality. I feel sure if my brethren in the Erie Conference, as well as in others, knew of your offer, they would soon be at work on their various charges to secure this important accession to their library. Accept my sincere thanks for your kindness.

S. DIMMICK, Pastor M. E. C.

"DEAR DR. HALL,—The elegant half morocco set of 'Appleton's Encyclopedia' you sent me is a *gem*. I can buy books at low rates, but *I* could not have gone into the open market and bought this set for $60. Wife and I are actually proud of it, and have given it the chief place in our little library. How you can sell such valuable works at your astonishingly low prices, and not 'go over the hill to the poor-farm,' is a good question for any debating club to wrestle with.

"Yours for some more books at the same rates,

"H. B. HUDSON,

559 Quincy St., Brooklyn, N. Y."

IMPORTANCE OF AN ENCYCLOPEDIA.

A writer in the fifth volume of the *Microcosm* remarks:

"Whatever the motive of wealth or personal aggrandizement may have been which prompted the originator and getter-up of the first general encyclopedia, from which all other works of the kind have emanated with various degrees of improvement, one thing is sure, that the world owes a debt of gratitude, that never will be paid in time, to the man who first conceived, formulated, and carried out this idea. * * * * * * And in this connection we may add, that the most generally intelligent person of his age we ever knew, as relates to all questions of science, history, biography, geography, art, literature, manufacture, commerce, monetary matters, etc., was a young man in Tiffin, Ohio, who gave several hours a day to the patient and careful reading of the various articles of an encyclopedia as a simple school-book, which he had purchased with money he had earned by teaching school."

The foregoing encyclopedia offers may be taken advantage of by addressing,

HALL & CO., PUBLISHERS,
28 PARK ROW, NEW YORK.

List of Our Books, With Prices.

1. **"Problem of Human Life,"** 524 large double-column octavo pages, richly bound in cloth, and gold-lettered. It contains the portraits of the six renowned scientists reviewed by the author, namely, Darwin, Tyndall, Huxley, Haeckel, Helmholtz, and Mayer, and is pronounced the most extraordinary scientific book of the century. Price $2.

2. **"Universalism Against Itself,"** 336 octavo pages, by the author of the "Problem of Human Life," written more than forty years ago. It contains a steel portrait of the author, is beautifully bound in cloth, gold and black, and is considered the most original and remarkable exegesis of Scripture texts ever produced. Price $1.

3. **The first five Volumes of The Microcosm,** bound substantially in cloth, gold and black, containing nearly 400 large royal octavo pages each: A. Wilford Hall, Ph. D., LL. D., editor. These five volumes contain the rise, progress, and development of the Substantial Philosophy founded by the editor, and which, it is believed, is destined at no distant day to revolutionize the scientific world. Price $1.50 per volume, or $7.50 for the set. No progressive, thinking man, who cares to keep abreast of the times, should neglect to secure these volumes.

4. **"The Walks and Words of Jesus,"** cloth, by the late Rev. M. N. Olmstead, an invaluable Harmony of the Four Gospels, just the book for the Sunday-school and for every religious family. Price $1.

5. **"Retribution,"** cloth, a most instructive religious book, by the late eminent scholar, W. L. Barnes, Esq., printed and bound in the best style of the art, with an elegant symbolical steel engraving as a frontispiece. Price $1.

6. Our condensed pocket **Webster Dictionary,** cloth, 384 pages, containing more than 25,000 of the principal words of the English language, and several hundred unusual words not yet found in Webster Unabridged. No person who has once used this dictionary will ever be without it. Price 40 cents.

7. **"Death of Death."** We take pleasure in announcing that we have made arrangements with Col. John M. Patton, the author of the above-named book, for adding it to our list of publications included in our ENCYCLOPEDIA OFFER, as made on this page. The price is $1.

8. **Text-Book on Sound.** This is the key to Substantialism, and the culmination of the revolutionary work it has inaugurated. Every school-teacher, professor, and student of science should have it and study it. It demonstrates the wave-theory to be false and sound to be a substantial force. Bound in cloth; price, 50 cents.

This list comprises the books from which selection is to be made in order to secure a set of Appleton's Encyclopedia as a premium. A single copy of either of these works as a sample will be sent by mail or express prepaid at the price named. See testimonials elsewhere.

SPECIAL OFFER, IF ACCEPTED AT ONCE.

It is the one desire of Dr. Hall before he dies, more than anything else, that every man and woman interested in his writings should own, as an heirloom to be transmitted to their children, a complete set of his books involving and setting forth the Substantial Philosophy. These books consist of the five large volumes of *The Microcosm*, bound in cloth, price $1.50 each ($7.50 for the five volumes); the "Problem of Human Life," price $2; and the "Text Book On Sound," price 50 cents; amounting in all exactly to $10. "Our special offer" is to send this full set of books, in seven volumes, by express, to any person who will at once remit us $5, or one half the price, which sum will not cover first cost.

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Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph.D., LL.D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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IS THE EARTH A GLOBE? No. 4.

ZETETICISM AGAINST ITSELF. No. 2.

BY THE EDITOR.

EVERY system or pretended system of philosophy, as well as every theory of science, whether true or false, is based on some one fundamental assumption or pivotal proposition upon which the whole philosophy or theory hinges, and to which every detail of argument is subservient, as of secondary importance. Such is the case with the Zetetic Philosophy, or the theory of the flat earth, as founded and formulated into a system by Mr. Rowbothan, who signed himself "Parallax," and as now advocated by its leading defenders—John Hampden, of England, and William Carpenter, of the United States. Let such salient element in any system or theory break down by the self-stultification of its basic principle, and it then becomes a waste of time and labor to break up and scatter its minor positions and details of argument.

As an illustration of this general proposition, we frankly state, as we have frequently done before, that if the cardinal proposition of the Substantial Philosophy can be shown to be fallacious or be logically turned against itself—that is, if it can be shown that the forces or phenomena-producing causes in nature are not real substantial entities or objective existences, or if one single exception to this fundamental principle can be pointed out and demonstrated—then Substantialism as a system of philosophy tumbles into ruins, just as we expect to show zeteticism reduced to a heap of contradictory rubbish in this article by totally breaking down its leading law. We thus burn the bridges behind us in our own crusade against the mode-of-motion theories of modern science, and were Hampden and Carpenter unbiassed investigators, they would cheerfully be willing to do the same in their crusade against the Copernican system of astronomy. As, in all their defiant challenges, however, they have never dared thus to cut off their retreat, we shall now do it for them by applying the torch to their zetetic pontoon while we call upon all believers in the flat-earth theory to witness the conflagration.

Last month we alluded to this cardinal proposition of zeteticism, and presented a few of the many considerations bearing against it. Let us again state this fundamental feature more in detail, and give some of the proofs from the highest authorities on the subject, before proceeding further with the work of its annihilation. In a single sentence that basic proposition of zeteticism is this: that the earth is a circular plane, over whose flat surface, and equi-distant from it at all times, the sun circles daily around the north pole, annually contracting its circles spirally toward the northern center till vertically over the Tropic of Cancer, on June 21st, and then expanding them, like those of the mainspring of a watch, till it is vertically over the Tropic of Capricorn, on the 21st of December; *and that the rising or setting of the sun is only an appearance caused by the law of perspective by which the angle of vision is so contracted as to make the sun appear to sink below the horizon in consequence of its great distance from us.*

REV. FLETCHER HAMLIN, D. D., Ph. D.

[For Sketch, see page 90.]

Parallax says:

"Although the sun is at all times above the earth's surface, it appears in the morning to ascend from the northeast to the noonday position, and thence to descend and disappear, or set, in the northwest. This phenomenon arises from the operation of a simple and everywhere visible *law of perspective.* A flock of birds, when passing over a flat or marshy country, always appear to descend as it recedes; and if the flock is extensive, the first bird appears lower or nearer to the horizon than the last, although they are at the same actual altitude above the [flat] earth immediately beneath them." —"Zetetic Astronomy," page 124.

A dozen or more passages could be copied from Parallax. But to put this matter at rest, as the teaching of zetetic philosophers, we record the testimony of Mr. Carpenter, the author of several works on the subject, and withal a clever poet, who sent us the following reply to our September paper in such respectful rhyme, and containing at the same time the very evidence we wish, that we give the entire letter to our readers:

71 Chew St., Balto.,
Sept. 27, 1886.

Dr. A. Wilford Hall:

DEAR SIR,—Yours of the 25th just to hand.
In reply to your note, sir, I think you will find,
(If to get at the truth you be fairly inclined),
'Tis no practice of mine to "deny" what is said,
Just "in order" to suit the mere whims of my head;
If I *have* to deny, 'tis a duty imposed,
From the facts of the case when the "hearing" is clos'd.
But "in order to save" any "theory" at all,
Is as wide of the mark as that earth is a ball;
For we know quite enough solid facts "'neath the sun"
To relinquish all theory—so theory we've none!
This being the case, there's no trouble at all
To be *saving* what never can possibly fall!
Now the "rising" and "setting" you speak of is naught
But *appearance*, as e'en by astronomers taught:
Though the *cause* of this thing is not such as they tell us,
For the facts to a different conclusion impel us—
When the sun *seems* to "rise," he comes NEARER—that's all,
And there's not a shade of a rise or a fall!
Let him "rise" in the East—let him "set" in the West—
'Tis but every-day language, imperfect at best;
But when asked by a *scientist*—no, not at all.
You don't catch an old bird wait and see if he fall!
As to what may *appear*, as you say, to some folks,
'Tis a matter that, really, is brimful of jokes!
It *appears* to most all who think nothing about it,
That a ship's COMING UP! and they don't think to doubt it!
Coming up from behind—round the curve of a ball,
That's just twenty-five thousand miles over, that's all!
Why, if people were taught that the moon is green cheese,
When they rode the "cock horse" on their fathers' strong knees,
They'd believe it, of course, till the time came around
And they saw the mistake, when sound wisdom they'd found.
When you speak of "contempt" that our cause has well "merited,"
It is due to the thoughts that you've sadly inherited,
You should wait, my dear sir, and think well ere you act,
And not call us all fools till you find it a fact.
Take my word, learned sir, tho' your "patience" be tried,
You've a deal of work, yet, ere this cause you decide;
And you'll have to turn round, sure as your name is Hall,
To the truth that the earth is *no heavenly ball!*

Yours truly,
WM. CARPENTER.

To illustrate this teaching we now refer to our diagram (see next page) which we copy from the Volume by Parallax, as found at page 109. Upon the presentation of this cut to his readers, Parallax remarks:

"The following diagram, Fig. 60, will show the sun's peculiar path. N represents the polar center; A, the sun in its path in June, which daily expands like the coils of the main spring of a watch, until it reaches the outer or larger path, B, in December, after which the path gradually and day by day contracts until it again becomes the path A, on the 21st of June. That such is the sun's annual course is demonstrated by actual observation," etc.

We presented our readers with this same supposed demonstration as shown in one of his diagrams which we copied last month, and how far it went to demonstrate the truth of the flat theory those readers recol-

lent. We merely reproduce the present diagram to confirm our statements concerning the actual teachings of this theory, namely, that the sun rises alone by coming nearer to us, and sets alone by receding farther from us, in consequence of the contraction or expansion of the angle of vision as the distance increases or decreases according to the well-known law of perspective.

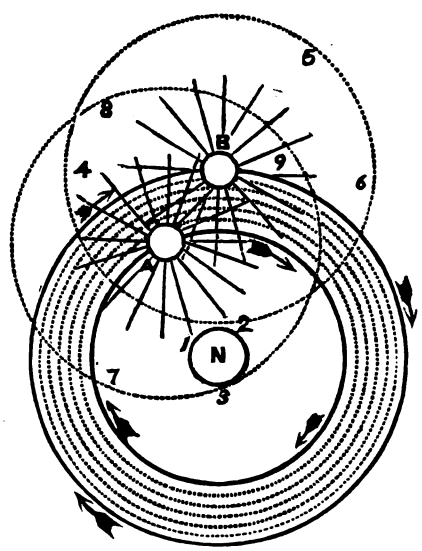
Of course it will be observed that the dotted circles 4, 5, 6, and 7, 8, 9, are intended to represent this perspective extent of the sun's rays in its two extremes of travel, according to the zetetic theory, while the small circle around the north pole (1, 2, 3, eighty degrees from the equator and ten degrees from the pole) shows the portion of the earth that has continuous day and night each year for several months at a time. The arbitrary and ridiculous limitation of the sun's radiance, by perspective, to these doted circles 4, 5, 6, and 7, 8, 9, over the surface of the flat earth, was absolutety necessary to the theory of Parallax in order to explain this long succession of daylight and darkness at the north pole, which the globular earth and its yearly revolution around the sun so beautifully account for, and which so naturally make the sun and fixed stars appear to circle spirally southward and northward every year. We call this arbitrary assumption of Parallax ridiculous, though the term is altogether too mild to express its absurdity since an uncultivated savage knows, if the earth is a flat plane and even half a million miles in diameter, that the sun, as at noon, must shine all over it from boundary to boundary. We showed last month, by this very foundation law of zeteticism as illustrated by the continued appearance of a ship's topsail a hundred feet high for twenty miles, that the sun, (700 miles high), ought to keep in plain sight when 339,000 miles away, thus abundantly lightening the entire face of the earth even if more than 600,000 miles in diameter. How preposterous then for Parallax to draw these dotted circles contracting the sun's rays to less than 4500 miles of radiance just to serve the shallow purpose of accounting for the long seasons of day and night at the pole!

Having thus prepared the way, we shall now come to the new argument which is to break down this view of the rising and setting of the sun by the law of perspective, or by the mere distance it is away from the observer over the flat earth; and remember, if this one single cardinal assumption is shown to be false, as before intimated, the entire flat theory is overturned root and branch, and the earth demonstrated to be a globe.

In the first place, as essential to our argument, let us get at the size of this flat earth and thus find out the distances the sun has to travel in order to disappear by perspective, in thus circling horizontally above its surface around the north pole in an ever increasing and decreasing spiral path, from June 21st to December 21st from the Tropic of Cancer (A) to the Tropic of Capricorn (B), and *vice versa*. Now we could give these figures more accurately from Parallax, but as he is not here to fight the zetetic battle, we prefer to give them direct from John Hampden, his stanch representative in England, as he still lives and is ready to fight anything from the bulls of Bashan to the mosquitoes of Jersey Flats. In a tract sent us the other day, headed "Geometry of the Circular Plane and Harmony of the Solar Courses," he sets forth the diameter of this circular and flat earth at the equator, measured through the north pole, and also its diameter at the two tropics, twenty-three and one-half degrees respectively north and south of the equator. Here are his figures:

"The diameter of the sun's June or northern orbit, is 4200 miles; that of the mean or equinoxial orbit, is 6900 miles; that of the December or southern orbit, is 9600 miles; or an increase or decrease of 2700 miles. In June, the sun is vertical at 1350 miles north of the equator; in May and July, at 900 miles north: in April and August, at 450 miles north; in March and September, it crosses the equatorial line; in February and October, it is 450 miles south; in January and November, it is 900 miles south; and in December, it is 1350 miles south."

It will take but a glance to see the inaccurate and contradictory character of these figures, as the mere approximate guesses of the author; but their average is near enough for our main purpose—to determine the distance in miles from one degree to another of north and south latitude. Every intelligent reader knows that there are ninety degrees from the equator to the north pole. Carpenter's map, in a volume called the "Flat Earth Papers," shows this to be the same, according both to the flat and the globular theory; that is, one hundred-and-eighty degrees from the equator to the equator, measured through the pole. The Tropic of Capricorn—the sun's extreme southern limit, December 21st—is twenty-three and a half degrees south latitude, or beyond the equator, thus adding forty-seven degrees to the diameter of the earth as measured at that



latitude, or 227 degrees in all. Bear this carefully in mind.

Now Mr. Hampden gives the diameter of the earth, or of the sun's extreme southern orbit vertically over this tropic, as 9600 miles as seen by the above figures. Then if we divide 9600 miles by 227 degrees it gives us forty-two miles to each degree (discarding minor fractions), and consequently it is an easy matter to determine the distance the sun is from the observer at any given time, as measured from any degree of north or south latitude, counting its altitude 700 miles as set forth by Parallax.

Being thus fortified with the undeniable figures and distances of zeteticism itself, let us bring our first argument against its cardinal proposition to a culmination. To do this, let an observer be stationed at the seventy-eighth degree of north latitude on December 21st, or two degrees south, or outside of, the small circle of Parallax. This seventy-eighth parallel, remember, is 78 × 42 = 3276 miles from the Equator; while it is twelve degress or 504 miles from the pole, counting all the time forty-two miles to the degree as Hampden's figures make it. Our observer thus stationed on the parallel of seventy-eight degrees of north latitude, is two degrees outside of the dark circle of Parallax, and consequently where the sun never disappears at noon in winter, but remains two degrees above the horizon even on December 21st, or when at its extreme southern limit, as admitted by Parallax. The first nail we wish to clinch in this badly constructed coffin of zeteticism is to find just how far our observer is from the sun when it is two degrees above the horizon at noon December 21st. Answer: Seventy-eight degrees north of the equator added to twenty-three and one-half degrees south of the equator (Tropic of Capricorn) make 101 1-2 degrees, which multiplied by forty-two miles to the degree, give 4263 miles as the zetetic distance of our observer from the sun *while it is still in plain sight by this famous law of perspective;* and don't you forget it!

Now for the climax of this destructive state of facts. Let our observer remain at his station on this 78th parallel for six months or until the 21st of June, when the sun has crossed the equator and arrived vertically over the Tropic of Cancer 23 1-2 degrees north of said equatorial line, or within 54 1-2 degrees of our observer, or within 66 1-2 degrees of the pole. How far is he from the sun on this 21st day of June at *midnight*, measured right across the polar center? Answer: Add the sun's distance beyond the pole, 66 1-2 degrees, to our observer's distance this side of the pole, 12 degrees, and we have 78 1-2 degrees, which, again multiplied by 42, give 3197 miles! Thus we reach the overwhelming proof of zeteticism against itself in the fact that its foundation law of perspective leaves the sun at noonday two degrees above the horizon when 4263 miles away from our observer on December 21st, while sending it below the horizon at midnight and making it pitch darkness on June 21st when only 3197 miles distant, *or more than one thousand miles nearer to our observer!* These are figures which cannot be made to lie. And yet all this, according to Parallax, Hampden, and Carpenter, takes place by the infallible *law of perspective*, by which "the sun appears to set below the horizon of the flat earth simply by getting farther away, and appears to rise simply by getting closer to us!"

Thus breaks down and tumbles into ruins the fundamental law of the flat philosophy over which and about which so much defiant boasting, blustering, and challenging are heard in this country and England. And with the bottom thus dropped out of zeteticism, how simply and beautifully are all the phenomena involved in these exposures explained and accounted for on the principles of a globular earth revolving daily on its axis and annually around the sun! We beg of every flat philosopher who lays any claim to intelligence or honesty in the investigations of science, and who is capable of grasping the figures here set forth, at once to give up the flat cause as irretrievably lost, and so notify THE ARENA. The men who will do so will merit the respect of mankind while they live, but those who, from crushed pride, refuse to do so will only earn and fasten upon their memories the contempt of the intelligent after they are dead and gone.

Take another singular fact as an amusing feature of zeteticism. Not a word can be found in all the writings of Parallax, Hampden, and Carpenter on the probable altitude of the moon above the earth, though the founder of zeteticism distinctly claims to have measured the height of the sun by triangulation and found it to be just 700 miles. As none of these flat philosophers have dared to triangulate the moon we shall now proceed to help them to the much needed information.

In the first place, Parallax and the whole flat school admit that the moon is some distance this side of the sun, since they acknowledge, reluctantly, that the eclipse of the sun is really caused by the moon passing between it and the earth. So far so good. Now it is well known to every mathematician who has calculated an eclipse of the sun and marked out the exact path of totality

along a given belt of country, that the sun is 400 times farther from the earth than is the moon. The chronometric instant of first contact, at two stations selected a given distance apart, taken in connection with the known velocity of the moon's travel, makes this fact a matter of pure mathematics that none but a self-willed sciolist will gainsay. Hence here is where the real fun of the zetetic "philosophy" comes in; for the sun being but "700 miles" measured distance above the earth demonstrates the moon to be but *one mile and three quarters from us*, or less than half as high as John Wise has gone many a time in his balloon! And as the moon, at this enormous (!) distance from the earth, is only two feet in apparent diameter by the well-known law of perspective, its actual size, as the balloonist touches its rim, must be therefore less than five feet in diameter! There are two things as collateral facts that are surprising in connection with this now authenticated size and distance of the moon. One is that Barnum, when he had John Wise in his employ, did not have him bring the toy down for his museum; and the other is that the little lunar globe has not long ago knocked itself into smithereens against the crags of the Andes, since they are more than twice the altitude of the moon! And to cap this climax of absurdity, the moon, with only *one four-hundredth* the altitude of the sun, sets by perspective precisely at the same uniform distance from the observer, just as the same monstrous theory would make the top sail of a ship, one hundred feet high, disappear by perspective at the same distance as would a toadstool three inches high!

Jesting aside, this whole zetetic puerility is the legitimate and logical fruit of a system of teaching at present dignified as a "philosophy" by such men as Hampden and Carpenter. We firmly believe, however, that Parallax, though terribly deluded, had enough intrinsic honesty and good sense in his make-up to have at once surrendered the flat theory had these considerations against his perspective reasoning been critically urged during his lifetime. We have not the slightest hope, however, of any such effect being produced upon Hampden and Carpenter, for the most obvious of reasons. But they may rave and rant, challenge and defy, till they become sane, and they can never resurrect their flat theory from this shattering overthrow of their cardinal law of perspective, as the solution of the rising and setting of the sun.

We might safely leave this law lying, as it now does, dead at our feet; but, lest the two champions referred to may imagine that there is still the breath of life in its body, we will give it one more terrific kick and then bid it adieu. This final settlement of its case is based on the startling self-contradiction that, while the *space* between the sun and the earth (700 miles, as observed at the Tropic of Cancer, June 21st) is contracted absolutely to nothing by the angle of perspective, and lost out of sight below the horizon, making it midnight within a distance of 3197 miles, as just shown, *yet the sun's disk itself does not become a particle smaller in appearance by the same law of perspective, though receding from the observer, as just seen, a distance of* 4263 *miles* on the 21st of December. The mere statement of this fact would be sufficient, to a capable investigator, to dematerialize zeteticism; but we purpose to elaborate the argument involved that it may be the more thoroughly enjoyed by the general reader.

The sun at 700 miles away, vertical overhead, according to Parallax, appears to be about two feet in diameter. Yet when the observer has gone into the Artic Circle and sees the sun away over the Tropic of Capricorn more than 3500 miles farther away, it still remains two feet in diameter! What kind of humbug law of perspective must it be which, according to zeteticism, can produce such contradictory results as to wipe out 700 miles of actual space between sun and earth, while not reducing the sun's disk a single iota? Let us look into this matter seriously for a few moments. Now there is a true law of perspective, as every intelligent person knows, which reduces the apparent size of all bodies as they recede from us, as well as of all distances or spaces between them to precisely the same degree. This law, as determined by experiment, is this: that any given body, as well as any given space, will disappear to the naked vision when removed away about 3000 times its own diameter. That is to say, a globe a foot in diameter will be reduced to a mere point if removed 3000 feet away. And if we place two such globes a foot apart, and then remove them till they are reduced to points, they will seem to touch each other, the space between them, having diminished in the same ratio. Parallax quoted this law, and gave it his approval; yet he totally failed to notice how completely it crushed the life out of his basic solution of the rising and setting of the sun by some bogus or bastard law of perspective, which reduces the 700 miles of space between sun and earth to absolutely nothing, while leaving the sun itself precisely the same size whether 700 or 4000 miles away! We venture to assert, boldly and triumphantly, that no flat philosopher ever possessed the logical grasp to see this destructive effect of the true law of perspective, upon his notions of the rising and the setting of the sun. 'Tis true, a mere point of intense light, as a fixed star or an electric arc light, does not decrease in brilliancy according to this law of perspective, the diffusion of light around the luminous point counteracting the perspective decrease. But every body, luminous or not, with an outlined and measurable disk conforms, and must, in the nature of things, conform to this true law of perspective, which causes apparent decrease in the size of the body as its distance from the eye increases, and as the angle of vision subtends a smaller fraction of a circle.

Now supposing the sun to be 700 miles from an observer at the Tropic of Cancer at noon on June 21st, as Parallax asserts, and that it is then two feet in apparent diameter, how large should the sun (thus reduced to two feet in 700 miles) be at the start or close to the observer? By a little calculation we find its actual diameter to be 1235 feet. Then by applying the true law of perspective approved by Parallax, that a body of any size must be reduced to a point in receding 3000 diameters, we find that the sun should become a mere point of light like a fixed star, at 750 miles away! Gentlemen of the zetetic school, make the figures yourselves and behold where your flat philosophy stands. But instead of the sun's becoming a point of light in going fifty miles farther away from its overhead position at the Tropic of Cancer, it continues, in defiance of the boasts of zeteticism, to remain precisely two feet in apparent diameter when 3500 miles farther away, as recently proved.

While this state of facts must fall like a thousand wet blankets at one time over the heads and shoulders of Hampden and Carpenter, the whole problem, involved as it is and as it must be, in the true law of perspective, is perfectly plain, harmonious, and beautiful to a disciple of Copernicus, Kepler, and Newton, since the enormous true magnitude of the sun—hundreds of thousands of miles in diameter—and its prodigious true distance—scores of millions of miles away—can cause no appreciable reduction in its apparent size from any possible changes of earthly position, nor would such comparatively trivial changes as a few thousand miles more or less sensibly affect the angle of vision which alone causes this apparent diameter of the sun. Thus all the way through every conceivable problem that may be presented, the present system of astronomy answers substantially every inquiry that can be propounded, while the flat theory answers nothing, explains nothing, and leaves the whole complex appearances of the solar system a mess of the most irreconcilable incongruities.

While the Copernican system accounts for all phenomena in heaven and upon earth by fixed and orderly laws of nature, carrying forward systematic results by regular motions superinduced by the action of uniform forces, this mongrel system of flat philosophy does not even claim an orderly operation of natural laws and forces for the production of heavenly phenomena, but as if under the hallucinations which fill the air of a lunatic asylum, it jumps to constantly recurring miracles and the arbitrary interposition of divine power for managing the simplest movements of the solar system, rather than let their intellects assume control of their puerile whims and thus place the whole complex machinery of the universe under the reign of established law. Nothing but a see-saw miraculous interposition of infinite power could make the sun circle spirally outward over the flat earth and around the north pole till December 21st, and then check up its accelerating momentum, begin to reduce its speed, and change to an interior spiral direction, contracting more and more till June 21st, and thus go back and forth perpetually in utter defiance of the physical laws and forces. Yet, more like fanatical dervishes than scientific investigators, these flat theorists look upon such useless interference with law and order as an every-day matter of course, and never wince or wink an eye in their efforts to swallow down such philosophical nonsense. Men who will thus rush headlong to the assumption of miracles at every theoretical whim that may cross their paths, are too far gone in philosophical lunacy to be reasoned with on any scientific subject. Yet just such a man now fills the editorial chair of a publication called the *Earth*, and insists defiantly that not only the sun and moon keep up this semi-annual to-and-fro miraculous spirality, but, that countless millions of stars are semi-annually engaged in the same silly performance, when the orderly motions of the earth alone, under the control of the established physical laws, would answer every purpose much better. These men even exhaust the dictionary in their search for epithets with which to belittle astronomers who believe in Newton, Kepler, and Coperincus. They call them infidels because they interpret the Scripture references to the moving sun as meaning such only in appearance or relativity to the earth; yet when the Bible says: "From the *rising* of the sun even to the *going down* of the same," they coolly turn round and tell us that the sun only rises and sets in "appearance" by the law of perspective! (See Carpenter's poem.)

We thus rest our case on this foundation law of the flat theory, and feel that we have done a service to mankind in so crushing its very life-principle that the mere beginner in science can take the most ingenious disciple of Parallax and wind him around his finger like a thread of twine. For no one can doubt the fact, if this cardinal law of the zetetic system has nothing to do with the sun itself—not decreasing its size the smallest perceptible fraction of an inch in a change of thousands of miles in distance—it follows unavoidably that it can have no effect whatever on the sun's rising and setting. What problem in Euclid was ever more completely demonstrated than the one thus met and fortified? To assume that a law of physical science, which produces not the slightest change in the sun's size in 4000 miles of change in distance, actually causes it to rise and set, *thus diminishing* 700 *miles of space to nothing*, is to assume just such puerile babyism as makes up the warp and woof of the whole flat-earth theory.

REVIEW OF PROF. DRUMMOND'S BOOK

BY H. F. HAWKINS, ESQ.

(*Concluded from last month.*)

ALL evolutionists of the materialistic school hold that evolution has a limit within the realm of nature — the organic kingdom. Prof. Drummond, however, says: Not so. After quoting from Mr. Spencer, to show that such is their claim, he adds: "It is the distinct claim of the third kingdom that this limit is not final"—page 402. Here he has Christ to step in and impart the spiritual life to man, and this he calls the "second birth." He also calls this spiritually-begotten organism a "twice-born" organism. After this important part has been performed by Christ, evolution again takes hold of the newly-made, embryonic spiritual organism and proceeds to complete it. Here is his description of the process—page 402: "Then from a mass of all but homogeneous protoplasm the organism (spiritual) must pass through all the stages of differentiation, and integration, growing in perfectness and beauty under the unfolding of the higher evolution, until it reaches the Infinite Complexity, the Infinite Sensibility, God." Is this not amazing, to say the least of it? But read again from pages 403, 404: "The goal of the organisms of the spiritual kingdom is nothing less than this—to be holy as he is holy, and pure as he is pure, and by the law of conformity to type, their final *perfection* is secured." "The inward nature must develop out according to its type, until the consummation of *oneness* with God is reached." Again, page 401, he says: "Whence has all this system of things come, is, after all, of minor importance compared with the question: Whither does all this tend? * * * And it is, perhaps, impossible, with such faculties as we now possess, to imagine an evolution with a future as great as its past. So stupendous is the development from the atom to the man, that no point can be fixed in the future as distant from what man is now as he is from the atom. But it has been given to Christianity to disclose the lines of a further evolution." Again he says: "The goal of evolution is Jesus Christ." Once more we quote to set this question entirely beyond all possibility of doubt: "This attempt to incorporate the spiritual kingdom in the scheme of evolution, may be met by what seems at first sight a fatal objection"—page 404. He then notices this objection, and adds: "On the surface this objection seems final—but it is only on the surface"—page 405.

"Come now, let us reason together" for a short time, and see, "by following out these lines," if we can tell "whither all this tends." Let us lay aside every intention, save to reason logically and seek the truth. We have seen that evolution "first began with an amorphous cloud of nebulous matter, and without any outside interference it proceeded to the formation of the entire sidereal system, from the very highest inorganic formation down through all the thousands of inferior forms all around us—even to the very lowest. After life appeared upon the scene, we see the same power proceeding from the "unicellulor cryptogam" throughout the entire vegetal world up to the highly differentiated and complex "phonerogam." We further see the same power beginning with the monera, or the "amorphous amœba," and building, producing or bringing forth the entire animal kingdom, including man as "her most finished product." Finally, we are told that the same identical power now begins, and not until now, with man, the highest product so far, and proceeds to evolve him, or out of him, a spiritual being. (But before this can be done Christ must come to the rescue and impart to man the spiritual life, regenerate him, man must be "born again.") Having entered the spiritual kingdom, evolution is to carry on its work there until the spiritual organism "reaches the Infinite Complexity, the Infinite Sensibility, God." "Until the final consummation of oneness with God is reached." Until our "final perfection is secured." What, then we ask, will be the difference between us and God? Shall we be all made Gods, or equals of God? But we will not be so hard as to insist upon this point. It is not necessary; for we propose now to show that, by holding that one solitary individual in the spiritual kingdom has been evolved, he fastens upon himself the evolution of the *entire* kingdom, God included. Let us see.

On page 413 he says, speaking of the universality of evolution: "What applies to the individual applies to the family, what applies to the family applies to the kingdom, what applies to the kingdom applies to the kingdoms." Then in answer to his position that, the spiritual kingdom is within the scheme of evolution, we have only to say: If you admit one solitary individual, even the very lowest, in the kingdom has been evolved, then the entire kingdom has been evolved; for, "what applies to that individual applies to his family, and what applies to his family applies to his kingdom." Not only this, but should he abandon the idea of the evolution of the spiritual kingdom or of the human race, he is still in the brush (so is any one else) so long as he holds that one solitary planet, plant, bird, beast, or any other thing whatsoever, either inorganic or organic, has been evolved. Whenever or wherever that one thing is found that he says has been produced by evolution, then we answer: What applies to it applies to its family, what applies to its family applies to its kingdom, what applies to its kingdom applies to all kingdoms. But again, the Professor tells us that the spiritual kingdom is the last in the scheme of evolution, the chief capstone of this great structure. This being the order laid down for us, here in our world we are justified in assuming that, in all time, in all worlds that ever have or ever will be inhabited, the same order has been and forever will be observed—the spiritual has been, and will be, the last. From this it unavoidably follows that *matter was before spirit*—matter is eternal, spirit has been evolved.

Along this line spring up some thoughts we almost shrink from writing. If evolution is true, and if the spiritual kingdom is within the scheme as Prof. Drummond holds, the only difference between us and these high spiritual organisms, (perhaps many of them instead of one) is, they are a little in advance of us up the road of evolution. Perhaps they were evolved from worlds evolved long before our world came into being. We have come from the same source and by the same law. We are traveling the same road and are destined to the same end. Finally, when they reach their limit, if a limit there be, we shall then overtake them at the top and be as great. They have had nothing to do with our coming into being, and, still less, if possible, to do with the greatness of our possibilities, as they are only our "elder brothers." Here we leave the reader to follow this line of thought as far as he pleases, but again remind them of the Professors' language: "When I began to follow out these lines, I had no idea where they would lead me."

Perhaps some one will say: Prof. Drummond holds that before there can be an evolution in the spiritual kingdom, Christ appears upon the scene and imparts the spiritual life to man. We confess he does so hold, and this he calls the "second birth"—"regeneration." But, my dear sir, you only get the Professor into more trouble. Admit the correctness of your position, and it follows that, as nature knows man only as an animal, like all other animals he only possesses animal life. Until he is "regenerated—born again"—until Christ imparts the spiritual life through this means, man has none, he is still possessed only of *animal life*, and with him, as the brute, death ends all. Away goes hell and future existence for all those dying unregenerated or not "twice born." Do you see? But another trouble gets in your way. As it requires Christ, or God, to impart the spiritual life to man before he can be evolved into a spiritual being, and, seeing the Professor has forced himself to accept the evolution of the entire Spiritual kingdom, what are you going to do for a God or Christ to impart this life to the very first man, from whom the very first spiritual being was evolved? Here you are stranded again. If God could be dispensed with at the beginning, so He can now be dispensed with. This is indeed the logical outcome of evolution of any name, or fashion.

Right here we propose to devote a little thought to the question, *What is a law?* A correct comprehension of this small word, so freely and loosely used, is going to play havoc with a great many theories when it is properly applied. Blackstone says: "Law is *a rule* of action prescribed by the superior," etc. Prof. Drummond tells us "The fundamental conception of law is an ascertained working sequence or constant order among the phenomena of nature * * * The natural laws originate nothing, sustain nothing * * * They are modes of operation, not operators; processes, not powers. Now the point we wish to impress is, *a law is not an entity.* Then it *cannot be a force.* The laws of nature, therefore, so fluently spoken of by the generality of men, *never have done anything since time was.* The word "law" is simply a term used to express the *uniformity with which a given force invariably acts.* Did you ever think of this? This is a fact which none can dispute. Then you can clearly see that evolution is not the result of any law of nature, if we admit it as a fact, but is necessarily the result of some universal force, and the *uniformity* with which that force invariably acts is all can possibly be meant by evolution if you hold it to be a law only. This being so clearly true, it is equally plain no one can say that anything is the result of evolution. But perhaps it will be said: evolution is the active force—the real cause itself of all results. What, then, is this force? Evolutionists of the materialistic tendency say: it is the forces of nature inherent in matter, which Power Herbert Spencer says: "we do not honor with such titles as 'the Master Builder,' or 'the Great Artificer.'" ("Essays, Scientific, Political, and Speculative," vol. I., page 240.) Theistic evolutionists say: "It is God." "Evolution is only God's method of working." Prof. Drummond must believe it is God. He does not say so in plain words, but he tells us "laws do nothing. They are only processes, not powers," etc. Hence, it being a force, he is compelled to say it is God; or else, with Spencer and others, go headlong into irretrievable materialism. But, alas! How his logic slaughters the Christian God, when he proceeds to "frame a larger doctrine" of evolution. He says: "And the doctrine gains immeasurably by such an enlargement. For now the case stands thus: evolution, in harmony with *its* own law that progress is from the simple to the complex, begins itself to pass toward the complex. The materialistic evolution, so to speak, is a straight line. Making all else complex, it alone remains simple—unscientifically simple. But as evolution unfolds everything else, it is now seen to be itself slowly unfolding. The straight line is coming out gradually in curves. At a given point a new force appears deflecting it; and at another given point a new force appears deflecting that. (Something like the improved method of 'pitching' in base ball) . . . What we are reaching, in short, is nothing less than the

evolution of evolution." (*Italics his*, pages 406, 407.)

Well, truly, we can't tell what to think of Prof. Drummond's system of Christianity. Before proceeding to criticise the last position, we lay down this self-evident proposition. *Evolution can proceed no further than perfection.* When this point is reached in the very nature of things, there can be no further development, or evolution. This being true, and as we have seen that none of the works called results of evolution are the results of any law but of a force, and having seen also that this force must be admitted to be the veritable God, or become materialists, and finally seeing that this universal, omnipresent power that is developing everything else, "unfolding everything else," evolving everything else, is now evolving itself, it follows irresistibly that God is now developing or evolving Himself. From this it follows that He is not now perfect because perfection cannot be developed in the least. If not now perfect, then He never has been, or, if so, then He has degenerated. Do you see? We are glad to be permitted to enjoy the hope, however, that our God may be a perfected being some time in the future as He is now in the hands of evolution—undergoing self-development.

If you say God is not developing Himself, only His law called evolution, then we answer God's laws are not perfect, and you are still in the ditch without any means of escape.

Our article is now much longer than we intended, but we are not half done with the Professor. But, quit we must some time, so we will add a few words by way of general summary and close the present article.

Accepting evolution is denying the mosaic account of creation. If Moses was either ignorantly deceived or an impostor, which he must have been to write a false history, then down comes the first five books of the Bible as unreliable, and if Moses is not authority, "who, then, can be believed?" If evolution applies to one kingdom, it does to all kingdoms, even including the spiritual kingdom. Not only this, but if one individual in any kingdom is the result of evolution, so are all the individuals of the entire kingdom, from *Alpha to Omega*, from the very lowest spiritual organism to the very highest. He destroys all future existence for the unregenerated or those not born of the Spirit of Christ. No hell! The very thing all the devils, both in and out of hell, would most desire. If the unregenerated man is immortal, being only an "animal," without any spiritual life, then are all the animals immortal. But to hasten to close, leaving all minor points to be collected by the reader, we call attention to only one more. Holding as he does the evolution of evolution, we care not whether he says evolution is "God the power," or "natural forces the power," or God's laws the power," either position is destructive to him and the Christian religion. If he says it is the natural forces, then he joins the materialistic host. If he says it is God's laws or any other conceivable laws, he is confronted with the truth, admitted by himself, that *laws do nothing.* If he says it is God, then he is again faced by his doctrine that "evolution is evolving itself." In this last dilemma we care not whether he says God is evolving Himself or only his laws; then one or the other is imperfect. But he cannot crawl out through any keyhole by saying it is only God's laws being evolved. He has shut off this possibility of escape himself. In either case, however, he at once opens the door for the logical deductions, in strict harmony with the theory of evolution, that they were formerly much more imperfect than at present, and also that they originally came from very small imperfect beginnings, like all other evolved beings and things. Again, when he is told that, as the Christian world admits no power but God, there was then no power to make Him, and if he exists at all it must be by "self-creation," or "spontaneous generation," a pure work of evolution, as held by materialists, he lies at the feet of his opponents with his mouth hermetically sealed by his own deductions. "When I began to follow out these lines, I had no idea where they would lead me."

NEW MADRID, Mo.

HEAT NOT A "MODE OF MOTION."

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

IN a former article we sought to show, that force is not a property of matter, as are ductility, elasticity, mobility, etc., but that all force is necessarily substantial. That it is not a "mode of molecular vibration" appears if we consider the unreasonableness of assuming that vibration of any kind or "mode" can take place in inert matter, before a force interposes to produce it. Having thus already shown that force in general is substantial, and is, therefore, not a "mode of motion," we propose in this paper to consider *heat* (one of these forms of force) in the light of the "Substantial Philosophy," and perhaps we may discover, ere we conclude this discussion, that Lord Brougham was unwittingly unlimbering his artillery against Tyndall & Co., when he said "There is nothing so plain, to which the influence of a preconceived opinion, or the desire to further a favorite hypothesis, will not blind men, and their blindness in such cases bears ever a proportion to their learning and ingenuity."

It is true that some great names stand associated with the "mode of motion" theory. Aristotle considered heat to be "a condition of matter." Lord Bacon in his *Novum Organum* declares, that "heat itself, its essence and quiddity *is motion, and nothing else.*" Rumford said in 1798, "it appears to me extremely difficult, if not quite impossible, to form any distinct idea of anything capable of being excited and communicated as heat is, *except motion.*" Davy defines heat as "a peculiar motion," and in his "Chemical Philosophy" tells us that the "laws of its communication are precisely the same as the laws of the communication of motion." Locke, later on, insists that "what in our sensation is heat, in the object is nothing but motion," and John Tyndall in his "heat considered as a mode of motion" (a work which placed him in the front rank of *so called* scientific expounders) holds the same view. Now, on the principle that every effect must have an adequate cause, let us examine this question.

I. HEAT IS EVIDENTLY A SUBSTANCE. It is passing strange that the "mode of motion" disciples insist that molecular force, gravitation, heat, light, magnetism, electricity, and vital force produce all the changes which take place in matter, and yet insist that these forces have no *substantial* existence. *This is really equivalent to saying that zero unhelped can produce results!!!* This means death to the truism, "No effect without a cause," for a non-existent, non-substantial cause is an impossibility. Now consider:

1st. *Only that which has substantial existence can produce effects.*

(*a*) *The* QUALITY *of a thing cannot produce independent and separate results.*

It may become the means through which, or the occasion by which, certain effects obtain by or upon the substance possessing it, but of itself it is powerless because not an entity. The sun's luminous property only permits the light force to emanate; the electrical *property* of the dynamo apparatus only allows the electric force to transmit over the wire; the sonorous property of the bell only concedes the privilege of emanation to the force of sound when the bell is struck; and the magnetic property of a magnet only allows the magnetic force to go forth and lift the iron.

(*b*) *But heat does produce effects.* Indeed, the very language used by scientists in studying and explaining the correlation of forces, and Helmholtz's declaration that force, like matter, is never created or destroyed, necessarily imply that forces are more than mere shadows and ideas. Heat produces changes in matter, and it would have been as possible for a non-existing Grant to have changed a line of battle, as for non-existing heat to change a solid to a liquid. Grant's work on the field and in the chair of state proved him to be something more than a "property of matter" or a "mode of motion." No man who accepts the theory of "molecular vibration," can object to or be blamed with inconsistency for believing with Strauss, that Moses, and David, and Jesus were imaginary and mythical personages; for if the red-hot metal running like water does not prove the substantial nature of heat, then the Mosaic Law, and the Psalms, and the Christian Church (that blazing bush, ever burning but not consumed) may not prove the previous substantial existence of real men. Surely had Rumford seen even with Helmholtz's much better, though greatly impaired vision, he would not have declared that because material substance could not possibly furnish heat without limitation, therefore motion was the only thing that could. No wonder that such a man, to whom the universe was made up of only matter and motion, should in the days of the revolution, for the gold of a wealthy widow, espouse the cause of the British and be driven from his home as a traitor. Fortunate indeed had it been for the interests of true genius if, when he was engaged in the breeding of horned cattle in Bavaria, he had pursued exclusively *that* calling to which he was evidently best adapted. But to return; consider how heat expands, fuses, evaporates, and burns, and who in his senses can doubt that it is a substance, though subtle and imponderable. We may not therefore be surprised to find Webster's definition of heat smacking strongly of Substantialism when he speaks of it as "*recognized by its effects.*" Indeed, if the effects of heat may be visible and yet heat itself be only an unsubstantial existence (and is not that a contradiction in terms) then pray tell us how we are to know that *any cause* is substantial? Admit the shadowy and attenuated definition of heat as taught by Tyndall to-day, and the infidel may immediately declare without fear of successful contradiction "the soul is not an entity," for "if visible effects upon metals may be produced by the unsubstantial, the same may take place upon and through the human body." *Christianity must hold fast the primal truth that effects always result from real causes!!!*

II. IT BEING THUS EVIDENT THAT HEAT IS A SUBSTANCE WE NOW ASK, CAN MOTION (WHICH ALL ADMIT TO BE UNSUBSTANTIAL IN ITS NATURE) BY ANY MEANS BECOME, OR EVEN CAUSE THE EXISTENCE OF (HEAT) THE SUBSTANTIAL? Does change of "mode" change the nature of anything? The animal moving slowly, rapidly, or in a circle is the same in nature. Or, can shadow ever produce substance?

1. *What is motion, and what is its relation to heat or any other force?*

(*a*) *Motion is but the act or process of changing place, and is utterly different from any energy or force which produces effects.* Indeed it were as reasonable to ascribe power to *rest* (which is the opposite of motion, both terms indicating not substantial existence, but conditions of existence), or to say that the destruction of the charred wooden structure produced the fire which kindled the conflagration. *So far from being the essence of any force, it is ever the resultant and offspring of force.* (*b*) *Nor is the thing more plausible when put as a "mode of motion."*

For if motion is not an entity, surely none of its "modes" can be, whether it be tardy, accelerated, simple, compound, rectilinear, rotary or helical. The shadow is the same whether moving in a straight line, or performing regular or irregular antics on the parlor wall. Heat is a force, and a force is a capacity of exercising an influence, or producing an effect, but who (save men blinded to the truth), ever believed that any "mode of motion" had such a capacity.

(c) *Indeed motion is not even the cause of heat.* It can never be conceived to be such unless we admit the truth of Mill's erratic hypothesis, that "cause and effect imply nothing more than uniform precedence and consequence," a theory now universally denied by German metaphysicians, and which Victor Cousin called "a fantastical theory which gives a denial to universal belief and to facts," and the existence of which Sir John Herschel attributed to "the omission of a distinct, immediate personal consciousness of causation." Here is an evident confusing of means with cause. The heat generated by friction is not motion, nor a mode of motion, but something revealed by means of motion. We must not call the slain man a revolver because it was the means of making death manifest to living men; nor must we make the revolver, or rather, its slight kick in discharging, responsible for the victim's death, when behind it was a living cause. The method and means of revelation must not be confused with the Cause of Revelation, for it were as reasonable to call the minister God as to call motion the cause of heat!

It being thus evident from reason and observation that heat is neither motion nor any mode of it, nor even the effect of it, but rather, in some cases, revealed by it, and in others, the result of it, it necessarily follows that—

III. THE BIBLE BEING A BOOK OF TRUTH, NOWHERE TEACHES THAT MOTION IS THE CAUSE OF ANY SUBSTANTIAL EXISTENCE. We are led to the consideration of this point from the fact that the author of that—*in most respects*—unexceptionable defense of the faith, entitled "The Old Bible and the New Science," speaks occasionally in that work of "motion from which heat and light come," and then, to prove the harmony of Scripture with the "mode of motion" theory, quotes the passage, Gen. i. 3: "The Spirit of God *moved* upon the face of the waters," as if the subsequent "light," etc., was but a natural sequence of that "moving."* Now, what are the facts in this case?

1. *The verb* מרחפת (*Marakepeth*) *is significant.* It is in the Feminine Piel Participle form, and means literally "cherished—kept brooding over the face of the waters," as the eagle over its young. It is kindred with רחם (rakam), which in past tense signifies "to have mercy or compassion toward the needy and helpless." Now consider:

(a) *That moving or brooding did not evolve light.* Light, like the resurrection of Lazarus, was the sequence of the Divine Word. "Let there be light." The coming of light was *instantaneous*, while the *tense of this verb proves* that the brooding was *more than momentary.*

(b) *That moving or brooding did not institute life.* For, on the one hand, brooding anticipates at most only the evolution of life already in principle existing, as appears from the hatching of fowls by artificial means; and, on the other hand, the origination of life in the chaotic and confused mass would have been premature, and out of harmony with the narrative which reveals the existence of living things as an instantaneous act of Jehovah. And if life were thus evolved, surely it would not be by the *motion* of the brooding agent.

(c) *This Hebrew verb never means to tremble.* Gesenius says that ancient versions render it to tremble and to shake, but *it is mere conjecture!!!*

(c 1-2) *In brooding there is not the origination of heat by motion, but the transmission of it by resting*, and

(d) *It must be further remembered that this verb in the Piel tense is "rarely used in connection with* THINGS!" (*Gesenius*).

It is frequently used in Scripture in reference *to persons*, but only once (*i.e.*, Jeremiah xxx. 18) clearly concerning *things!*

(e) *This brooding is in every case in Scripture connected with the already living and therefore the already visible and* WARM!

Surely, in view of these facts, we have no reason to think that light, heat, etc., were the result of this brooding.

2. *What, then, is the true interpretation of these words "the spirit of God moved upon the face of the waters?"*

Its meaning will appear, if we will remember:

1. *That the three persons of the Trinity are sometimes revealed in the Old Testament as one, by the Hebrew word,* אלהים *Elohim; sometimes as Jesus, the second person of the Trinity, by the word* יהוה אלהים *Jehovah Elohim, and sometimes as the Spirit, the third person, by the words* רוח אלהים *Ruack Elohim.*

Consider also—

2. *That references to the* PERSONS *of the God-head are more numerous in the book of Genesis than the mere English scholar would imagine.* In Genesis, ii, 10, and ever after that, the word Lord, the "I will be," evidently refers to Christ; and Eve, when she held her first babe in her arms, had so definite an idea of the promise concerning "the seed of the woman," that she said, "I have gotten or acquired a man, not *from* but אתיהוה eth Jehovah, *even* the *Lord*—the "I will be," or the Lord himself."

3. *These distinct references teach the interest of the three persons of the Trinity in our fallen race* VERY EARLY IN ITS HISTORY!!!

4. *The passage under consideration teaches the prospective interest of the Spirit in man,* EVEN BEFORE MAN WAS MADE!

"The Spirit, God, kept brooding, looked with compassion, pity, tenderness, upon the face of the waters." We learn here not that light, or heat, or electricity, or life, or any other force was originated by molecular vibration, but that the Holy Spirit, who, as God, knows all things from the beginning, looks tenderly and compassionately upon the nucleus of that world in which sin would, in the future, work its fearful results, and in which (perhaps alone of all the worlds God has made) he is to woo men from sin and wretchedness. Thus as the "I will be," even "the Christ," revealed himself as early interested in man by appearing as "the Lord" to Adam, and Enoch, and Job, so the Spirit evinces his early interest in the future of a world yet in chaos, by bending and brooding over its coming peoples. Thus this passage reveals a pitying God looking in tender love upon his future injured and suffering offspring. Whereas prophets saw the coming Christ, he, with more than prophetic vision, sees the oncoming multitudes of "needy," "helpless" immortals (for, we repeat, the verb here rendered "brooded," is in the Piel tense, and, as a rule, refers to *persons*), for whom in future ages he will make "intercession with groanings that cannot be uttered." Thus the same *compassion* which possessed the "Spirit" when Paul encouraged the Romans to pray (Romans viii. 26), moved him before Adam lived toward a race as yet unborn.

Such is the true interpretation of this passage of Scripture. Nor can we wonder that God the Spirit thus pitied the coming race, when we consider that it must have appeared to him then as it now is, fallen, in danger of hell, "carnal" in "heart," and "enmity against God," more, "professing themselves to be wise," but becoming "fools," preventing their only possible happiness by seeking to dethrone Jehovah from his rightful seat in their hearts, *content like brutes to be familiar with only matter and motion!* No wonder that he pitied them, and, like his equal the Son in a later day, "when he saw the multitude he was *moved* with compassion on them because they fainted and were scattered abroad, as sheep having no shepherd." How striking, that the Spirit, not even the Incarnate Son, but the pure, immaterial, substantial, Infinite Spirit, is thus found *brooding* over the sinfulness and folly of a race, which, in future times, will in its blindness seek to make the inspired statement of that very fact an argument against the possible existence and immortality of real spirit. No wonder that God pitied us as he prospectively saw us, Bartimeus-like, groping in the darkness.

Finally, we remark that the "mode of motion" theory of the origin of force is refuted, as we have seen, by reason, by analogy, as well as by the fundamental principles of the correlation of force as so forcibly proved by Dr. Hall in his great argument on the "Locust and Heat Problem," in THE MICROCOSM of January, 1886. We have also found that the philology of Genesis i. 2 reveals no shadow of evidence in favor of the theory in question. This being true we may not be surprised to find that, Democritus dreamed of heat as an entity, that Lavoisier and Black held caloric to be an actual substance, or that Prof. Tait, of Edinburgh, rejects the "mode of motion theory" of heat as opposed to reason and common sense. God hasten the day when this and other hypotheses which, like sharp knives, are cutting loose the thoughtless and unsuspecting from the moorings of orthodoxy and setting them adrift on an unknown sea without compass or rudder, shall be given to the depths of oblivion. Meanwhile, we say to materialistic scientists everywhere: "If any man among you seem to be wise in this world, let him become a *fool*, that he may be *wise*."

PEEKSKILL, N. Y.

* Indeed, he says: "The word with which science ends its inquiry, after the origin of things, is the same with which Moses began his 'book of origins'—the Spirit of God *moved* upon the face of the waters."

DARWIN AN ATHEIST.

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

MANY persons claim that Darwin was not an atheist. In fact, when I first read his "Origin of Species," which I did a number of years ago, I was under the same opinion. Although I saw that his work directly and emphatically antagonized the Mosaic cosmogony, and his account of the supernatural origin of the species, yet, from what he had said at the close of the volume, I thought he could hardly be considered an atheist. I am now, however, satisfied I was mistaken. It is now evident to my mind that the passage which misled me was adroitly inserted as an after-thought for this very purpose, so as to gain the ear and patronage of the Christian world by thus sugar-coating his atheistic pill. The passage in question reads thus:

"There is grandeur in this view of life, with its several powers having been breathed by the Creator into a *few* forms or into *one*, and that while this planet has gone cycling on according to the fixed laws of gravity, from so simple a beginning, endless forms, most beautiful and most wonderful, have been and are being evolved."

That this was intended merely as a blind—to give his work currency among Christian readers—is clearly admitted in substance by Haeckel, who thus apologizes for Darwin's effort to conceal his atheism:

"The courageous but *cautious* naturalist was at the time (1859) *purposely silent upon*

the subject; for he *anticipated* that this most important of conclusions of the theory of descent [that man was evolved from a monkey instead of created] was at that time the *greatest obstacle* to its being generally accepted and acknowledged." ("History of Creation," vol. 1, p. 7.)

Dr. Tefft, in speaking of Darwin's fraudulent and double dealing method, upon this subject says:

"If Darwin could deceive his readers as to his real opinions, and the end he had in view, he was then quite capable of giving us those false reports of nature, those imaginary facts charged against him by such an able scientist as Prof. Henderson. He was writing for a 'purpose,' and for one I have never failed to notice a sort of coloring, an argumentative side, in the whole mass of his so-called scientific observations." ("Evolution and Christianity," p. 18.)

That this passage of Darwin's was intended to deceive, and was inserted merely for the purpose of concealing, if possible, the true character of his godless creed, and thereby inveigle Christians into the acceptance of atheistic evolutions, is evident from the fact that it does not harmonize with the rest of his work, but directly antagonizes it. This has been recognized and admitted by some of his best friends. The distinguished German admirer of Darwinism, Prof. Schmidt, in speaking of this passage, says emphatically: "On this occasion Darwin has *certainly been untrue to himself.* * * * *It is directly incompatible with the doctrine of descent.*" Prof. Zollner is equally emphatic. He says, when speaking of this passage: "*To hold the beginning of life as an arbitrary act of creation is to break with the whole theory.*"

The truth is Darwin's *theory* as set forth in his "Origin of Species," in spite of this mistletoe passage, is wholly opposed to the Bible, and antagonizes it at every point where they chance to meet concerning creation. Mr. Darwin throughout his work treats the Mosaic account of the origin of the universe, and the various vegetable and animal forms of life, as the merest fiction. And notwithstanding his theory is so essentially and radically diverse from the account given by Moses, as to manifestly be in open conflict with it, yet he makes no attempt to reconcile them. While on the other hand he is continually, either directly or indirectly, assaulting the Mosaic cosmogony as "the miserable hypothesis of special creations." That his "Origin of Species" is atheistical in its spirit, and in its tendencies, is too palpable to be denied, and that he intended it should be, can admit of no reasonable doubt by those who knew him. Even Thomas Carlisle tells us that he read it, in view of this characteristic of the work, with sorrow and disgust; and that this feeling, as we learn, he retained until the close of his life. He, therefore, without any hesitation, classed him among atheists. His language is as follows:

"The so-called literary and scientific classes in England now proudly give themselves to protoplasm, origin of species and the like, to prove that God did not build the universe. I have known three generations of the Darwins--grandfather, father and son; atheists all."

That Darwin utterly rejected the Bible and its teachings, as of no authority whatever, is also fully established by his own declarations made in a letter to a German friend, who had written to him for a statement of his religious views. This brief epistle is as follows:

"SIR,—I am very busy, and am an old man in delicate health, and have not time to answer your questions fully, even assuming that they are capable of being answered at all. Science and Christ have nothing to do with each other, except in so far as the habit of scientific investigations makes a man cautious about accepting any proofs. As far as I am concerned *I do not believe that any revelation has been made.* With regard to a future life every one must draw his own conclusions from *vague and contradictory probabilities.*"

This letter, which is dated Downs, June 5th, 1879, (only three years before his death), shows that with him there was no revelation, no atonement, no Christ, no God, and no hope. And the evident animus of his life-work, in which he has shown so much patient industry, was to blot out all these important truths from existence, and to shut us up in utter hopelessness and darkness forever. Such are the legitimate teachings of evolution.

TOMPKINS COVE, N. Y.

LIFE—A SUBSTANCE.

BY J. R. HOFFER.

THAT there can be no existence without substance or essence in form, is an axiom that the modern philosopher can hardly afford to deny. Though life is intangible to any of our physical senses, which deal only with matter, it cannot be denied that life is the most real thing in existence; for it alone can recognize existence. And it is the only producing power; all other forces being plainly traceable to life as their cause. Life is therefore the actual, unproduced substance. "I am the Life," said the Lord.

All material substances, which are the ones with which our bodily senses deal, are dead and resistless in the hands of the laws and forces that proceed from life. The material are too apt to be the substances to which we give nearly all our attention, and thus the habit is easily formed of ascribing passive deadness to all substances, even contrary to our reasonings. Knowing, too, that the substance of the physical body is dead matter, those who deny the existence of immaterial substances, must necessarily ascribe vitality to them, since the extreme parts of the body are as sensitive and active as those nearest the seat of vitality, and even more so. But when we recognize with the Apostle Paul that "there is a natural body, and there is a spiritual body," the former material and the latter living, then it is easy to see that it is the spiritual that moves the material. And since the spiritual alone has life, it is also plain that it formed the physical over itself, so that the spiritual must at least have all the tissues, fibers, vessels, and parts that are found in the natural.

What is, perhaps, least understood of this subject is the connection between matter and spirit. That spirit pervades everything in nature is evident because nature is known to be maintained by immaterial laws and forces, and what is immaterial is spiritual; therefore the spiritual world or realm and the natural are together. The spiritual is therefore in the material of all nature as it is in the body of every living creature. God is the life, namely, infinite life, which in its extension becomes finite, consequently this extension assumes deadness and therefore fixity as to space. Life has only fixity as to character and quality or force, while dead fixity is an external limit. Spirit or life is therefore not in space, and as to space does not displace matter.

Life being the cause of all effects, therefore, of all things in nature, there can be no natural things that do not correspond with or are representations of something of life. The forces operating in nature, and generally called its laws, are not life, but, as it were, life's material tools, consequently in their operation they represent life. Heat is a representation of love and light of wisdom, and from these two acting together, is all material existence. So life in its operation is love and wisdom or good and truth, which are the real substances: matter being only phenomenal or representative.

While the forces in nature are void of conscious life, they are life's material tools; and being operated by conscious, wise and loving life, effects are produced even in matter that could not result from their being put into undirected motion. Such are the tides which take place on opposite sides of the earth at the same time, and the motions of the planets in eliptical orbits, without ever changing their courses, notwithstanding the relation of their attracting bodies to each other is constantly changing. So the variableness in temperature and rainfall in the same part of the year is not affected by the operations of unconscious forces. Life is therefore the moving and producing cause in all things, and consequently the only real I Am substance, other substances being effects and not existences.

MOUNT JOY, Pa.

DEISM, ATHEISM, Etc.

BY J. S. DUVAL.

I have not the presumption to set myself up as the champion of the gods, much less as an antagonist. In these disconnected thoughts I shall make no effort to refute the arguments brought forward in advocacy of the doctrine of atheism or materialism (for I take it that they are synonymous terms) by men of such acknowledged abilities and learning as Darwin, Tyndall, Spencer, Ingersoll, and others. Whenever I have differed with these "high authorities," I have done so without any reference whatever to their views and opinions, except simply to state the reasons why it is that I have arrived at opposite conclusions, after bringing to bear upon the subjects treated of all the consideration and reflection my limited faculties would permit.

There is no one who places a higher estimate upon the labors of scientific men than I do, nor upon the value of the additions they are daily making to the very limited sum total of our knowledge; yet I candidly believe that with all their wisdom, talents and learning, there are some things of which they are as ignorant as I am myself, or as "Lo! the poor Indian, whose untutored mind sees God in clouds and hears him in the wind."

Therefore, though I am well aware that I am neither wise, learned nor scientific, I do not consider it presumptuous in me to give my opinions upon the subjects discussed in these "disconnected thoughts;" indeed, for that very reason I do so with less hesitation, because I may justly claim to be considered as a *fair type* of that vastly preponderating class, who like myself are neither wise nor scientific, and as *such* and upon *these subjects*, that they are entitled to some weight although they may differ materially from those of the "high authorities" above mentioned. On all purely scientific questions, in fact upon all questions where talents and learning were requisite for forming just conclusions, had I differed with the "recognized authorities" above named, I would probably have kept such differences to myself, but as I have said before, I sincerely believe that upon some subjects (such as God, eternity and the immortality of the soul) the "learned and scientific" are no better "posted" than I am myself.

I have attempted no labored dissertation or treatise, but have simply given the disconnected thoughts that suggested themselves to my mind after reading some of the works of the materialists or atheists I have alluded to. No doubt many of these are not original, and many are erroneous, and all probably badly expressed for want of sufficient practice in writing and composition. Nevertheless, such as they are they have

satisfied me perfectly, that there is an omnipotent, Supreme Intelligence, who rules everything and imposes laws upon the material universe.

The wisest, most talented and learned man in the world knows nothing (comparatively) beyond a few meager facts, gleaned from experience and very imperfect scientific knowledge, and which (in comparison with what is unknown to him and "undreamt of in his philosophy"), even within the circumscribed sphere of his observation, are but as a drop of water to the Atlantic Ocean. With such limited knowledge and minds so finite and imperfect as to be incapable even of grasping the ideas of limitless space or an eternity of time, it does seem to me presumptuous in any one to deny the existence of a Supreme Being, because forsooth his *knowledge*, or rather his physical senses, give him no assurance or evidence of the fact. This is fully as absurd as it would be for an inhabitant of some distant star or world, who had no knowledge of the physical characteristics of our globe, except what had been acquired by the investigation of as small a specimen as a single leaf or flower, to assert that there were no such things as oceans, mountains, lakes and rivers on its surface."

The materialist says that the "apparent design" in all we see, and the harmonious working of Nature's laws, in place of being any evidence to him of the existence of a Supreme Ruler, is precisely the opposite. If he says he had seen any such thing himself, or if there were any credible records to the effect that the laws of Nature had ever been interfered with even for a single moment, he might then suppose possibly that there was "some power behind the throne greater than the throne itself," and capable of controlling these laws. But he says he has no knowledge of any such interferences himself, and that he has no faith at all in the accounts given of such interferences. All this, however, does not convince me (nor will it any one else, I am sure, who reflects for *himself* upon the subject) that the evident design wherever we investigate is not proof positive of the existence of a Supreme Intelligence. When I find everywhere and in everything unmistakable design, I am compelled to infer there was and is a designer, just as I am forced to believe there is a cause for every effect.

"How is it possible to suppose that dead, inert, unreasoning matter, whether in time or eternity it is all the same, could have assumed laws to itself resulting so invariably in definite ends and purposes, and all without any interference or clashing with each other, whether it be in guiding innumerable worlds in their orbits, or in evolving from the tiny acorn "the brave old oak that has stood for a thousand years." If I could suppose it possible that dead inorganic matter could have assumed laws of any kind for itself (and even that much is beyond my credence), I cannot but think that such laws would have been wholly without definite aim or purpose—in fact, that they would have been a mere chaos of conflicting and antagonistic forces.

As an instance of the definite ends and purposes "designed" and brought about by the operation of some of these laws, let us examine the organ of vision in animals. How evidently the whole mechanism has been "planned" and "designed" to enable them to perceive objects outside of or at a distance from themselves. Each of the manifold parts of this complex organ is exactly what it should be in order that the *whole* might serve the purpose intended, to say nothing of the ingenious arrangement of lids and eyelashes, so evidently furnished for the protection of this delicate organ from external injury, and the entire machinery operating in perfect accordance with the laws of light—laws independent of and external to itself, and which were in force and operating long before an eye was ever formed. If this be the work of "chance" operating through dead, unreasoning matter, then it seems to me that "chance" is a misnomer altogether, and that it has established a just claim to the appellation of a divinity. When the materialist ignores the existence of a God, and in doing so makes a god of nature, or rather of matter, I care not by what name he calls it—nature, matter, cosmos, or anything else—and gives to it the attributes of divinity, it is *per se* a god itself.

"I cannot see how it is possible that life, and much less that intelligence could be the result of any combinations of dead, inorganic matter. Each separate atom being originally dead, how can any combination of them produce life and intelligence?" It seems to me impossible to make something out of combinations of matter which did not exist previously in any of its atoms. It would make matter a creator, which the materialist himself will not allow, for, according to his creed, nothing was created, but existed eternally. Man himself has made thousands and tens of thousands of combinations of matter, but life never has been, in a single well-authenticated instance, the result of any such combinations. Dead matter is one thing and life another, though sometimes connected or joined together in a way that is incomprehensible to us.

"The atheist or materialist, in denying the existence of a God, is compelled, of course, to deny the immortality of the soul. His belief, or creed, is that a man is a mere combination of material atoms—a living automaton obeying blindly the laws imposed upon him by originally dead matter. If this be true, and man is a mere automaton, or machine, operated upon by the irresistible laws of matter, then, of course, it follows that there can be no such thing as "free will," and, consequently, he is no more responsible for his acts than a mill is for the quality of the grist it turns out. If he does good he is entitled to no credit, if he does evil he cannot be blamed. The fatalism of the Turk is of a high order compared with that of the materialist. The Turk believes that his destiny is marked out for him by an over-ruling providence; the materialist, that his is but the mechanical operation (thro' the material atoms comprising his body) of the 'irresistible laws that govern matter.'

"And yet, strange to say, the materialist is as enthusiastic in his praise of honesty, truth, charity, benevolence, and all the other virtues, as he could be if he were a devout believer in Christianity itself. Although, according to his creed, man is simply an automaton, obeying perforce the laws imposed upon him by matter. If I am wicked because I am compelled to be so, or virtuous for the same reason, how can there be such things for me as either virtue or vice? and what interest can I have or feel in those 'so-called virtues?' None whatever; and for me they would be the veriest myths and non-entities. With such a belief, all that could concern me in any way would be to make the most of my situation here by gratifying my appetites, and propensities without any regard whatever to those 'so called virtues and vices.'"

A materialist of high standing for learning and talents says that religion is responsible for a large proportion of the evils that have brought woe and misery upon mankind. Such an assertion, I think, is not sustained by the facts, and possibly has its origin in the same feeling of animosity toward religion which leads scoffers to say when speaking of members of the church who have "fallen from grace" or of ministers who have brought shame upon their sacred calling, "Don't talk to me about your religion when I see the vicious and immoral among its followers as well as elsewhere." It is true the world has been very wicked *with* religion, but what it would have been *without* it we can well imagine!

The materialist above alluded to, goes on to say that religion has been the *cause* of more than half of the cruel wars that have devastated the earth, thus casting upon religion the blame that should attach only to its fanatic, vicious, or *pretended* followers. No one can read the Scriptures, for instance, and say that the doctrines therein set forth and taught in any wise sanction the waging of cruel and unjust wars any more than they do the crime of murder. Possibly the materialist may reply to this by quoting those passages of Scripture, wherein the Lord commands the children of Israel to go forth and slay "root and branch," the idolaters, who were opposing their entrance into the "promised land," hoping thereby to place me between the horns of a dilemma, that I must either deny the authenticity of the record, or else accuse the Almighty of being cruel and tyrannical; but I am neither gored by the one horn nor the other. Shall we measure the acts of God by the same rude standard we apply to those of man? As well might we attempt to fathom the depths of the ocean with a boy's minnow line! Acts we might justly consider as extremely vicious and wicked when done by man through ambitious and selfish motives, would be just the *reverse* if done by the will or at the command of God. We can take but very imperfect, one-sided and short-sighted views of the results and bearing of actions; but the "all-seeing eye" perceives everything at a glance, and knows precisely what will be their results for millions of years to come, or for an eternity. God neither wills nor desires the wretchedness of any of his creatures, and however harsh and tyrannical his acts may seem to us unquestionably whatever they may be, they are the *best* for the ultimate good of all. Even a belief in atheism would be preferable to a belief in a cruel and tyrannical God.

That religion has been made the *pretext* by wicked and ambitious men for waging cruel and unjust wars, no one will deny; but a knowledge of human nature teaches us that, if the pretext of religion had been wanting, some other pretext would have been found to serve their purposes. A people or a nation can always find an excuse for waging war, when they wish for war. Even in our enlightened times, we have known one nation to make war upon another because her people would not consent to be poisoned with opium! But let us suppose for the sake of argument (though I am far from admitting it to be the fact), that religion has been the cause of wars that never would have been waged, if there had been no such thing as religion. Even then we might fairly compare the good it has effected in the moral world, to what has been effected in the physical one by water, without which the earth would soon become an uninhabitable waste. If occasionally through its fanatic, ambitious or pretended followers, it has carried destruction to some localities by "devastating flood," yet through all time it has been gently descending everywhere in dews and rains to refresh the earth and replenish the streams with living waters. The cruelties that were perpetrated *in the name* of religion by the "Holy Inquisition," are known to every one; but the millions and billions of kindly, charitable acts and deeds that have resulted from moral and religious training have never had a historian. They are known only to God himself. The "floods" are remembered, but the gentle dews and rains are quickly forgotten.

Keely Motor Stock.

WE intimated last month that persons desiring information concerning the above named stock would receive it free of charge by addressing the editor, *with stamp for return postage.* Those who have not received an answer will know the reason.

THE SCIENTIFIC ARENA.

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PASTOR HENRY B. HUDSON, ASSOCIATE EDITOR.
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HYDROSTATIC PRESSURE—A MECHANICAL PARADOX.

NEW YORK, Oct. 11, 1886.

A. Wilford Hall, Ph. D., LL. D.:

DEAR SIR,—Will you kindly give the readers of THE SCIENTIFIC ARENA a rational explanation of hydrostatic pressure? The problem may be stated substantially thus: Suppose a frictionless piston of one square inch superficial area entering a tank full of water. Now, if I press my finger against this piston to the extent of one pound, I produce a pressure of one pound upon every superficial inch of the inner surface of the tank, as well as upon the surface of every object immersed in the contained water, even should such objects amount to tens of thousands of square feet of tinfoil, so separated that the water may circulate freely between the sheets.

This problem is appropriately styled the "hydrostatic paradox," and, no doubt, involves the most profound mystery of any problem known to physical science. Having failed to find an explanation of this enigma in any work on physics, I appeal to you as the one most likely, in my opinion, to solve it. By giving it your early and careful consideration you will greatly oblige me as well as render a most valuable service to the scientific world.

Yours very cordially,
DR. HENRY A. MOTT.

REPLY BY THE EDITOR.

THE problem of hydrostatic pressure is truly the problem of problems in physics, and its rational solution is unquestionably of the greatest importance to the scientific world. It is every way fitting, therefore, that this solution should appear first in the columns of THE SCIENTIFIC ARENA, and we are glad that Dr. Mott, led by his very careful investigations square up against this problem, should so judiciously have thought of this journal. We shall therefore try as briefly as may be to give him and our readers what we believe to be the first detailed scientific explanation of this supposed mechanical paradox ever published.

Before commencing our solution let us prepare the way by a gradual introduction and consideration of minor mechanical problems involving precisely similar results, but so much more simple or less complex than the main problem here propounded that they are observed and passed over by physical investigators without at all considering their paradoxical character. Take, for example, the simplest of all facts in mechanics—if we press down a pound weight on two sheets of paper lying one on the other, we manifestly press two pounds on the two sheets of paper, since the actual pressure is substantially the same on each, the transfer of the pound pressure being direct from the one to the other. If instead of two sheets of paper we press one pound upon Webster's Unabridged Dictionary consisting of 1,000 sheets of paper closely piled one upon another, it is evident that we press one pound on each separate sheet of paper constituting the book, thus making the pressure on all the sheets 1,000 pounds. Nay, this is not all; each sheet of paper not only receives the pound pressure transferred from the one above it, but each sheet below retransfers back upon the sheet above it, by reaction, the same pound pressure it had received, making one pound of actual pressure on each side of each leaf of the book, or 2,000 pounds pressure in all. This is no less apparently paradoxical than the more complex problem involved in hydrostatic pressure acting in all directions upon the inner surface of an inclosed tank of water by the movement of a piston as described. Indeed, there is no more real mystery involved in such a complex mechanical effect, when fully understood, than in the fact of the simplest mechanical action and reaction, such, for example, as if we press one pound with our finger against a table, the table must press one pound against our finger, thus making two pounds of actual pressure.

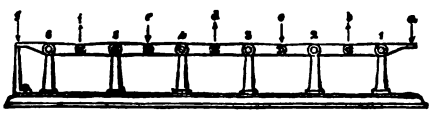
The whole problem, as presented by Dr. Mott, will be found involved in this simple law of mechanics: that action and reaction are always and of necessity equal, and therefore that reaction is a simple duplication of action and a necessary repetition of the original force of such action, however many times transferred from body to body by means of the various mechanical powers such as lever, wedge, screw, incline plane, pulley, etc., all of which are but mechanical modifications of the lever and its effects. The man who can solve the simple paradox of the one pound pressure of his finger against the table producing one pound pressure of the table against his finger, can master this mighty hydrostatic paradox or any other complexity in mechanics, as will soon appear.

But before coming to the details of hydrostatic or fluid pressure infinitely repeated, let us try further to prepare the reader's mind for the more mysterious phase of the problem by simpler stages of this fundamental law of action and reaction, and thus show how its duplication and repetition may be extended on *ad infinitum*, and still be as simple as if but transferred a single time from our finger to the table, and by reaction from the table to our finger, thus duplicating the pressure once.

Take, for example, a number of common spring-balances hooked one to another, as a step toward these minor illustrations. Now it is evident if we pull one pound on the end balance, supposing the series to lie at zero on a frictionless table, we will pull one pound on each and every balance in the string, and the dial or graduated scale of each balance will record one pound even should the chain of instruments be a mile long. This is a beautiful illustration of the endless effect of action and reaction without the slightest loss of force, if the mechanical conditions are favorable. One of these mechanical conditions for the registering of the one pound by each balance, is the fact that the mechanical *motion* of the pound pull must be duplicated for each balance added, since such *motion* or distance traveled by the pound pressure, represents the work done upon each spring in causing its duplicate registry of this same pound.

The problem thus illustrated involves the same principle in mechanics as the raising of a hundred-inch piston, entering a tank of water and loaded with one hundred pounds, by pressing down one pound on a one-inch piston entering the same tank. The large piston will be raised only *one-hundredth* as far as the small piston is pressed into the tank, on the universal law of leverage, that what is gained in power must be lost in motion. But this forms no part of the explanation of the great problem of hydrostatic pressure, as some have mistakenly supposed. Such pressure involves no appreciable mechanical work, since it involves only an infinitesimal motion among the particles of the fluid employed. Let us illustrate the real paradox in the case by the imperfect action of a system of levers whose ends simply *press*, but which do not *move* so as to perform mechanical work.

Take a series of rigid, straight levers with fulcrums in the center, and with their connected ends hinged to each other, the end of the last lever in the system being prevented from moving by a stop, as shown in the accompanying cut. By a careful examination



of this diagram the student of physics will see the law of action and reaction exemplified in its simplest as well as in its most intricate relations to mechanics, and thus better than in any other way have his mind prepared for the true solution of the hydrostatic paradox in hand, and for a comprehension of the real form of mechanical power which applies directly to that problem.

Referring to our diagram, let us for the moment confine our experiment to the first lever, extending from *a* to *b*, and let us suppose it to be frictionless as it hinges on the fulcrum at 1, with its end at *b* fixed. Now if we press down with our finger one pound at *a*, we just as certainly press up one pound against the fixed support at *b*, while with equal certainty we press down two pounds at the fulcrum at 1, thus making four pounds of pressure on that lever. But this is not all: by reaction the end of the lever at *a* presses upward against our finger precisely with the same force that our finger presses downward upon it, thus making two pounds of pressure at that point. The same of course must occur between the other end of the lever and its stop, the two surfaces of contact mutually pressing a pound a piece against each other; while the pin in the fulcrum, at 1, returns by reaction against the lever the same two pounds of pressure there borne down upon said fulcrum, thus fairly and mechanically producing eight pounds of actual pressure through that lever by the communication of a single pound downward pressure at *a*. How can there be imagined a more startling paradox than this?

But the enigma becomes more complex and mysterious when we discover that if the first lever is connected with a series of similar frictionless levers, the same eight pounds of mechanical pressure will be transferred and produced in each lever added to the series, first down at *a*, then up at *b*, down at *c*, up at *d*; first *action*, then *reaction*, and so on to the end of the series, even should the system of levers extend for miles, and should they be so connected as to operate in all conceivable directions, up, down, laterally, diagonally, criss-cross, etc. We have thus not the slightest difficulty in seeing how a tank could be ingeniously filled with minute levers and fulcrums, and even by connected systems of levers piled on systems by which an approximate paradoxical pressure in all directions could be produced similar to the one in hand.

But this is by no means the solution of this

great problem, nor does it begin to grapple with the mystery involved, although by such a conclusive illustration of the unlimited duplication of pressure by action and reaction, the reader's mind is no doubt by this time thoroughly prepared for the real solution when it comes. Plainly nothing similar to rigid levers could be imagined as existing among the infinitesimal particles of any fluid substance in order to cause an infinite duplication of the pressure between them, and by which they are forced apart and separated in all directions.

Since leverage, proper, will not solve the problem, what other form of the mechanical powers will meet the case, since it is manifest that it can only be accomplished by mechanical power in some form? We answer that the mystery is completely and satisfactorily solved by the action of the *wedge*, and that it can be solved by no other form of mechanical power.

Let us first show the application of this form of mechanism to the separation of two objects only, before extending the principle. We have first to suppose a perfectly frictionless *wedge* of infinite taper, entered between two frictionless bodies. Now it is plain that if a pound force be applied to this wedge, it will act with a pound pressure against each of the two bodies in the tendency to separate them. If this frictionless wedge should have an infinite taper in all directions, approximately like the point of a needle, it is plain, should it be pressed between a nest of frictionless bodies, all touching it, that each of these bodies would be forced outwardly with the pound of pressure the same as if the wedge acted upon but two bodies. Then let us suppose that all of the bodies thus pressed outwardly are themselves also frictionless wedges of infinite taper, each entering between similar nests of bodies, which again are of the same wedge construction; and finally, let us suppose that every particle of matter, to its infinitesimal size, which fills the tank, is itself a frictionless wedge of infinite taper, and at once we see how the initial pound pressure against the first entering wedge-particle is duplicated and repeated by action and reaction against every similar wedge-shaped particle in the tank, and consequently against every part of the inner surface of the tank itself, as well as every object within the tank against which such frictionless wedges can come into contact.

Now it is a fact that a tank of water, constituted of a substantially infinite number of frictionless particles, each of infinitesimal size, is practically made up of just such a system of frictionless wedges as we have described, since being infinitesimal in size they are equivalent to an infinitely tapering wedge. Then we have only to begin our experiments with an imaginary piston entering this tank, of the diameter of a single one of these frictionless wedges, and we can see at a glance how the particular wedge against which the piston is pressed with a given power must be forced between other similar particles, these between others, and so on throughout the entire mass of water, thus giving the full pressure of the piston against every infinitesimal particle or wedge the tank contains, as well as against every similar particle of the tank's surface. If this be true, and if it gives a rational view of the question with reference to the action of such a piston, it is unquestionably true and rational with reference to a larger piston, *such frictionless wedge-pressure in all directions corresponding exactly to the force applied to the piston and the number of infinitesimal wedge-particles against which the piston presses.*

This is the solution and this is the law of hydrostatic pressure; and thus only can the apparent paradox be explained.

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THE MELODY OF PROSE.

BY THE OFFICE EDITOR.

IN the last London *Spectator* there is a very critical and thoughtful article on what the writer calls the *Melody of Prose*, as being superior in its intrinsic rythm to that of poetry. He claims that but few writers possess the inspirational genius to have attained to this accomplishment of writing pure, melodious rhythm in simple prose sentences. These general statements are no doubt based on truth, but the writer leaves it open to question whether or not the examples he selects from different prominent writers of prose melody are by any means the finest in our language.

He makes no selections from American authors, but claims to find the richest specimens of rhythmical composition in such writers as Lander, Junius, Sterne, Johnson, Burke, Gibbon and Napier, and makes many beautiful quotations to prove their superiority in melodious sentences, as judged from the standpoint of his own rhythmical taste. We notice, however, that his choicest selections, as the embodiment of his own conception of this branch of art, are composed entirely of sententious paragraphs, oftentimes disjointed, as if almost intentionally aphoristic. One of these passages, and which the writer considers his finest example, is taken from the "*Dream Vision of the Infinite*," by De Quincy, which we reproduce verbatim:

"'Angel, I will go no further. For the spirit of man aches under this infinity. Insufferable is the glory of God's home. Let me lie down in the grave that I may find rest from the persecutions of the infinite; for end, I see, there is none.' And from all the listening stars that shone around issued one choral chant. 'Even so it is; angel, thou knowest that it is; end there is none, that ever yet we heard of.' 'End is there none?' the angel solemnly demanded; 'and is this the sorrow that kills you?' But no voice answered, that he might answer himself. Then the angel threw up his glorious hands to the heaven of heavens, saying, 'End is there none to the universe of God? Lo! also is there no beginning.'"

Now, although we confess it to be a venturesome piece of American hardihood to criticise the deliberate artistic decision of a *Spectator* essayist, we would do injustice to our own convictions of what constitutes a fine English style of composition, were we not to protest against this apostrophe from De Quincy, as containing anything even resembling the true melody of prose. Think of a sentence like this, as containing anything either rhythmical or melodious: "Even so it is; angel thou knowest that it is; end there is none, *that ever yet we heard of!*" What good prose writer would for a moment dare to tempt the waste basket by ending a sentence with a preposition, when by a slight transformation the sentence could have shown decent respect for the queen's English by ending with the verb?

We dissent entirely from the judgment, as well as the artistic taste of this *Spectator* critic, in arraying selections made up of short sentences, as properly presenting and portraying anything like true, much less melodious prose composition. If there is one thing in English literature which we detest more than another, it is this tyroism in the construction of an essay, whether it be long or short, which makes each half dozen words or so a sentence, and almost every sentence a paragraph. We never take up such a literary production without the unavoidable impression that there is something fundamentally weak in the author's brain, or else something unfortunately defective in his education. When the novice in a village school stands up tremblingly to read his first composition, it will generally be found to have much the ring of this choice paragraph from De Quincy, selected by the *Spectator* critic as the climax of prose melody. One which we chanced recently to hear by a sturdy youth, went on to discuss the nature and uses of our atmosphere in the following words:

"The air cannot be seen. Without air we should all die. All animals breathe the air. Air reaches all over the earth. Birds fly in the air, but fall to the ground when they are shot. Air is sometimes still but nearly always in motion. Wind is made of air. Clouds float in the air, and so does smoke. Air is blue when you get up high enough," etc.

This but slightly exaggerates the style of much that the *Spectator* critic parades as among the finest and most melodious specimens of English prose writing.

We do not by these adverse comments set down aught in malice against the exceptionally grammatical, earnest, and painstaking contributor to that high-toned London magazine. Most critics are apt to measure the literary corn of their neighbors in their own half-bushels, and should any deficiency turn out in the quantity thus poured into their special literary grain sacks, you may look for the cause in the shrunken or deformed half-bushel itself. We venture to guess that this critic, who could thus select aphoristic paragraphs from the entire domain of English literature, as embodying the maximum excellence of current prose melody, could not, if put to it on a wager, write a compound sentence of any respectable length, in which its two extremities would make harmonious sense.

In our own estimate of the true rhythmical form of prose writing, though we may fall vastly short of it in our own style of composition, no paragraph can be melodious or rhythmical which is jerky, sententious, or disjointed. The true rhythm of prose is seen and felt in that consecutive onflow of thought from the pen's point which indicates a grasp and sweep of ideas on the part of the writer, when the sentence was begun, of more than a finger's length before he should be compelled to quit and begin again. Let such full-grown sentences as here alluded to fall into line in any set treatise, placed in symmetrical order, with their periods well rounded and their minor divisions well punctuated, and with occasional shorter sentences interspersed for variety and emphasis, like the well-filled companies of militia forming for a dress parade, punctuated by the drawn swords of lieutenants and captains, and interspersed by the emphatic passages of mounted officers, and the sentences of such an essay, if full of original thought, will not lack melodious rhythm by reason of their length.

The flowing melody of a prose sentence will never suffer obscurity by extension to any desired length, provided strict literary care be taken that its opening thought lose not a place in the memory of the reader before its culminating words shall add their ringing climax.

In a future paper we shall endeavor to follow the example set by our *Spectator* essayist, and will present selections from American writers, in which the true melody of prose, here foreshadowed, shall be elucidated.

SKETCH OF REV. FLETCHER HAMLIN, D. D., Ph. D.

BY THE EDITOR.

THE subject of this sketch whose likeness appears on the first page of this issue of THE ARENA, was born in Kingston, Ulster County, in the State of New York, January 9th, 1843. On his father's side he inherited the endurance and vigor of ancestors, some of

whom with Washington faced the nation's foe "in the days that tried men's souls," and others were active and prominent in the war of 1812, under Andrew Jackson, who was of the same blood with themselves.

On his mother's side he is of French-English stock, which links him to the Huguenots, who took refuge in foreign countries after the celebrated revocation of the Edict of Nantes. Considering his ancestry, we may not be surprised to find him intensely enthusiastic and persistent in whatever he undertakes; characteristics which, when properly controlled, as in his case, by prudence and good judgment, are as a rule prophetic of success. When the subject of this sketch was but eighteen months old his mother died, but a kind providence supplied her place by a tender grandmother, whose pious counsel and consistent Christian life served very largely to direct his thoughts and to control his actions. Frequently reminded by her in those tender years of his life, that he was the child of an ascended saint who awaited his coming in the "City of Gold," he grew up under a sense of spiritual responsibility, which measurably restrained him from running into those flagrant sins which everywhere beset the young.

Evincing in early life a remarkable thirst for knowledge (a thirst which in all his subsequent career has been his chief physical danger), he was at the age of twelve foremost in all his classes at school, including the study of three foreign languages, to which he afterward added one or two others. His intense love for philological investigation was remarkable, and to-day he delights to spend hours in this field which so richly remunerates the faithful toiler. His elementary education was acquired at the Kingston Academy in his native town, after which he became a student in the Ashland Collegiate Institute, at that time under the care of that ripe scholar and successful educator Rev. H. J. Fox, D. D. Here his progress was so marked in all branches of study, and his intellectual ability so evident, that the Principal e'er long prophesied for him a noble and useful future. After leaving the institute he spent some time at Albany College; then for nearly two years he studied law, under Hon. T. R. Westbrook, afterward a Supreme Court Judge of the State of New York.

But the young man was *restless*, a sense of duty was resting upon him; he felt himself drawn toward the work of the Christian ministry. He had, in 1859, at the age of sixteen, connected himself with the Methodist Episcopal Church, having professed conversion in a revival service conducted by Rev. D. L. Marks. Now leaving the law, he began special preparation for the ministry, and in 1866, Dr. Hamlin united on trial with the New York Conference of the Methodist Episcopal Church. Passing his conference examinations in due time, he was received into full membership, and ordained Deacon at Harlem. N. Y., in 1868, by Bishop Clark, and Elder, at New York City in 1870, by Bishop Janes. The first six years of Dr. Hamlin's ministerial life were spent in circuit work, preaching three times on the Sabbath, driving from fifteen to twenty-five miles, and much of the time leading the singing, and the classes as well.

By this time his fame as a revivalist had gone forth (for in these six years about 600 had united with the churches he had served), and he was called to the pulpit of Jane Street Methodist Episcopal Church in New York City, and in 1872 began the work of a city pastor. The change from the mountain circuit to the city church was one which, as might reasonably be expected, provoked numerous prophesies of certain failure; but Dr. Hamlin was equal to the occasion, in the three years of his pastorate there receiving into church membership more than 400 souls, and leaving the charge in a flourishing condition. Thence he went to Yonkers, N. Y., in 1875. Here he filled an appointment different in all respects from that which he had previously served; nevertheless, such was his power of self-adaptation to the intellectual and social needs of the people, that at the expiration of his pastoral term, all the temporal interests of the church were in satisfactory condition, and he had added nearly three hundred to the membership.

Now came another crisis in his ministerial life. He had proved his ability to produce a flood tide, but could he take the tide at its flood and prevent it from receding? We shall see. At St. John's M. E. Church, Newburg, N. Y., a continuous revival had prevailed for nearly three years; that peerless manager Dr. L. H. King its pastor, must leave that church, and Dr. Hamlin was called to "hold the fort;" and not only did he do it, right royally, but added nearly 300 to its membership before he left it. And when he preached his farewell sermon to that people, not less than 1200 persons listened to his parting words. Thence he went to Hedding M. E. Church, Poughkeepsie, where on a single evening he was privileged to see nearly one hundred penitents at the altar of prayer. Such a Watch-night service was never before beheld in that city. After three years of effective work there, in which he added more than three hundred to its communion, he went from that church of the masses to St. Paul's M. E. Church, Peekskill, N. Y., where he is now closing his pastoral term, and preaches to one of the most intelligent, influential and wealthy congregations in the conference, and has already received about 250 into church fellowship. He has received into the M. E. Church over two thousand (2000) persons in twenty years, or an average of 100 a year for that time. It may well be doubted whether any man in his conference has received so many into church membership in the same number of years as has he. As a man Dr. Hamlin is genial, courteous, sympathetic, and positive, yet remarkably unpretentious. As a scholar he is a man of broad reading in science, history both civil and ecclesiastical, an ardent student of philosophy, and a most patient investigator of the bearings of current philosophical teachings on the religious thought of the age. His published articles entitled "Wilford and Genesis," "Errors and Needs of Modern Science," "Creation and Substantialism," "Christ and Culture," "The Soul and Entity," "Science and the Word," "Unity of Type," his address before the graduates of Rockland College on "The Relation of Ideal Goodness to Ideal Greatness," and (last but not least) his wonderful essay on "Force in its Various Aspects"—all these reveal the trend and profundity of his thoughts and the breadth of his scholarship. In his philosophical views, having studied the question carefully and thoroughly, he rejects the "Mode of Motion" theory in the acceptance of which Cooke and others were brought to grief, and is a firm and stanch friend of the Substantial Philosophy as taught in the "Problem of Human Life," using it with telling effect in combating all forms of infidelity.

As a preacher he is peculiarly himself. There is in him a versatility seldom found in the pulpit; for it is not often that the plain, earnest, and magnetic ability of the old time revivalist, and the cool, measured skill of the consecutive, logical thinker are so completely obedient to the mandate of one human will, that when the one is active, the very existence of the other is unrevealed. He certainly has no superiors in revival work, and few equals in the field of profound scientific or metaphysical discussion. Such is his intellectual superiority and ministerial standing, that in 1885 he received the degree of Doctor of Divinity from the Board of Regents of Florida State University; and in 1886, after a rigid examination, the degree of Doctor of Philosophy was conferred on him by the "Grant Memorial University," of which Bishop Walden, of the M. E. Church, is president. We do not wonder that a former Princeton Professor, and one of the most scholarly men in this state, said when he heard that these degrees had been conferred: "I knew years ago that he would be a marked man in his denomination." Dr. Hamlin has received flattering offers from other conferences, but has thus far remained amid the scenes of his early labor and marvelous success. May he live long to preach the Word and win men to Jesus Christ. Having been one of the ablest and most valued contributors to THE MICROCOSM from its commencement, we now have the assistance of his powerful pen in the columns of THE SCIENTIFIC ARENA, which we trust its readers will continue to enjoy while that most useful life shall be preserved. Personally we have ranked Dr. Hamlin, since our first acquaintance with him, as among our most trusted and cherished friends. Nothing we can say will add to the esteem in which he is held by those who personally know him, and we only speak of him thus warmly that readers at a distance may participate in this personal regard of his intimate friends.

MR. KEELY'S RESEARCHES.

SOUND SHOWN TO BE A SUBSTANTIAL FORCE.

BY THE ASSOCIATE EDITOR.

UPON the 24th of September, the editors of THE ARENA, in company with some ten other gentlemen from New York and Philadelphia, accepted Mr. Keely's invitation to witness some experiments at his shop, of a character to illustrate the line upon which his investigations have run all these years.

We found the great inventor in excellent health and spirits, having but just returned from his first vacation in years. He was hard at work upon his "vibratory governor," by which he expects to secure a *regulated* speed, and thus overcome another of the remaining difficulties in his work. We were assured by those familiar with the work, and in the confidence of the inventor, that the end is at hand, when the validity of the process will be established beyond controversy by the perfect and public utilization of the power in doing great and continuous work.

The introductions over, and the few minutes' chatting and chaffing ended, the experiments proceeded.

Mr. Keely first put together his liberator, the various parts of which were scattered about the shop, and freely accessible to such handling and examination as any one was disposed to make.

And we are frank to say that such examination upon our part failed to throw any new light upon the great question at issue. We saw nothing that suggested any other origin for the power than that claimed by Mr. Keely. Certainly all the well-known and easily-distinguished phenomena of the known gases, compressed air, etc., were not present. The various tests and experiments, showing the enormous force exerted, are all familiar to the readers of THE ARENA, these having been described by Dr. Hall's graphic pen in the July and September numbers, and need not be repeated here. What interested us most, and was, in fact, the object of our presence, were some experiments calculated to demonstrate the power of sympathetic vibration as applied to dynamics. For the purposes of these experiments, we were shown into an upper room about 12x14 feet in size, across one end of which extended a plain work-bench.

Upon this bench, extending more than half the length of it, were stretched two wires, tensioned to vibrate when agitated.

the first wire giving forth a low note, the second a tone considerably higher.

Commencing at the termination of the second wire, and constituting a continuation of it, was what appeared to be a small steel rod, really consisting of three sections, so arranged that the ends touched, the extreme end of the last one, terminating against a heavy plate of glass, perhaps three-fourths of an inch thick. The stretched wires and steel rods, extending nearly the entire length of the bench, in fact, leaving just room for the copper sphere that was expected to revolve by the force of sympathetic vibration, to stand at the end.

This sphere was an unpretentious, smooth structure, about one foot in diameter, hung in a circular frame, and free to revolve in either direction, looking quite like a school globe without its maps, except that one axle terminated in a rubber bulb, like a small syringe. This sphere was placed between the thick plate of glate against which the rod above described terminated, and a similar plate resting against the wall of the room, thus securing perfect insulation from both sides.

The four iron legs supporting the circle frame in which the sphere swung, also rested upon a common pane of glass, for which Mr. Keely sent to the store as we waited. Thus it will be observed the sphere was insulated upon the three sides of contact. Upon the bench were also two large tuning forks fixed upright in their movable pine resonant cases, standing some three feet apart, and the nearest one that distance from the sphere. Between the tuning forks stood a small brass object resembling a snail shell mounted on a pedestal, and called a resonator.

Thus much about the bench and its furnishing.

At the opposite end of the room from the bench, thrown carelessly upon the floor, was a flat ring about one inch wide, having a diameter of perhaps forty inches. Into this flat ring was fixed a large tuning fork at right angles with its flat surface. Attached to the inner edge, and extending entirely around the ring, was a brass tube half an inch in diameter, terminating where the two ends met in a small sphere, about the size of an apple. Between this ring and the bench, also resting upon the floor, was placed a small iron receiver, or "double compressor," as Mr. Keely termed it. A small copper pipe led from this receiver to the little ball or sphere of the brass tube on the inner side of the flat ring. Another copper pipe was attached to the receiver and led out into the adjoining room to the liberator. Through this long pipe, and through the "double compressor," and the short pipe was passed the "vapor" with which the brass tube in the ring on the floor was "charged."

Before the ring was charged, or any experiments were performed, Mr. Keely proceeded to get the "mass chord" of such of the party as desired to have a hand in the experiments. We can imagine the reader asking what is the "mass chord," and while we do not claim to be sufficiently enlightened to stand sponsor to the motor nomenclature, we venture the explanation that the chord or tone to which the body or person responds or is in unison is what is meant by the mass chord. This was the *modus operandi* of its determination—Mr. Keely put into the hand of any volunteer assistant a steel bolt (called a "sensitizer") resembling a car coupling pin, but shorter, and having a one-quarter inch hole through its length; extending from the end of this was a ten-foot hair-like wire that terminated in a reed whistle: this whistle Mr. Keely dropped into the snail-shell resonator that stood on the bench. When the bow was drawn across the tensioned wires and the tuning forks on the bench, and the sensitizer having been gently struck against something to agitate the "vibrators" within it, if the "mass" or resultant sound did not suit Mr. Keely, he handed a small steel pin or rod, picked up from a pile of various lengths lying on the bench, to the assistant, to be held in the disengaged hand. If the chord was still unsatisfactory, a longer or shorter steel rod was given to the assistant, until the tone was declared right. In one end of each of these steel rods was a small hole perhaps an inch deep. Every change of assistant necessitated a change of rod to be held in the hand, no two persons using the same.

When all was in readiness, the brass tube within the flat ring on the floor was charged with the force, though, during the operation, the sheet of vulcanized rubber in the top of the "double compressor," which Mr. Keely said would only yield to a pressure of 2000 pounds, was blown out with a report that indicated great power, and caused some of the brave savants present to seek positions in remote corners.

At this point Mr. Keely passed out into the room through which entrance was gained to the experiment-room, in which all the spectators remained. The only known factors of the experiments that were in the room with Mr. Keely were the liberator and a brass tube about four and a half inches in diameter, and perhaps eight inches deep. This piece of mechanism was supposed to be full of "resonators," and the top suggested an old-fashioned candle-mold. In exhibiting this through the window, by which he had his only communication with any of the party, Mr. Keely said as he placed it on the bench beside him, "I can give you 140 octaves with that."

Now let us recapitulate the preparations before stating the experiments. In one room, a bench with its stretched wires, and steel rods extending its length, two large tuning-forks in movable pine cases, a snail-shell resonator, and the insulated copper sphere. At the opposite end of the room, lying upon the floor, was the flat ring with one turning fork fixed upright in it, and the brass tube charged with the vapor, upon its inner edge. In the middle of the floor, the small "double compressor," connected by copper pipes with the brass-tube ring. NO VISIBLE OR APPARENTLY POSSIBLE CONNECTION *between the bench and the revolving sphere at one end, and this "compressor" and flat hoop at the* OPPOSITE *end of the room.* The one dozen spectators remained in this room.

In the adjoining room were the liberator, "140-octave resonator," and Mr. Keely. Communication between the two rooms was limited to a door near the bench, which Mr. Keely left partly closed as he passed out, and a square hole, or window, at the opposite end of the partition containing the door.

At this square opening Mr. Keely took his stand—thrusting his head and shoulders through into our room, and fixing his eyes on the, thus far, stationary sphere.

Dr. Wood stepped within the circle upon the floor, grasped in one hand the "sensitizer" (from which the hair-like wire extended out into the "140-octave resonator" near Mr. Keely), and held in his other hand the steel pin of his "mass chord." Mr. Keely commanded the bowing of the tuning-forks, which was promptly done by volunteers, when lo! the hitherto imperturbable sphere, away across the room, began to revolve, slowly at first, but with an increasing speed as the forks continued to vibrate. Dr. Woods stepped out of the circle, and the sphere stopped at once; stepping back into the circle, the sphere immediately responded.

Dr. Hall next stepped within the magic circle, the forks upon the bench, and the one upon the hoop on the floor were vibrated, and the sphere started off again, like a thing of life.

Then Mr. Chas. Collier, to whom this whole experiment was also new, tried it, and the same results were as unfailing as before.

Mr. Keely next said he would exhibit the sphere revolving in response to its note upon a harmonica, *without the aid of any vibrating tuning-forks.* With Mr. Collier still standing within the circle, holding the "sensitizer" and "mass chord" steel pin, Mr. Keely began playing "Home, Sweet Home" upon the harmonica. Our gaze alternated between the strange musician and the responsive sphere. As soon as he sounded a certain chord the sphere began to revolve; faster and yet faster it sped, urged on by this mysterious power, until it attained a speed of several hundred revolutions a minute. But a chord not its own quickly brought it to a standstill.

The spectators looked from one to the other in silent wonder, when Dr. Hall, with his irrepressible instinct for investigation, exclaimed: "Let me play that harmonica." "Certainly," replied the master spirit, "any one who likes may try it." Then one and another remembered some long-lost chord. But it mattered not to the sphere whether "The Girl I Left Behind Me" or "Hark, from the Tombs a Doleful Sound" was the selection; so long as the chord to which it was responsive was sounded, it whirled on; other chords might be sounded at the same time, still on it went. But if that chord was not heard, no other sound or combination of sounds affected it in the least.

The reader can hardly appreciate, from this simple narrative of the facts, the emotions awakened by such an exhibition. The entire absence of careful preparation for the gathering, as shown by Mr. Keely's repeated search for objects needed at various points, that should have been gathered and placed where wanted beforehand; the change made on the instant by the substitution of one article for another, that was found to be a misfit or would not work, etc., all added force to the results shown, and yet cannot be reproduced on paper. Mr. Keely asserts that these or other experiments are not devised to convert observers. He cares not what may be the conclusion of individuals or the press, being sure of the end himself, and only continues these exhibitions at the request of parties desirous of seeing with their own eyes the strange things thus far accomplished. And our purpose in reporting thus in detail what we saw, is served by putting it to the possession of our readers all the facts in our hands, thereby enabling them to form such an opinion as in their judgment these facts seem to warrant.

Small-Potato Criticism.

BY THE EDITOR.

WE are often impressed with the words of our heading as we read the critical attempts of certain reviewers to disparage the literary productions of their contemporaries. We have not infrequently had our nerves completely knocked out, as the pugilistic slang has it, in reading a grave argument by some pretentious reviewer, in which the weighty matters of philosophical and scientific discoveries are discussed with seeming profundity, to observe the thread of the criticism ruinously blurred and broken by an abrupt and egotistical chuckle over some supposed inaccuracy of language, wholly unimportant if the point be well taken, and totally irrelevant to the matter in review whether the point be well taken or not. It is often the case that such superficial critic, in his eagerness for some slip of the pen over which to display the smallness of his intellect and the greatness of his ambition to show his smartness in an array of italics and quotation marks, really wastes his sneers over a typographical blunder instead of a real error on the part of the writer under his popgun fire.

No matter for this, so it is only something that will bear italicizing, for so intent is the critic in belittling the views he is opposing that he will even gladly lose the thread of a respectable argument for the sciolistic satisfaction of firing one of his blank cartridges at some imaginary fault in his antagonist's grammar.

We are led to these reflections in reading a criticism in the October number of *Lippincott's Magazine*, by one Babcock, directed chiefly against an able and most polished paper from the pen of Mrs. Bloomfield Moore, which appeared in the previous number of that publication. Mrs. Moore's paper was a philosophical treatise favorable to the Keely Motor, and disposed to treat it fairly, which, however, was sufficient to stir up the bitterest sarcasm of this literary marauder against the reasoning of one whose philosophical grasp he could no more approach than can the beauty of the dromedary approach that of the English race-horse.

Not content with his puerile fiasco in criticising what he manifestly failed to comprehend, he turned his batteries of smoke against THE ARENA article in which the Keely Motor had been described, and chancing to find a typographical error, he dropped his argument for the italics which he thought would tickle readers as shallow as himself; and true to the instinct of the diminutive hunting-dog, he left the trail of the bear to make the woods echo with his barking at the hole of a chipmunk. As a rule, such is the rat-terrier species of criticism in our great magazines which has greeted every writer who has had the courage to examine Mr. Keely's invention and the candor to print his unbiased convictions concerning it. This Babcock seems to be no exception to the general rule. He forgets that there is nothing so great, profound, or sacred that it cannot be ridiculed and laughed at in a shallow way by a weak imitator of a circus clown, while the solemn beast which brays at the moon as much comprehends the magnitude of the subject he discusses as does this magazine penny-a-liner who vents his spleen at a claimed discovery which he has not the courage even to examine.

The Motor Illustrated.

NEXT month we expect to present our readers with an illustrated discription of the famous Keely motor, comprising cuts of the "liberator," the claimed origin of the power, the "lever," by which the power exerted is measured, and last but not least the "engine" that thus far completely baffles the scientific world by its marvelous operation.

No such illustrations as are herein contemplated have ever before been given to the public, and will be of great value to our readers, in helping to a clear understanding of the mechanism employed by Mr. Keely for the development of his discovery.

Publishers' Department.

Our Next Sketch.

ARRANGEMENTS are being made that will enable us to present in our December number a Portrait of Mr. Keely with a sketch of his life, both prepared especially for THE ARENA. The face of the man, together with a brief outline of his life and researches, who claims to have made the discovery of a motive power so original in its character, and comprehensive in its scope, as to insure, in the event of its full development, a complete abandonment of all known motive forces, cannot be without interest to the masses. And Mr. Keely only confirms confidence in his judgment by selecting THE ARENA as the medium by which the public may make his acquaintance.

IF you have been receiving THE ARENA to complete *your* subscription to THE MICROCOSM, **YOUR SUBSCRIPTION EXPIRES WITH THIS NUMBER.** Send in your renewal before the 25th of November, if you find THE ARENA worth 50 cents a year to you. **SEE OUR LIBERAL OFFER** to former MICROCOSM subscribers below.

Complete Files.

AMONG the hundreds of new names sent in each month, not more than a dozen have yet come to us ordering the subscription to begin with any number subsequent to the first or June issue. All desire the *full set.* This is right. THE ARENA is not published as a current newspaper, but as a periodical of reference, each issue full of scientific and philosophical thought that will never grow old. And such is the permanent relation of each issue to the great scheme of philosophy unfolded and elaborated in THE ARENA exclusively, that every subscriber orders all the back numbers. We are not surprised at this, but prepared for it at the outset by having each issue electrotyped, and the result has more than justified our care. Already we have had to print three editions of back numbers to supply the demand.

When we regard the amount of scientific thought, of the profoundest character, afforded in twelve numbers of THE ARENA (26,000 words per month, or 315,000 per year, equal to a book of about 500 pages) at the small cost of *fifty cents*, we shall not be surprised if the subscribers of two or three years hence order all the back numbers, just as our present readers are constantly ordering all the bound numbers of THE MICROCOSM, in which has been developed the Substantial Philosophy, under the editorial management of Dr. Hall, its founder. Every subscriber now should *secure* and *preserve* a complete file of THE ARENA, and every student of philosophy will need THE MICROCOSM to complete his library.

Subscribers to The Microcosm.

As intimated in our Oct. issue, THE ARENA has been sent to all who were subscribers to THE MICROCOSM at the *time of its suspension*, to complete their year. *This is the last number* to which such of our readers are entitled.

THE ARENA will always stop at the expiration of subscriptions unless renewed. We call attention again to our offer made last month to THE MICROCOSM subscribers (this includes *any* that were *ever* subscribers) as follows:

Every former subscriber to THE MICROCOSM who will, within the next sixty days, send in one new name with 50 cents, need send only 25 cents for his own renewal, or if *two* new names with $1.00 are sent his renewal shall be free.

The sixty days are now become *thirty.* Many are taking advantage of this most liberal offer, and we hope to hear from every one of the former readers before Dec. 1st.

AN AGENT for THE ARENA is needed in every town in this country and Canada, and we are rapidly securing them. We wish some one of our readers at each post-office, who is sufficiently interested in Substantialism to act as agent for THE ARENA, would promptly send us a card to that effect; and if there is no agent acting in that field, such person will be duly accredited as our agent, and then our communication with that neighborhood will be systemized and simplified. 100,000 subscribers is our end. Who will aid us? See our club rates, etc., elsewhere.

SPECIMEN COPIES will be promptly forwarded to any person whose name may be sent to us by a friend. New subscribers are constantly coming to us in this way. If you are pleased with THE ARENA, show it to a friend; or, if that is impossible, send his name to us, and we will mail him a copy.

THE SCIENTIFIC ARENA

PREMIUM LIST and CLUB RATES.

Names and cash to be sent at one time.

1 Subscriber with 50c., Elementary Studies for Beginners in Music. Price 15c.

2 Subscribers with $1.00, Immortality of the Soul Proved by Science. Price 25c.

4 Subscribers with $2.00, ARENA for one year. Price 50c.

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Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

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Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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IS THE EARTH A GLOBE? NO. 5.

(Conclusion.)

THE PERSPECTIVE DISCUSSION BEARS FRUIT.

BY THE EDITOR.

HAVING, in the last two papers, turned "Zeteticism Against Itself," and proved by its own basic law of *perspective*, on which the whole flat-earth superstructure rests, that the theory is false from root to branch, it is now fitting that we gather in the fruits of those unanswerable considerations and place the proof of the globular form of the earth so graphically before the scientific world that there will be no more trouble with Hampden and Carpenter, even among the most superficial beginners in astronomy.

Let us, then, with as much modesty as becomes one in such a position, proceed to reap this well-ripened harvest of demonstration in favor of the globular form of the earth to which that overturn of the claimed action of the law of perspective has so logically entitled us. The arguments we presented against that basic law of zeteticism, particularly in our last paper, have furnished indubitable proof that the sun does not and cannot rise and set as the effects of *perspective* or by the lessening of the angle of vision between the sun and the horizon of the flat earth, on account of distance; and hence it follows that this law, whose principles are so well understood, has nothing to do with such rising and setting. This being so, it becomes one of the most conclusive demonstrations ever given in favor of a scientific proposition that the earth must be a globe, and that the sun, moon, and stars rise and set by first coming above and then passing below the curved surface of the globular earth alone by its daily rotation on its axis.

No zetetic advocate pretends to question the fact that the earth is a rotating globe, provided the law of perspective can be fairly shown not to account for the rising and setting of the sun. Even Carpenter, with all his uncompromising hardihood in contending for the flat earth and for the skimming of the sun, moon, and stars along its surface around the north pole every twenty-four hours, does not hesitate to admit that the earth must be a rotating globe, provided this assumed law of perspective shall be fairly broken down as an explanation of such rising and setting of the sun. He deserves no credit, however, for such logical concession, since it is absolutely unavoidable.

The reason for its necessity is, as before stated, the admitted fact that this assumed rising and setting of the sun by a perspective narrowing of the angle of vision alone on account of increased distance, *is the fundamental element of the entire zetetic philosophy.* If that law be not true, then there is nothing true in the flat theory. This fact is not questioned by Parallax. We wish it distinctly understood, therefore, and call Carpenter and Hampden to witness that in this formal assault upon their primary law of perspective we are not taking advantage of any trivial mistakes in argument or incidental oversights in language on the part of Parallax or any of his followers, as the basis for our claimed overturn of this flat theory of the earth. Such a questionable dealing with any theory by an assailant would be justly entitled to but little weight, and we are free to confess that we would feel ourself deserving of severe reprehension did we base our objections to zeteticism on any such trifling foundation for assault as one, two, or even a dozen mere mistakes in calculations or oversights in arguments on the part of zetetic advocates. We surely have had experience enough to teach us better than to base fundamental assaults upon casual and incidental errors, since we have too often learned experimentally how easy it is to perpetrate mistakes in calculation when contending for great principles without such errors dangerously affecting the main question at issue. A man who will seize upon and magnify such incidental errors, when he knows in his inmost consciousness that the main cause itself cannot be budged a hair, deserves scientific execration.

JOHN W. KEELY.

Hence it is that we pursue no such narrow and unmanly course toward Parallax, Hampden and Carpenter, but thrust boldly into their faces the foundation law of the whole system, and without which as a basis zeteticism could not exist for one moment. It was this fundamental law of perspective which we so completely annihilated last month—a law without which the sun of zeteticism can neither rise nor set, and every man among them knows it. And we here reiterate the fact as a proof that the foundation of zeteticism is shattered, that while this law of perspective annihilates 700 miles of space between the sun and the earth, reducing it to nothing, thus producing sunset by contracting the angle of vision on account of distance, *it does not produce the slightest effect on the apparent diameter of the sun itself!* Think of the preposterous idea of a whole system of astronomy founded on a law called *perspective*, which proceeds on such a suicidal and laughable method of causing sunset as to obliterate 700 miles of space while refusing to lessen the apparent size of the sun even the sixty-fourth of an inch! Such is the law on which Parallax bases his system for the delectation of such gullible philosophers as Hampden and Carpenter. And now to show that we are justified in emphasizing this cardinal phase of our assault against the flat-earth philosophy, the reader will bear in mind this our prediction, should any replies ever appear from Hampden or Carpenter, *that no reference will ever be made to this overwhelming fact, simply because it admits of no kind of answer.* Small errors in figures and calculations will, no doubt, be harped upon *ad nauseam*, but this argument never Mark our word for it.

Now, as this argument, if there were none other, destroys the law of perspective, let us demonstrate the earth a globe as the result: It is admitted by Parallax, as well as not denied by either Hampden or Carpenter, that the fixed stars are farther away from the earth than is the sun or the moon, since they are occulted or eclipsed by both sun and moon. Therefore, if the rising or the setting of the sun cannot be occasioned by the natural operation of the law of *perspective*, as shown, it follows that the rising or setting of any fixed star has likewise nothing whatever to do with this same law of perspective. Hence, we have only to make application of this argument against the perspective rising and setting of the sun to the polar star (which remains fixed to a stationary observer, but rises and sets to one traveling north and then south), and the overwhelming demonstration of the globular form of the earth becomes established.

We need not inform the commonest and most uneducated observer, who has ever traveled a few hundred miles northward or southward, that the polar star inclines toward the northern horizon just in proportion as we go south, and that it rises toward the zenith just in proportion as we go north. Not only is this a fact known and observed of all men, even savages, and admitted by flat philosophers, but it is equally an observed fact that the angle of inclination of such rise or fall of the north star, as we travel a certain measured distance southward or northward, *is always exactly what it should be with the observer passing around the curved surface of a globe of the known diameter of the earth, and without one second of an angle being allowed for perspective!* This fact alone means annihilation to the zetetic

theory; and of course the reader can now see at a glance why we made such sure work of demonstrating that the sun could not rise or set by the law of perspective. If the sun cannot so rise and set, neither can the polar star to an observer traveling north and south. Let us therefore make the destruction of zeteticism doubly destructive on this argument.

Station a man at the forty-fifth degree of north latitude, or just half way from the equator to the north pole as measured geographically around the earth's spherical surface, say at about the center of the State of Maine, *and the north star as viewed by him will be at an exact angle of forty-five degrees' elevation above the northern horizon, just as it should be with the earth a globe!* How could such precise coincidence of latitude and angle of elevation occur by mere perspective, if the earth were a flat plane?

Then let the explorer pass northward, one, two, or more degrees, *and the polar star will rise one degree of angle toward the zenith for every degree of north latitude the observer journeys*, till reaching the pole, as Parallax admits, when the north star would be vertically overhead. What but the fact that the earth is a globe could produce such precise effect on the gradual rising of the polar star, as we go northward, especially with the assumed law of perspective broken down as so triumphantly done in the last two papers? If the reader has forgotten that cataclysm to the flat philosophy, he should go over those papers again and note the demonstration, that if the north star is only 700 miles above the earth (the height Parallax fixes for the sun), it could not disappear by perspective over a flat earth in less than 339,000 miles by the very ratio on which he makes a ship's top sail 100 feet high remain in sight for nearly twenty miles, notwithstanding the action of this law of perspective! Carpenter, with all his rhythmical croakings about our demonstrations (and we have received a full half-dozen flat poems from his versatile pen since we commenced), is as silent over this 339,000-mile argument as is one of his Baltimore frogs in the month of January. His stub-pen refuses even to rhyme over such a "negatizer," as Keely would call it.

Continuing our demonstration of the globular form of the earth by reference to the polar star, let the observer, instead of going north, start southward from the center of Maine, and no intelligent person questions the fact that this star will sink one degree toward the northern horizon for every degree of latitude he journeys onward, till when he reaches the equator, ninety degrees from the pole, the north star will be exactly at the horizon, or just visible above the surface of the quiescent ocean; while a single degree or even half a degree (say twenty-two miles) farther southward will sink that star out of sight.

Could such a coincidence of absolute and mathematical degrees of elevation in this star, with the absolute degrees of surface-latitude of the earth as a globe passed over by the observer, ever occur in a million of chances by the angle of perspective, even if that law acted at all on a fixed star, which we see it does not? The commonest intelligence should enable any unbiased person to see the impossibility of such precise coincidence by the law of perspective, even if such law applied to our unaided observation of heavenly bodies, since the perspective fall or declination of any distant body depends on the distance the body is away, and its known distance above the earth; whereas all the thousands of stars in the neighborhood of the polaris, whatever their size, distance, or altitude, show the same rise and fall to the fraction of a second of angle, as we go north or south, if observed the same time of night, or when they are in the same apparent relation to the polar center.

A system of coincident facts like this is only conceivable on the hypothesis that the earth is a globe, and that all heavenly bodies appear diurnally to fall below the horizon alone by the intervention of the curved surface of the rotating sphere on which we live, and that the pretended philosophers, who have attributed this vast array of concurrent phenomena to the law of perspective instead of assigning it to the simple and self-evident cause of the earth's rotundity and rotation, are the most pitiable and worst deluded class of men anywhere to be found outside of lunatic asylums.

Besides this array of facts observed and recorded by explorers and travelers, as connected with the northern heavens, the same thing is equally true of the southern heavens. We have it not only from the records of southern explorers, but from a number of living witnesses who have recently traveled to and sojourned in Chili, Brazil, and Australia, and who have been repeatedly around Cape Horn, that the moment they cross the equator and the north star disappears below the horizon, new stars, clusters and constellations, never seen north of the equatorial line, begin to appear above the southern horizon; and that as soon as they have gone far enough, say to forty degrees south latitude, the Southern Cross, with the southern pole of the heavens, appears in sight.

Although there is no large star, like Polaris, at the exact southern center of the heavens, as a landmark for observation, yet the observer, by keeping close watch for several hours in a clear night, when there is no moon to disturb the vision, will see the same circling of stars and clusters as they revolve around that polar center, to all intents and purposes the same as takes place around the north star observed from the latitude of New York. Yet Hampden and Carpenter, with all these facts in their easy grasp should they consult intelligent travelers from the far south constantly reaching England and the United States, have the supreme hardihood, if not unparalleled effrontery, to deny that there is any polar center to the southern heavens such as here described!

We have much we could say in extending and illustrating this method of exposing the ruins of the pretended law of perspective, and thus of adding demonstration to demonstration that the earth is a rotating globe; but Mr. Hudson, the proprietor of THE ARENA, thinks that the flat theory is already buried so far out of sight that it would be a work of supererogation to continue the disintegrating process beyond the present number. Hence, we will close the discussion by adding one short and conclusive proof which we clip from another paper which we had prepared for the January ARENA, and thus leave the globular form of the earth a simple, self-evident fact known and observed repeatedly of every man who has eyes. We refer to the *eclipse of the moon*, in which the round shadow of the earth, cast by the sun, seems to have been purposely outlined by nature to forestall some fossilized ptolemaic specimen of antiquity from involving himself in such a prodigious fallacy as a supposition that the earth is flat.

So conclusive was this proof of the globular form of the earth, unless neutralized, that the critical mind of Parallax was forced to its utmost strength and ingenuity to bring some excuse to bear by which to neutralize its force. He knew only too well if this dark circular shade which is seen crawling over the moon's face in time of an eclipse could not be shown to be something besides the earth's shadow, then zeteticism was dead. So he brought his best efforts to bear, introducing them first by denying that the earth's shadow had anything to do with a lunar eclipse.

Now, simple denials of the most obvious facts can be recklessly resorted to by any one who has sufficient cheek to fly into the face of reason. Parallax could just as consistently have denied that the eclipse of the sun was caused by the intervention of the moon, but as he thought he could manage to keep up the flat theory of the earth and admit the self-evident truth about the sun's eclipse, he concluded that it would be better to have a little common sense on the side of zeteticism than to scout it altogether. But as to an eclipse of the moon, caused by the shadow of the earth! No, it would never do, for that would demonstrate the earth to be a globe and no mistake. Hence, it must be *denied* at all hazards, and at the same time some sort of pretense at reason must be rallied to the support of such denial, or even the omnivorous credulity of such a man as Hampden could not take in zeteticism. These mock reasons for denial were mustered after a fashion, and it only remains for us to state them and then annihilate them, leaving that which eclipses the moon to be what it really is—the shadow of the earth—and the earth therefore a globe.

The first reason he gave was that the moon has been seen to rise eclipsed while the sun was still in sight. How, Parallax asks, could this have occurred and the earth still be between the sun and moon so as to cast a shadow? We answer, just as easy as a microscopic insect could sit on the top of an orange and see two other oranges, one east and the other west, one hundred feet away, and all three oranges in perfect line! Besides this, the conditions of our atmosphere are often such that the light is so refracted or bent downward as to make the sun still visible some seconds after it has actually set. The same is true of the moon, a fact which more than abundantly accounts for the shallow point raised by Parallax and which Hampden and Carpenter harp upon as if it contained a grain, even, of logical force.

While the founder of the flat theory could imagine weight in this weak objection to the real cause of the moon's eclipse, he conveniently overlooked the paralyzing fact that *never since Adam was there an eclipse of the moon except exactly at full moon, or when the sun, moon, and earth were known to be in line!* As an eclipse of the sun can only appear on the earth at the time of *new moon*, when the three are in line, and as an eclipse of the moon can only occur at *full moon* when the three are equally in line, does it not logically follow that the eclipse of the moon is as certainly caused by the earth between it and the sun, as that the eclipse of the sun is caused by the moon between it and the earth?

The other point made by Parallax, and the only supposable explanation of the moon's eclipse, aside from the earth's shadow, which zeteticism could contrive, is the preposterous assumption that there is a circular, translucent body several times larger than the moon, and revolving around it, that passes over its face once in a while, thus obscuring its light! No attempt, however, is made to account for the fact that this circular somber satellite of the moon, notwithstanding its prodigious size, never gets in front of its face except exactly at *full moon*, when the earth, sun, and moon are in line.

This, however, is not the worst difficulty that the advocates of zeteticism have to explain connected with their luny invention. This monstrous translucent, revolving satellite of the moon, as it turns out, does not revolve or travel at all, but simply stands still, letting the moon, like the Pharisee of old, pass by on the other side at its normal gait. Neither do flat philosophers try to account for the fact that their monstrous satellite not only stands still in space, just as the shadow of the earth does, according to astronomy, allowing the moon to pass through it at its regular velocity, *but that this supposed satellite is exactly the size the earth's shadow should be at that distance* (240,000 *miles*) *according to the known diameter of the earth and sun, and the known dis-*

tance between them! How, we ask, short of the supervision and constant presence of miraculous power, could such innumerable coincidences possibly occur? Yet these flat investigators take them all down and seem to be equal to the swallowing of what a scientific crocodile would run from.

But why waste time, the reader asks, with such baseless assumptions? If the reader knew Hampden and Carpenter as we do he would not ask such a question. This flat doctrine must be crushed out in the interests of science, monstrous as it is. It is the boast of these braggarts that no man dares to attack their positions in a scientific journal. We have shown our willingness to attack the incongruous doctrine, and we now end it with this positive proof that the earth is a globe by its shadow cast on the moon. And in leaving it we present the final demonstration that this shadow cannot be a satellite of any kind coming between the earth and the moon, and do so by this culminating fact:

If the moon is eclipsed by the intervention of a dark satellite many times its own size, why is it that fixed stars and planets, of the faintest magnitude, in close proximity to the moon's field, over which the same satellite passes, are not eclipsed? Echo answers, *Why?* but zeteticism answers nothing! There is scarcely an eclipse of the moon that fixed stars cannot be seen right through this so-called satellite *as distinctly as in any other part of the heavens!* As the earth's shadow necessarily comes to a point and terminates a short distance beyond the moon (about 600,000 miles), not extending anywhere near far enough to reach the nearest planet, it clearly explains why it can eclipse nothing further away from the earth than the moon. If there were such a somber satellite revolving around the moon, and as large as the shadow of the earth is known to be at that distance, it could be easily traced and would inevitably be all the time eclipsing stars and planets in the neighborhood of the moon's field, *a thing never observed by any astronomer in all the tens of thousands of observations made and constantly making at the numerous observatories in various parts of the world.*

Thus we have the most direct and positive proof that the cause of the moon's eclipse is not the supposed monstrous satellite which the desperate recklessness of Parallax forced him to invent or else to abandon his flat philosophy. And since it cannot be the intervention of a satellite, it remains as before, and can be nothing else than the shadow of the globular earth. And thus ends zeteticism with this wiping out of its preposterous satellite; and thus also ends the flat-earth nonsense by this absolute demonstration that the earth is a globe.

THE TENDENCIES OF AMERICAN PHILOSOPHY.

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

THE peculiarities of the political origin of the United States has presented an aspect of novelty in the religious history of America unparalleled in the history of any European nation. The founders of our government were wise students of the philosophy of history, and they knew that many of the misfortunes of European states were caused by the union of church and state, so they determined to have no longer a state religion, but they were favorable to a religious state. They rightly believed that there was sufficient divinity in the Christianity of the Bible to support itself, without coercion on the part of the state. Previous to the revolution, there were only two states granting religious toleration—Rhode Island and Pennsylvania. It was not until 1791 that the amendment to the Constitution of the United States was adopted forbidding Congress in the future from passing any law for the establishing of religion or forbidding its free exercise. During the establishment of religion in New England, many worldly persons were introduced into the church, and they prepared the way for a tide of skepticism which very rapidly spread over the country. The coercive measures that had been used caused many to acquire a dis taste for religion.

In 1794 Joseph Priestley, a skeptical English philosopher, emigrated to the United States, and settled in Northumberland, Pa. He had controverted on historical grounds both the divinity and pre-existence of Jesus Christ, and was thought to be in hearty sympathy with the French Revolution. His friends went so far as to celebrate the anniversary of the capture of the Bastile. While Priestley was skeptical in many respects, he did not renounce Christianity, but built up a Unitarian Church at Northumberland. A few years ago I had the privilege of seeing the church in which he preached. Thomas Paine very much sympathized with the views of Priestley. He had also been a dissenting minister in England. After he came in contact with the French philosophers, he went far beyond Priestley, and entirely renounced Christianity, attacking it in a bitter style in his "Age of Reason." Although he has been so called, Paine was no atheist; he was a deist and hoped for a future life. Through his influence the materialistic philosophy of France was introduced into this country. French philosophy wielded, for a time, a powerful influence at both Yale and Harvard Universities.

Theodore Parker, born in Lexington, Mass., in 1810, represented in America the religious side of German philosophy. As America had received a wave from the French shore, there now comes one from Germany. Parker, strictly speaking, was a disciple of De Wettle. In his discourses on religion he declared that Christ and the Bible were the two great idols of Christians. Parker confounded intuition and instinct, and declared that man instinctively arrives at a knowledge of God and of redemption. While the Materialists were disposed to ignore intuition, the Rationalists magnified it beyond all bounds, and insisted that man is a sufficient guide in himself, and needs no revelation.

In the Unitarian Church of America there have been three tendencies: First, those who denied the doctrine of the Trinity, but accepted the miraculous in the Bible; second, those who denied also the miraculous element; third, those who even denied the authority of the Bible itself. The first class was represented by Channing, the second by Priestley, and the third by Parker.

Although we have no established religion in the United States, be it said to the honor of our free institutions and the power of Divine truth, that nearly all the great statesmen and philosophers of America have been believers in Christianity and in the divine authenticity of the Bible. Washington, Franklin, Webster, and Clay were supporters of Christianity. Edwards, Nott, McCosh, Shields, Hopkins, and Porter, the greatest philosophers America has produced, have all been defenders of the grand truths of the Bible. The greatest danger to which American Christianity is now exposed is the fearful tendency to materialism in its new garb of evolution. Evolution, as defined by its ablest advocates, is pronounced materialism, and it banishes God from the universe. Those who claim to be theistic evolutionists use the word evoluion in the sense of progress, and it would be much better for them if they would use a word in which there is no ambiguity. The only way to successfully combat evolution is to insist upon a strict definition of the term.

Dr. Deems, President of the American Institute of Christian Philosophy, in his recent work, the "Scotch Verdict." has clearly shown that evolution has not been proved. Dr. Hall, in the "Problem of Human Life," has shown that it cannot be proved. A very thoughtful minister said to me a few days ago, that Dr. Hall had done a great work for the world in carrying the substantial into the regions of the spiritual. In a few years it will be axiomatic with scientists that all forces, whether material or immaterial, must be substantial. In the last issue of THE SCIENTIFIC ARENA, is found a very able article from the pen of the scholarly Chancellor of the University of Florida, which shows the way in which the philosophic needle is now pointing in America.

CHARGED WITH HERESY.

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

ONE of the most important and interesting ecclesiastical investigations ever instituted in an American church court was recently commenced in Boston. Up to the time of this present writing, the proceedings have been only of a preliminary character, yet of such a nature as to attract great attention and promise far-reaching results. It seems that the theology of New England has experienced a shock almost as alarming to its staid and stalwart orthodoxy as were the recent earthquakes to the inhabitants of the South Atlantic coast. Indeed there is no telling to what extent the crust of the old theological world may be broken, and its pent-up sulphur permitted to escape. It is hoped, however, that Plymouth Rock itself may not be seriously affected by the subterranean disturbance whose muffled mutterings are liable at any time to break forth with terrific thunder and catastrophic upheavals. Our Puritan brethren should not forget the rock-ribbed shore where the Mayflower completed her perilous voyage and landed her liberty-loving cargo of independent souls amidst their clamors for the rights of conscience. And it would be well for the court to remember that the professors now charged with holding opinions not in exact harmony with established doctrinal tenets may possibly have consciences also, and that after a manner which the orthodox call heresy they may yet render acceptable worship to the God of the Pilgrim Fathers. Even though nearly three centuries have passed away since religious liberty sought and found a home in New England, the rights of conscience are just as sacred now as they were when the Puritans, under the smiles of heaven, fled before the intolerance of ecclesiastical tyranny in Europe.

Andover Theological Seminary is the nest where the alleged heretical egg has been laid. And although there has been considerable cackling by other hens on the outside of the theological hennery for several years past, it is only recently that anything very serious has been suspected. It is, however, borne constantly in mind by the guardians of orthodoxy that the evil of heresy is not confined altogether in the laying of the egg. The danger to Christendom is in the possible process of subsequent incubation. It is only after the chicken is hatched that it spreads its wings to fly. The Board of Visitors, recognizing this alluring fact, have shown themselves wise enough in their generation to begin to make preparatory preparations to commence something. It is possible that they will either break up the nest, nip the alleged evil in the bud, or learn that it is not so much of an evil after all the ado about it. If the writer is not very much mistaken, there will be more cackling than ever upon the classic banks of the Merrimac. This is not the age of the world's progressive history in which Christian men of stalwart and searching intellects are disposed to don the robes of recantation at the

bidding of a Protestant inquisition, unless the truth in its broader, brighter splendor leads them to a willing renunciation of manifested error.

Underlying this and all similar investigations of alleged heresy, whether in matters of religion or science, there are certain fundamental questions which should be settled before the court is really ready to proceed with business in any particular case. Is there such a thing as progress in the apprehension of the truth? Are we required to pin our opinion or fasten the tendrils of our faith to the shrouds of the Reformers? Does God expect us to build our creeds upon the coffin lids of Calvin, Luther, or Zwingli? Is the theology of the sixteenth century to be taken as our infallible guide in our duty to seek a more perfect interpretation of God's infallible word? Is it not an honor to the Westminster Confession to admit that it has helped so to school the church in preparatory knowledge as to make its pupil wiser than her teacher? Are we doing justice to the sacred memory of our immortal Calvin by building all our theological tenets upon the tacit assumption that he was the custodian of the Church's conscience to the end of time, and that he did nothing more nor less than to construct a cage for religious parrots? Is it not true that theological science in the nineteenth century has an advantage over that of any preceding century in the possession of more adequate means to arrive at greater correctness in the interpretation of the inspired Scriptures? Admitting that truth never changes as to its essence, is it not still true that unchangeable truth is constantly coming to be more truthfully apprehended through the earnest search and clearer consciousness of a progressive Christendom? Are we to suppose that the great reformers of the sixteenth century, or New England theologians of any subsequent age, ever dreamed that their work was to be the end of all perfection, and that they were engaged in bottling up a fixed and finished orthodoxy, to be uncorked and used by the church at the very threshold of Christ's millenial glory? When will it come to be more generally admitted that, though each age is bound to the past, it is not so bound by the past as to surrender its own freedom and increased responsibity? The Andover Professors will awaken and attract the admiration of the Christian world by a moderate persistence in their determination to follow the Christocentric principles of theology to its most remote logical deductions. It is hoped that the stand which they have taken will not give rise to further schism, but lead rather to greater harmony, upon a higher plane than has yet been attained by a militant church. Intelligent and progressive Christianity is free to be bound by the truth, and bound to be free from all error. When the foregoing questions are fairly answered, and the aforementioned fundamental principles fully recognized as underlying all searchings after the truth, the Board of Visitors will be ready to announce the opening of the court in such a way as to give justice to the accused and edification to the anxious multitude now watching the preliminaries with increasing anxiety.

The Professors to be arraigned are five in number. They are Churchill, Harris, Hinks, Smith, and Tucker. The charge about to be laid against them in the indictment is that of heretical teachings in a volume entitled "Progressive Theology." The book contains, in substance, what had previously appeared in the Andover *Review*. Their alleged heresy is not that they have advocated a more excellent theology than that which has for many years prevailed in the general teachings of New England orthodoxy, but that they had drawn therefrom some inferential conclusions which are not in accordance with the doctrinal tenets and accepted views of the Church as regards the prospect of a portion of the human family after death. According to the new theology there is some danger of God's glory being limited by the damnation of a less number of heathen than what some of the old predestinarian confessions seem to call for. These Professors, according to the writer's understanding of their views, teach that: as Christ stands organically related to each individual of the race, no individual member thereof should be considered as hopelessly lost until after there has been a deliberate rejection of Christ by the individual. A rejection of Christ in a manner and under circumstances that take away all future hope implies a development of the individual's character to such a degree as to render it possible for the individual to reject Christ by a free determination of his will in an anti-Christian direction. Now, since these learned, pious, and conscientious Professors of theology do not see any possible way for the untaught heathen to develop their characters sufficiently in this life to enable them either to choose or reject the historic Christ with a free determination of the will, they hold that the character must have opportunity to develop, and the choice be made in that future state of the substantial soul which lies immediately over the borders of this present sphere of human existence. This is, in substance, the heresy for which they are to be tried. It is not a new element in theology. The writer well remembers meeting with it twenty-eight years ago in the excellent "Dogmatic" of Dr. Ebrard of Germany; and it has since been carried out to greater fullness by Dr. Dorner and others. These Andover Professors are not ignorant of what some German divines are teaching; neither are they too cowardly to teach their own apprehensions of the truth in the face of all popular clamors against it. Our best beaver goes sailing into the air in honor of Andover conscientiousness and courage. Theological scribblers have charged them with teaching a "second probation." Such, however, is not the case. The heathen, as individuals, have never yet had the first probation, and the writer is too dull of intellect to see how they can have any fair probation at all until after they have had their characters sufficiently developed to see the good, and to make it possible for them to exercise their wills in a fair, free, full and deliberate choice thereof.

FREMONT, O.

WELLS AND WORDS.

SOME years ago, in the interior of Pennsylvania, stepping on the cars, walking in and seeking a seat, I noticed a familiar female face. Approaching where she sat, I asked the privilege of taking a seat by her, in order that the tedium of the ride might be more agreeably whiled away than it could be to sit sullenly engaged in my own reflection. The request was gently and courteously granted, as the acquaintance was more than a passing one.

Like thousands of persons, the young lady was a member of church, and like other thousands, her inward life was not what she expected it would be when she united with the church, while it was far from filling the measure of her yearning aspirations.

I knew that a few months before she had made a very marked stage in her religious life; and that from the time of that event she had enjoyed a state of mind much more satisfactory than she had had before that event. As some months had elapsed since the more inward openings of the soul-life were experienced, I thought it most probable that she had gone through some diverse experiences and states of consciousness. For I knew that certain soul-conflicts always follow when advances have been made into the more elevated and delightful planes of spiritual life and religious consciousness. Accordingly, I experienced a measure of anxiety to learn from herself when the conversation might easily and naturally turn in the proper direction the present attitude of her conscious delight. Speedily the opportunity came. As the train was making quick curves in the windings of the river, on whose banks we were running, the conversation as suddenly turned into the winding ways of her soul-experiences, and I ventured to inquire the progress she was making in the spiritual railroad, on which she had entered some months before.

She was both too honest and too earnest to mince or evade. And looking at me with emotion inscribed on the face, with a considerable tinge of sadness and disappointment, she answered, "O, I hardly know! I think I have not had so deep a religious experience as some other persons have had." I replied, "How do you know that? How can you *determine* that question?"

Looking at me again with still an anxious and a somewhat puzzled expression of face, she once more replied. "I judge from *the words* they employ." Continuing I inquired, "How can you determine the matter in that manner?" At this she almost gazed at me, the face wearing the expression of intensified emotion and puzzled solicitude.

At the moment the cars were whirling by a neat white farm-cottage, and I said: "Miss Nannie"—my acquaintance justified the familiarity with the given name—"suppose we shall alight from the cars, and going to the front of that house, we should find a hole dug in the ground ten feet deep, and it was full of water, what would you call it?" With an amused countenance, she replied: "I should call it a well." I continued: "Suppose we should come to the back of the house and find another hole one hundred feet deep, and full of water, what would you call that?"

Looking at me again, with a face rather confused, as not seeing where the question tended, she replied in a changed tone: "Why, I'd call that a well, too." I thence continued: "Now, here are two things called by the same name—two things to which you apply the same word. When, hereafter, a person uses the word 'well,' will you be able to tell from the use of the word whether the thing signified is ten feet deep or one hundred feet?"

She said quickly: "No; how could I tell the depth of the hole and the amount of water in it by the use of the word 'well,' when the word is applied to holes of all depths and of all degrees in fullness of water?" and she looked me a little keenly in the face.

"Very well," I replied. "When a 'well' of water springs up in two human hearts, and each owner talks of his or her well, how can you tell, from the use of the word 'well,' or from any use of language, whether the 'well' is 'ten feet deep,' or 'one hundred feet deep,' and how much water it contains?"

Her face was, for an instant, fixed in thought. Then many playing emotions came and went, when, laughing heartily, she exclaimed: "Why, I never thought of looking at the matter in that light! I see I have been foolish, and I have suffered anxiety by indulging in silly comparisons, while all involved had relation to the different *depths* which attach to the meaning of words. Oh, I see the whole matter!"

And this illustration, suddenly occurring, opened to myself more fully, "the whole matter." I discovered a new realm of thought. As countenances differ with an infinite variety, so do the faculties of human souls. They differ as two wells, one ten feet deep, and another, one hundred, with all depths between ten and one hundred. Then there are all varieties in the quantity and quality of the water in the different wells. A small quantity, in a shallow well, seems great to the owner; and being small, it is

easily agitated, the little waves seeming very large in the small well's estimation.

A large well could receive all the water contained in the smaller one, and it would make very little change, while scarcely any notice would be taken of the diminutive ripples on the surface. Yet the two well-owners will use the same "words" to describe the depth of the well, the quantity and quality of the water in it, and the emotional agitation.

Call the "wells" human minds; the water, truth in them; and the quality of the water, the purity or impurity of truth, and what a world of instruction we have in analogies. Some are ten, some a hundred feet deep, and there is every variety between the extremes. Then endless is the diversity in the quantity and quality of the water of truth in human minds! Yet all these minds, in a general way, use the same words to draw the water out of their mental wells, producing that nameless variety, confusion, conflict, misunderstanding and even hatred, so prevalent and rampant in art, science, literature, philosophy, politics and religion, which constitute our checkered civilization.

One person uses words with reference to his "well." Another seeks to apply the same "words" to the water in his well, and the words do not fit—they do not suit either the quantity or the quality of the water his well contains. Then others give more attention to the "words" used, than to the things the words are meant to signify. Thence come apparent differences, but differences which relate rather to the depth or the shallowness of the meaning to be attached to words. And hence arise criticisms, disputes, and *learning in literature* (?). Yet the real *thing* is understood by none of the parties. It is a word-fight *about* wells.

One, tainted by conceit, thinks his own well is very deep, and quite full of water, excellent in quality. Another, very modest, concluding from the word buckets, used to draw the water, judges the well of the other to be deep and full of pure water, while both his own well and water are shallow. It was the taint of conceit and the modesty that gave the double delusive appearance. And, thus, as words are used, they quite as much conceal as convey thought. We can hardly know what one means from the "words" he uses, let the person be as fair and just as he may in the use of them. The reader or hearer cannot tell whether they have, or were meant to have, "ten" or "a hundred" feet of meaning. Then, too, the meaning will depend on whether the hearer or reader has a "well" "ten feet deep" or "a hundred," and will be essentially modified by the quantity and quality of water in the hearer or reader's well.

The author of *Substantialism* may write an article in the choicest words, to him clear as the light, and free from ambiguity. This depends on the depth of his well, and the quantity and quality of the water in it. But falling into a shallow well, having little water in it, and that of poor quality, the article will not convey the author's meaning to the reader. It will be shaded, tinctured, inverted and perverted.

From the differences in people's wells, and the quantity and the quality of the water in them, arise dislikes, aversions, strifes, confusions, and contentions. And century after century are bitter criticisms and belligerent logomachys making it largely true that "words are used as the means of concealing ideas." For words are often "the hypocrites" of ideas.

The illustration may take a thousand forms, permeating the streams of human society. The depths of other's griefs, the heights of their joys, cannot be known from the use of "words." These can be *known* alone from intercourse and experience. The same thing is true in all the realms of mental activity and moral action. "Words" delude, mislead, pervert.

The schools of philosophy, political parties, religious sects, have their origin in the depths and shallowness of men's "wells," and in the use they make of word-buckets, in drawing water from them, and giving it to others to drink. "Words" being the external robes of ideas and doctrines, if not used with the same depth, quantity, and quality of meaning by the writer and the reader, there is division, where a little care, a shade more philosophy, tinctured by a few drops of charity and a little patience, would bring the diverging parties to see that the difference between them arises out of the fact that their wells have different depths and different fullness of water, while the water has different qualities, some being more clear and some more muddy.

And to-day the world and society are tossed to and fro by reason of the great variety in men's "wells," and the manner in which the water in them is agitated and thrown into waves. And the word-buckets play no insignificant part in the scenes which are enacting about us. People are sad and dejected because they do not see that "words" vary in meaning according to the depths of persons' wells, and the quantity and quality of the water which the wells contain. And from these things, rightly considered, the race might learn some wisdom.

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THE BRIDGE CABLE-GRIP.

WHO WAS THE INVENTOR?

BY THE OFFICE EDITOR.

BUT few of our readers at a distance know what is meant by the "Bridge Cable-Grip," much less will they be able to form a true conception of the importance of this invention to the future commercial interest of the country. Hence a few words of explanation may not be out of place in this journal for the benefit of those mechanically inclined.

At the inauguration of the present rapidly growing system of cable roads some eight years ago, to take the place of horse-car railways in our cities, it became a serious mechanical problem as to the best means of taking hold of the constantly moving endless wire-rope by some device connected with the car, and then letting go of it as the car was required to start and stop to take on and discharge passengers, avoid obstructions, etc.

At once numerous mechanical inventions were suggested, but all of them were embraced in two general classes. One of these consisted of two pieces of grooved soft metal so constructed and arranged as to clasp the moving cable on either side, thus allowing it to slip through between them with as little harm to the steel wires as possible, till by careful manipulation of such gripping device the stationary car would commence moving and finally attain the speed of the cable. The other device consisted of two series of grooved rollers or sheaves, one series on either side of the cable and so arranged that the gripman by operating a lever could close these sets of rollers against the wire rope while at the same time applying brakes to their periphery, thus gradually stopping their rotation and starting the car without any slipping whatever of the rope against the grooved surface of the roller-sheave; and thus, as it was claimed, greatly tend to preserve the cable from wear, over that caused by the sliding grip device.

In order to use the first of these devices, (the sliding jaws) it was found in practice that the cable had to be continually coated with a composition of tar and grease to allow it to slip through the grooved jaws of metal without too rapidly abrading the wires of which the cable was constituted. This necessary precaution kept the cable in a very disagreeable and untouchable condition, while the roller device allowed the rope to remain perfectly clean and bright.

At the commencement of the cable road system a number of patents were applied for by different inventors embracing the salient features of these two general mechanical principles, the first two applications for the roller grip being made by a Mr. Halliday of California and Col. Wm. H. Paine, a well known mechanical engineer of this city and one of the chief constructors of the great New York and Brooklyn Bridge. These two applicants for patents on the roller grip naturally came into collision, both devices being substantially the same. An interference was declared by the Patent Office, and the usual litigation at once followed. After the delay of taking testimony and the regular hearing was had before the Commissioner of Patents, Col. Paine was decided to be the prior inventor, and the patent was accordingly issued to him.

From the very incipiency of the Brooklyn Bridge it was planned with a view to having its cars run with an endless steel wire cable, and Col. Paine being largely identified with the original plan and construction of the bridge, had no difficulty in securing the adoption of his patent grip for taking hold of the constantly moving cable. He accordingly made an assignment of the use of the patent, free of charge, to the Bridge Company, and our readers will remember, about three years ago, how the papers teemed with comments, both adverse and favorable, concerning Col. Paine's cable grip as the experimental trips of the bridge-cars began to be made.

Much of the unfavorable criticism was believed to be instigated by the owners of the patents for the opposition, or sliding grip, which had already been adopted by the California and Chicago cable roads. The claimed merits of the two principles of grip were hotly canvassed in the papers, all sorts of evil being predicted against Col. Paine's grip by the opposition, while liberal offers were made by them to put the sliding grip on the bridge-cars if the company would only throw the roller-grip aside.

But all this while, and amidst all this contention, Col. Paine pursued his wonted quiet demeanor, improving his methods of applying his grip to the cars, while the bridge company became more and more satisfied with the working of the roller device, and its observed trifling wear of the wire cable. In the meantime it was a matter of record that the same kind of wire rope, as used with the sliding grip on the San Francisco and Chicago roads, would require replacing in six or eight months of use, even when manipulated by the most skilled and experienced gripmen employed on the cars—a matter known to be of the greatest commercial importance to these enterprises, when we consider that the cost alone of such a cable several miles long is the most expensive item of the entire outfit of such a road.

Still with this fact staring the opposition in the face, and the fact of the probable trifling wear of the rope by the roller-grip being now confirmed, the parties interested in the other patent kept up the hue and cry against "Col. Paine's grip," still trying in vain to get the bridge company to substitute the metal jaws and the tarred rope, till at last months rolled into years, with the bridge cable still doing good service and the roller-grip more beautiful and effective in its operation than it had been claimed to be at the start, when the clamor for a change ceased and the papers dropped the discussion.

We are just now reminded of all this, and are led to the penning of this article by seeing it announced in the papers, that on the sixth day of November, just past, the old cable of the bridge, after three years of ef-

fective and successful service, was taken away, and replaced by a new one made by the Roeblings, having lasted more than four times as long as a cable can be expected to endure under the other gripping system, and its time of endurance would have extended over a longer period were it not for the damage done it by experimenting with the sliding grip, thus completely justifying the mechanical sagacity of Col. Paine, and the good business sense of the bridge company in not listening to the clamor of a wealthy monopoly who were pushing the interests of an inferior patent.

But now we come to another and to the romantic feature of this long grip controversy, involving in its *denouement*, as it does, the real inventor of this roller-grip as used on the bridge cars and as likely soon to be used on all the cable roads throughout the country. When the grip was first tried on the bridge before it was opened to the public, and when the nature of the device had been first made known through the papers, it flashed upon the mind of Dr. Wilford Hall, the editor of this journal, that he was the original inventor of the roller-grip, that it was justly his property, and that he had published a full description and drawings of the invention in the *American Artisan* some six or seven years before Col. Paine had made application for his patent or gone through with his successful interference contest with his Californian competitor. A reference to the back numbers of the *Artisan* at once confirmed this claim of Dr. Hall. The reporters of the *Tribune*, *Times*, and other city papers, soon caught the scent, and as is their wont began to ventilate the fact that Col. Paine's grip was in fact Dr. Hall's grip. And as soon as Colonel Paine's attention was called to this startling discovery, and he had examined the records of the *American Artisan*, published by Mr. Henry T. Brown, the old and distinguished patent attorney of this city, he called on Dr. Hall at his office and magnanimously surrendered all claim to the invention, acknowledging himself to have been anticipated for six or seven years, a fact of priority which had then for the first time come under his notice.

It seems that notwithstanding the patent office had full files of the *American Artisan*, yet the examiners as well as the attorneys in the Paine and Halliday contest had entirely overlooked this full and long previous description of the very invention over which they were contending, and as a consequence the patent was illegally issued to Col. Paine. Dr. Hall in the meantime being wholly absorbed in his scientific and philosophical discoveries, could keep no track of his important inventions, though he had previously taken out between fifty and sixty different patents. This one, however, the most valuable of all, which he invented especially for the Greenwich Street elevated railway, he neglected to patent, as this road decided to use locomotives instead of cable traction as at first contemplated, and being without means, and advised by his attorney that it would sufficiently prove his priority of invention by publishing it to the world, he did so, thus waiting to apply for patent till there was some cable road started adapted to its use.

The Bridge company having been informed by Col. Paine that his patent assigned to them for the roller-grip was worthless, having been anticipated for several years by Dr. Hall's invention, that company at once offered to pay the whole charges of re-opening the case before the patent office, with a formal declaration of interference to set aside Col. Paine's patent, and thus to have the patent issued to Dr. Hall, provided the bridge company should receive from him the free use of the grip for their cars as already assigned to them by Col. Paine. Dr. Hall of course accepted this offer, and at once the case was formally opened, and an interference declared, Col. Paine testifying before the preliminary commission as to the date of his invention, thus sending it back to the examiner with the *Artisan* record as a *prima facie* case in favor of Dr. Hall, the bridge company in the mean time footing the bills, amounting to in all more than $1,000.

Suffice it to say that the examiner, after reviewing the testimony, issued his decision without hesitation, awarding "priority of invention" to Dr. Hall, thus annulling the patent of Col. Paine, which had been issued some six or seven years previously, but deciding at the same time that the publication of the invention for so many years, without applying for a patent in the usual form, was equivalent to abandoning it to the public. On this decision being known, the Bridge company appealed the case to the Board of Examiners, and finally to the Commissioner of Patents. But these higher courts held, with the examiner below, that Dr. Hall, by his unfortunate neglect of due application for patent, had given his great invention to the public, thus allowing any cable road in the country to use it free of charge.

Thus ended a bitter disappointment to the plodding inventor and hard-working editor, who could so justly and honorably have laid his hand on thousands of dollars, had the patent officials used the discretionary power of doing this simple act of justice to a worthy inventor, instead of following the example of some arbitary decision of a predecessor, who might have had other and justifying occasion for an adverse decision.

Nothing, therefore, now remains in the way of relief but for some generous-minded member of Congress to look into the open and unquestionable merits of this case as here set forth, and for the encouragement of future inventors having more brains than money, to make an example of this valuable grip-invention as an act of intrinsic justice to one who has spent his life in scientific discoveries and mechanical improvements.

We need only add that Col. Paine, as well as Mr. Martin, the chief engineer of the Brooklyn Bridge, will confirm the truth of the narrative as here set forth.

MR. KEELY'S NEW PHILOSOPHY.

BY CLARA J. BLOOMFIELD MOORE.

In reading, quite recently, Macvicar's "Sketch of a Philosophy," I have been frequently struck by the similarity of the views between himself and the discoverer of etheric force, whose inventions you have noticed in your columns. How long it may be before men of science will think it worth their while to master the details given in the writings of these men remains to be seen. The late Dr. Macvicar said that, when he considered how difficult he had found it to believe that such insight into nature as his views imply is possible to be attained, he was not so unreasonable as to expect that others would, in his time, regard them even as probable, much less as proved. He expressed himself as content with the private enjoyment which these views imparted to himself, "especially as that enjoyment is not merely the gratification of a chemical curiosity, but attaches to a much larger field of thought." One of the points to which he refers, as possessing great value to his own mind, is the place which his investigation assigns to material nature in the universe of being. He says that it is much the fashion in the present day to regard matter and force, more shortly matter, as all in all. But, according to the view of things which has presented itself to both of these men, "matter comes out rather as a precipitate in the universal ether, determined by a mathematical necessity; a grand and beautiful cloud-work in the realm of light, bounded on both sides by a world of spirits, on the upper and anterior side, by the great Creator himself, and the hierarchy of spirits to which he awarded immediate existence; and on the lower and posterior side, by that world of spirits of which the material body is the mother and nurse." Macvicar says the hyphothesis that there are no beings in the universe but those who possess a molecular structure, and that sensibility and intelligence take their first beginnings in such structures, is one of the most inadequate conceptions that was ever proposed for scientific belief. Science is not only very blind, but glories in her blindness. She gropes among the dead seeking the origin of life, instead of going to the Fountain of all life, the Ever Living, as these philosophers have done.

In theorizing on the philosophy of planetary suspension Mr. Keely says: "As regards planetary volume, we would ask in a scientific point of view: How can the immense difference of volume in the planets exist without disorganizing the harmonious action that has always characterized them? I can only answer this question properly by entering into a progressive analysis, starting on the rotating etheric centers that were fixed by the Creator with their attractive or accumulative power. If you ask what power it is that gives to each etheric atom its inconceivable velocity of rotation (or introductory impulse), I must answer that no finite mind will ever be able to conceive what it is. The philosophy of accumulation" (assimilation, Macvicar calls it) "is the only proof that such a power has been given. The area, if we can so speak of such an atom, presents to the attractive or magnetic, the elective or propulsive, all the receptive force and all the antagonistic force that characterizes a planet of the largest magnitude; consequently, as the accumulation goes on, the perfect equation remains the same. When this minute center has once been fixed, the power to rend it from its position would necessarily have to be as great as to displace the most immense planet that exists. When this atomic neutral center is displaced, the planet must go with it. The neutral center carries the full load of any accumulation from the start, and remains the same, forever balanced in the eternal space."

Mr. Keely illustrates his idea of "*a neutral center*" in this way: "We will imagine that, after an accumulation of a planet of any diameter—say, 20,000 miles, more or less, for the size has nothing to do with the problem—there should be a displacement of all the material, with the exception of a crust 5000 miles thick, leaving an intervening void between this crust and a center of the size of an ordinary billiard-ball, it would then require a force as great to move this small central mass as it would to move the shell of 5000 miles thickness. Moreover, this small central mass would carry the load of this crust forever, keeping it equi-distant; and there could be no opposing power, however great, that could bring them together. The imagination staggers in contemplating the immense load which bears upon this point of center, where weight ceases. This is what we understand by a neutral center."

Again, Mr. Keely, in explanation of the working of his engine, says: "In the conception of any machine heretofore constructed, the medium for inducing a neutral center has never been found. If it had, the difficulties of perpetual-motion seekers would have ended, and this problem would have become an established and operating fact. It would only require an introductory impulse of a few pounds, on such a device, to cause it to run for centuries. In the conception of my vibratory engine, I did not seek to attain perpetual motion; but a circuit is formed that actually has a neutral center, which is in a condition to be vivified by my vibratory ether, and while under operation, by said substance, is really a machine that is virtually independent of the mass (or globe), and it is the wonderful velocity of the vibratory

circuit which makes it so. Still, with all its perfection, it requires to be fed with the vibratory ether to make it an independent motor. . . . ."

Alluding to his illustration of a neutral center, Mr. Keely says: "The man who can, even in a simple way, appreciate this vast problem has been endowed by the Creator with one of the greatest gifts which He can bestow upon a mortal. . . . . All structures require a foundation in strength according to the weight of the mass they have to carry, but the foundations of the universe rest on a vacuous point far more minute than a molecule; in fact, to express this truth properly, on an inter-etheric point, which requires an infinite mind to understand. To look down into the depths of an etheric center is precisely the same as it would be to search into the broad space of heaven's ether to find the end; with this difference, that one is the positive field, while the other is the negative field. . . . ."

Again, Mr. Keely gives some suggestive thoughts as follows: "In seeking to solve the great problems which have baffled me, from time to time, in my progressive researches, I have often been struck by the fact that I have, to all seeming, accidentally tripped over their solution. The mind of man is not infinite, and it requires an infinite brain to evolve infinite positions. My highest power of concentration failed to attain the results which, at last, seeming accident revealed. God moves in a mysterious way his wonders to perform; and if he has chosen me as the tool to carve out certain positions, what credit have I? None; and, though it is an exalting thought that he has singled me out for a specific work, I know that the finest tool is of no value without a manipulator. It is the artist who handles it that makes it what it is. Indifference to the marvels which surround us is a deep reproach. If we have neither leisure nor inclination to strive to unravel some of the mysteries of nature, which task to the utmost the highest order of human intelligence, we can at least exercise and improve our intellectual faculties by making ourselves acquainted with the operation of agencies already revealed to man; learning, by the experience of the past, to be tolerant of all truth; remembering that one of Nature's agencies, known once as of use only in awakening men's minds to an awful sense of the Creator's power, has now become a patient slave of man's will, rushing upon his errands with the speed of light around the inhabited globe. . . . ."

In comparing the tenuity of the atmosphere with that of the etheric flows obtained by Mr. Keely from his invention for breaking up the molecules of air by vibration, he says, "it is as platina to hydrogen gas. Molecular separation of air brings us to the first subdivision only; inter-molecular, to the second; atomic, to the third; inter-atomic, to the fourth; etheric, to the fifth; and inter-etheric, to the sixth subdivision, or positive association with luminiferous ether. In my introductory argument I have contended that this is the vibratory envelope of all atoms. In my definition of atom I do not confine myself to the sixth subdivision, where this luminiferous ether is developed in its crude form, as far as my researches prove. I think this idea will be pronounced, by the physicists of the present day, a wild freak of the imagination. Possibly, in time, a light may fall upon this theory that will bring its simplicity forward for scientific research. At present I can only compare it to some planet in a dark space, where the light of the sun of science has not yet reached it. . . . ."

It seems particularly fitting that THE SCIENTIFIC ARENA should be the first to make known to the reading public Mr. Keely's marvelous researches and still more marvelous inventions, inasmuch as the views of its editor on some subjects are identical with those held by Mr. Keely. Take, for example, the following quotation from one of Mr. Keely's papers:

"I assume that sound, like odor, is a real substance of unknown and wonderful tenuity, emanating from a body where it has been induced by percussion, and throwing out absolute corpuscles of matter—inter-atomic particles—with a velocity of 1120 feet per second, in vacuo 20,000. The substance which is thus disseminated is a part and parcel of the mass agitated, and if kept under this agitation continuously would, in the course of a certain cycle of time, become thoroughly absorbed by the atmosphere; or, more truly, would pass through the atmosphere to an elevated point of tenuity corresponding to the condition of sub-division that governs its liberation from its parent body." [Here comes in Dr. Macvicar's Cosmical Law of Assimilation.] Mr. Keely continues: "The sounds from vibratory forks, set so as to produce etheric chords, while disseminating their tones (compound) permeate most thoroughly all substances that come under the range of their atomic bombardment. The clapping of a bell in vacuo liberates these atoms with the same velocity and volume as one in the open air; and were the agitation of the bell kept up continuously for a few millions of centuries it would thoroughly return to its primitive element; and, if the chamber were hermetically sealed, and strong enough, the vacuous volume surrounding the bell would be brought to a pressure of many thousands of pounds to the square inch, by the tenuous substance evolved. In my estimation, sound truly defined is the disturbance of atomic equilibrium, rupturing actual atomic corpuscles; and the substance thus liberated must certainly be a certain order of etheric flow. Under these conditions is it unreasonable to suppose that, if this flow were kept up, and the body thus robbed of its element, it would in time disappear entirely? All bodies are formed primitively from this high tenuous ether, animal, vegetable, and mineral, and they only return to their high gaseous condition when brought under a state of differential equilibrium."

Thus Mr. Keely teaches, with Dr. Macvicar, that ether is the true protoplasm.

"As regards odor," continues Mr. Keely, "we can only get some definite idea of its extreme and wondrous tenuity by taking into consideration that a large area of atmosphere can be impregnated for a long series of years from a single grain of musk; which, if weighed after that long interval, will be found to be not appreciably diminished. The great paradox attending the flow of odorous particles is that they can be held under confinement in a glass vessel! Here is a substance of much higher tenuity than the glass that holds it, and yet it cannot escape. It is as a sieve with its meshes large enough to pass marbles, and yet holding fine sand which cannot pass through; in fact, a molecular vessel holding an atomic substance. This is a problem that would confound those who stop to recognize it. But infinitely tenuous as odor is, it holds a very crude relation to the substance of subdivision that governs a magnetic flow (a flow of sympathy, if you please to call it so). This sub-division comes next to sound, but is above sound. The action of the flow of a magnet coincides somewhat to the receiving and distributing portion of the human brain, giving off at all times a depreciating ratio of the amount received. It is a grand illustration of the control of mind over matter, which gradually depreciates the physical till dissolution takes place. The magnet on the same ratio gradually loses its power and becomes inert. If the relations that exist between mind and matter could be equated, and so held, we would live on in our physical state eternally, as there would be no physical depreciation. But this physical depreciation leads, at its terminus, to the source of a much higher development—viz., the liberation of the pure ether from the crude molecular; which, in my estimation, is to be much desired. Thus God moves in a simple way his wonders to perform. . . . ."

Again, Mr. Keely writes as follows:

"I shall not forestall an unproved conclusion, but fight step by step on the dark paths I am exploring; knowing that, should I succeed in proving one simple fact in science heretofore unknown, I shall in so doing be rewarded in the highest degree. In whatever direction the human mind travels, it comes quickly to a boundary line which it cannot pass. There is a knowable field of research, bordered by an unknown tract. My experience teaches me how narrow is the strip of territory which belongs to the knowable, how very small the portion which has been traversed and taken possession of. In this our century of widely diffused knowledge how ignorant is the vast majority! The farther we traverse the unknowable, the stronger will become our faith in the immovable order of the world; for, at each advancing step, we find fresh proofs of the immutable laws that reign over all things—from the falling apple up to the thoughts, the words, the deeds, the will of man: and we find these laws irreversible and eternal, order and method reigning throughout the universe. Some details of this universal method have been worked up, and we know them by the names of 'gravitation,' 'chemical affinity,' 'nerve-power,' etc. These material certainties are as sacred as moral certainties. . . . The nearest approach to a certainty is made through harmony with Nature's laws. The surest mediums are those which Nature has laid out in her wonderful workings. The man who deviates from these paths is sure to suffer the penalty of a defeat, as is seen in the records of 'perpetual-motion' seekers. I have been classed with such dreamers: but I find consolation in the thought that it is only by those men who are utterly ignorant of the great and marvelous truths which I have devoted my life to demonstrate and to bring within reach of all. I believe the time is near at hand when the principles of etheric evolution will be established, and when the world will be eager to recognize and accept a system that will certainly create a revolution for the highest benefits of mankind, and inaugurate an era undreamed of by those who are now ignorant of the existence of etheric force."

BADEN-BADEN, Germany.

A LIMIT TO THE HEIGHT OF THE ATMOSPHERE.*

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

DR. WM. HYDE WOLLASTON, in his famous paper, "On Finite Extent of the Atmosphere," † says: "If the divisibility of matter be infinite, so also must the extent of the atmosphere. For if the density be throughout as the compressing force, then must a stratum of given thickness at every height be compressed by a superincumbent atmosphere, bearing a constant ratio to its own weight, whatever be its distance from the earth. But if the air consist of any ultimate particles no longer divisible, then must expansion of the medium composed of them cease at that distance where the force of gravity downward upon a single particle is equal to the resistance arising from the repulsive force of the medium." And Dr. Lardner ‡ says: "If a particle of air were raised above this height by the application of any external agency and then disengaged, it would drop by its gravity to the surface of the atmosphere in the same manner and by

* Read before the New York Academy of Sciences, November, 1886.

† Phil. Trans., 1822.

‡ Handbook of Nat. Phil.

the same law that makes a stone drop to the ground."

Prof. Mattieu Williams, in 1870, published a book bearing the title "The Fuel of the Sun," in which he attemps to account for the sun's heat, and he claims that the correctness of his position rests upon the question: "Whether the atmosphere which surrounds our earth is limited or unlimited in extent."

Williams claims that our atmosphere is but a portion of a universal medium which is distributed by gravitation. To obtain the weight of the atmosphere of any body in space, it is only necessary, according to Williams, to "multiply the mass of the body expressed in units of the earth's mass by its own square root, and the product is the total weight of the atmosphere of the body expressed in units of the earth's atmosphere, or $x=m\sqrt{m}$, where x is the atmosphere of the body expressed in units of the earth's atmosphere, and m is the mass of the body expressed in units of the earth's mass." One of the arguments against a universal atmospheric medium is the fact that the most delicate tests for a lunar atmosphere give no evidence that one exists.

If the moon had an atmosphere, just before the limb of the moon appears to reach a star* the latter would be seen through the moon's atmosphere, if there was one, and would be displaced in a direction from the moon's center. But the most careful observations have failed to show the slightest evidence of any such displacement. The spectra of stars when about to be occulted have also been examined, in order to see whether any absorption lines which might be produced by the lunar atmosphere became visible.

The evidence in this direction has also been negative.

If there is a lunar atmosphere, it is too rare to exert any sensible absorption upon the rays of light. It is also stated in some astronomical treatises that a lunar atmosphere having a density equal to only 1-2000 of that of our own would be indicated by the acceleration of the observed period of an occultation. In answer to this, Williams says: "This calculation rests upon the assumption of an atmosphere suddenly and sharply terminating in an absolute vacuum."

The lunar atmosphere is, as Williams maintains, only a graduated condensation of the general atmospheric medium, and he calculates that the pressure of the lunar atmosphere could only be 1·50 of that upon the earth's surface; the barometer would stand six-tenths of an inch (15·24 mm.) instead of 30 inches (762 mm.), and the pressure 3-10 lb. (136·066 grms.) instead of 15 pounds (6,803·29 grms.) per square inch, hence the lunar atmosphere would be equal to a vacuum in the receiver of an old-fashioned air-pump.

Williams claims that the gravital attraction of the earth would go on accumulating an atmosphere until such attraction was neutralized by that of some other orb, toward which an imaginary course was tending. If we cross the neutral line, and continue further in the same direction, we enter the domain of another world, where the order of proceeding density is reversed. He calculates the pressure of the atmosphere of the sun at 32,903,928 lb. (14,923,906,601·68 grammes) per square foot, or about 230,000 tons (108,634,214·4 kilogrammes) on the surface of the human body; in atmospheres, 15,233·3. He calculates where the pressure of our atmosphere would be one grain (0·06479 grm.), the bulk of an equal weight will be 105,200 times greater than at the earth's surface. One grain (0·0679 grm.) there will occupy the space of 15 lb. (6803·39 grains) here. One pound (453·55 grammes) would be 15 times more rare, and one ounce (28·35 grms.) 240 times more rare.

Wollaston, after calculating the atmosphere of the sun, concludes that its extent would be so great as to visibly affect the apparent motions of Mercury and Venus when their declination makes its nearest approach to that of the sun. No such disturbance being actually observable, he concludes that an atmosphere cannot exist. He also calculated the atmosphere of Jupiter, and found it to be so great that its rarefaction would be sufficient "to render the fourth satellite visible to us when behind the center of the planet, and consequently to make it appear on both (on all) sides at the same time."

Williams shows that Wollaston's calculations are incorrect, as Wollaston's mistake is based on the assumption that the atmospheric pressure and density at any given distance from the center of the given orb will vary inversely with the square of that distance. As the area of the base upon which such pressure is exerted varies *directly* with the square of the *distance*, the total atmosphere above every imaginable starting distance would thus be ever the same. Williams also claims that the atmosphere in the interplanetary spaces will be subject to the same laws of motion as the solid planetary matter. Just what its density would be he has not deduced.

Observed and calculated movements of Encke's and Halley's comets seem to indicate the existence in planetary space of a medium—as an appreciable and measurable degree of mechanical resistance to motion of the attenuated matter of which they are composed is observable. This resistance may, however, at some future time be attributed to some other cause, which at present I will not stop to discuss.

Let us now consider the various heights which have been assigned to the earth's atmosphere by various investigators.

Sir John Robinson* says: "It is easy to show that the light which gives us what we call twilight must be reflected from the height of at least fifty miles, for we have it when the sun is depressed eighteen degrees below the horizon." The limit concluded, however, is forty-five miles (72·4 kilom.); but Robinson says: "A very sensible illumination is perceptible much further from the sun's place than this, perhaps twice as far, and the air is sufficiently dense for reflecting a sensible light at a height of nearly 200 miles (321·8 kilom.)."

Laplace states that at a height of 52,986 meters, or less than thirty-three miles (53,097 meters), the atmosphere is thinned out to the utmost degree of rarefaction obtainable in an air pump.

M. Quetelet has inferred the existence of what he calls the "stable atmosphere," occuying the region extending from forty to eighty miles above the earth's surface.

Newcomb and Holden† state: "As shooting stars and meteors commonly commence to be visible at a height of about 160 kilometers, or 100 statute miles, the earth's atmosphere must rise to this height."

Lockyer‡ states: "There is evidence to show that we have an atmosphere of some kind at a height of 400 or 500 miles" (643·2 to 804·6 kilom.).

Prof. Alex. Buchan states§ that: "The limit of the atmosphere will be reached at where the force of gravity downward upon a single particle is equal to the resisting force arising from the repulsive force of the particles. From the observations of luminous meteors, it is inferred that the height of the atmosphere is at least 120 miles (193 kilom.), and that in an extremely attenuated form it may reach 200 miles" (321·8 kilom.).

Prof. David Trowbridge‖ claims that if the earth were 490 deg. F. (272 deg. C.) warmer than it now is, the height of the atmosphere would be nearly doubled; and he fixes the present height at 343 miles (551·887 kilom.).

Prof. Alf. Daniel,* speaking of our atmosphere, says: "At a height of 210 miles (337·89 kilom.), the single molecules are relatively so few (1000 to the cubic em., or 0·061016 to the cubic in.) that each molecule might travel through a uniform atmosphere of that density 60,000,000 miles (96,540,000 kilom.) without entering into collision; beyond a height of 300 miles (482·1 kilom.) the atmosphere is so rare (less than one molecule per cubic foot—28·32 cubic dec.) that the particles might freely travel through such an atmosphere from one fixed star to another; while in the fields of space, at distances practically infinite from the earth or from any other star, the number of cubic miles containing a single molecule would be represented by the figure 1 followed by 314 ciphers.

"This opens to us," says Daniel, "an extraordinary view of the nature of our atmosphere. We must, though the process cannot be rapid—for each particle rising from the earth is retarded by gravity, and falls back toward the earth—constantly be losing particles of nitrogen and oxygen as we are dragged through space, and we may constantly be picking up new ones. If we entered regions of space in which there were no particles fit to make up our losses, it would be an interesting question how short a time would suffice altogether to deprive us of our atmosphere."

Williams, speaking of the assumed limit to the height of our atmosphere, and the *supposed* luminiferous ether, says: "What must be the action of such a resisting medium (ether) upon the supposed boundary atoms† of the atmosphere of our planet, as it is rushing through it with its orbital velocity of nearly two millions of miles (3,218,000 kilom.) per day? Obviously, to brush them off the surface of the atmospheric ocean, and leave them deposited in the midst of the luminiferous ether, as a gale of wind lodges the sea spray on a lee shore. The outer atoms, thus removed, would leave the rest below in the same condition of unstable equilibrium; for according to this atomic theory, it matters not how great or how little be the extent of such an atmosphere of aggregated atoms—the outer layer must be subject to no pressure beyond that of its own gravitation, and that must be neutralized by its own elasticity and that of the next below. Thus would this newly exposed stratum of atoms be swept away by the merciless ether; then another and another again, till the planet would be stripped bare to the bottom of its dry land valleys. Then the ocean, relieved of the pressure which restrains the volatizing power of the sun's rays, would spring upward into the condition of gaseous elasticity, forming another atmosphere subject to the same laws as the first, which would in like manner be swept away from the surface of the earth, leaving it all in a condition of arid, lunar barrenness."

Even if the ether were traveling in company with the earth in its orbit, there still remains the earth's axial motion; and then the whole solar system is traveling through space at the rate of 400,000 miles (643,600 kilom.) per day, all of which would tend to strip the earth of an atmosphere.

I will state right here, however, that while all this appears reasonable if such a medium as the ether existed, still I do not admit of the existence of any such medium, nor do I see the least necessity for my doing so. My reason for this is foreign to the subject we are discussing, consequently, I will proceed to show by entirely new methods:

1. That *if there is* a definite height to the atmosphere, such height cannot exceed a given height to be mentioned.

2. That *there is a definite height* to the atmosphere.

3. What that height *probably* is.

(To be continued.)

* Astronomy, Newcomb and Holden, p. 331.

* Ency. Brit., Pneumatics, 8th edition.

† Astronomy, p. 380.

‡ El. of Astronomy.

§ Ency. Brit., 9th edition.

‖ Of Waterburg, New York; see Record Sci. Ind.,

* Prin. of Phys., p. 224.

† Meaning molecules.

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SUBSTANCE, MATTER, FORCE, MOTION, PHENOMENON, ETC.

BY THE EDITOR.

NEARLY all the controversy arising among scientific investigators, both in the physical and metaphysical realm, comes directly from the want of correct and agreed-upon definitions of the principal terms to be employed in the discussion. We have wasted hours upon hours in argument with an intelligent man on some intricate question of science, to find out in the end that neither of us understood what the other was driving at, simply because the chief words in debate had one meaning in his mind, and quite another signification in our own. Hence the necessity first of all in entering into an argument, either private or public, either formal or informal, to settle down upon the signification to be attached to the principal words about to be discussed.

Take the first two words at the head of this article as an illustration. We firmly believe that nowhere in the scientific investigations of the past has the proper and consistent distinction been made between the terms *substance* and *matter* until that distinction was pointed out in the Substantial Philosophy. That distinction is as follows: that while all matter is substance or substantial, it is not true that all substance is matter or material. That substance is a generic term, embracing all entities in the universe of whatever kind or character, while matter is a specific term embracing only one department of substance, namely, the material department, or that classification which includes ponderable substances, or such tangible bodies as are subject to known material conditions, and subject to chemical and mechanical analysis. This generic and specific relation of substance and matter to each other is clearly illustrated by any usual classification of known entities around us, a hundred of which could at once be enumerated. As, for instance, the fact that all men are living creatures, while it by no means follows that all living creatures are men. Is not this a clear case? All grapes, for example, are fruit, but surely no one would thereby suppose that all fruits were grapes. All trees are vegetable, but no one would be justified in claiming therefrom that all vegetables must be trees. All gold is metal, but it does not follow that all metal is gold. In this case as in that of substance and matter, the term metal is the generic term, while gold is the specific.

Those who have not been informed upon the distinction here pointed out, and who have not taken time to reflect upon the rational application of this method of classifying entities, unhesitatingly declare that they are entirely unable to conceive the idea of any *substance* that is not *matter* in some degree of grossness or refinement. Plainly this confessed want of capacity for discrimination in a matter so self-evident and so easily illustrated by generic and special classifications everywhere in nature, is the strongest possible evidence of the materialistic tendencies of this age. It points with fatal certainty to the fact that, in the education which young men are receiving from our best schools and colleges, every scientific inculcation, both physical and metaphysical, is put upon the basis that matter in some form is all there is substantial in the universe, and that the use of the two terms, matter and substance, only comes from our natural taste for variety in verbiage to avoid tautology in language. But let our schools be so revolutionized as to accept this substantial and rational classification of the entities of nature, as the foundation of all true scientific knowledge, and at once this materialistic tendency so manifest in our bright and rising young men will give place to a true philosophical conception of life, mind, soul, and spirit, in their relation to all the other verities and entities of nature.

By substance in its *immaterial* sense is meant not only what are often called the physical imponderables, such as heat, electricity, magnetism, and the other forces of nature, but the vital, mental, physical, and spiritual entities existing within human, animal, and vegetable bodies. Let the young men of the rising generation be once thoroughly educated in the principles involved in the conception of substance and matter here pointed out, and at once their intellectual activities will expand and rise into a higher sphere of philosophical investigation than the present materialistic tendencies of science can ever furnish, while such a higher plane of mental perception and contemplation will as surely tend in the same proportion to dissipate sensualism in the land by thus intellectualizing and thereby elevating the race.

To our perceptions and experiences in nature two great fundamental truths confront us upon which and around which all other truths in science cluster. Those basic truths consist in this: *the entity which is moved and the force or energy which moves it.* The entity which is thus moved, or which is capable of being moved, involves all substance in the universe, whether material or immaterial; while the force which moves, in its primordial sense at once leads back to and includes the self-existent, uncreated, intelligent first cause of all things except himself, and which we term God. But intermediate, between the entity moved and this conception of the prime-moving force of nature, whence all activity proceeds, there are myriads of subordinate phases or minor forms of force through which the streams of energy channel their way to the countless effects we observe in the motions of objects around us.

From this primordial fountain of life and energy here alluded to may be said to spring two great rivers of force, one leading to the physical department of all activities in nature, terminating in the great reservoir or force-element, whence proceeds the innumerable phases or minor forms of force, such as light, heat, sound, electricity, gravity, cohesion, magnetism, and no doubt many other forms or phases with which man, as yet, has never become acquainted. The other great stream of energy, from that sole fountain-head of nature, terminates in a similar reservoir of vital and mental energy, from which every spark of vitality and mentality in the universe, and as needed in the animal and vegetable economy, are issued forth by divine mandate. All the movements in the physical realm, as well as all the activities in the vital, mental, and spiritual realm, are the direct results of these intermediate force agencies and instrumentalities radiating out like the ethereal fingers of almighty power from those two supply-fountains, and through which, as God's vicegerents, he performs and controls the physical operations of nature. Thus do all the activities in the physical and vital world result immediately from the various forms of force centering in and emanating from these two fountains, but mediately by correlation from the primordial fountain of personified vital, mental, and physical being, whence all things material and immaterial have originally proceeded.

This general conception of the entitative nature of all force is the only possible basis for the now received doctrine of the conservation of force or energy. To talk of conserving or preserving that which is not a substantial or objective entity is to talk with utter incoherency. Physicists little realize, when assuming the physical forms of force to be but modes of motion, how absurd it is to couple with such an idea the hypothesis of the "conservation of force." Substantialism brought the first ray of consistent daylight to bear upon this whole teaching of the correlation and conservation of the forces by making every form of force or energy an objective substantial existence. Instead of sound, light and heat being modes of motion, or in other words the mere vibratory motions of the material particles of air and ether, the Substantial Philosophy has resolved all these forces or phenomenon-producing causes into immaterial substances, and as really objective existences as are the objects which these forces impress or move.

Had physicists stopped long enough to reflect, before settling down upon such a frivolous phrase as "mode of motion" with which to define any form of physical force or any sensation-producing cause, they would have seen that they were making sound, light, and heat absolutely *nothing*, since *motion* is nothing in the intrinsic or absolute sense, except in name, the same as shadow, cold, silence, and darkness are absolutely nothing, though designated by name as a convenient method of conveying our thoughts.

But the carping advocate of force as a mode of motion asks how we can properly name that which is absolutely nothing? Well, in this very sentence the objector names *nothing*. Is nothing *something* because we have to give a name to our idea of *nonentity?* Absolute space is absolute nothing, and to comprehend the absolute nothingness of motion we have only to consider it as *position in space changing*, instead of *position in space at rest!* Do you say there can be no position in space without somebody to occupy that position either at rest or in motion? We deny it. The position in absolute space is *there* before the body occupies it as much so as after. Hence we place the starters in a race in their respective positions. But you say there can be no motion in space unless there is an actual body to move. Superficially this is true, though with a higher degree of scientific refinement it is not true. Mere *position* in space, without anything occupying it is capable of motion, as may be proved by fixing the thoughts on a given position, and then successively changing this position by continually changing the concentration of thought. You have to select the position in space before placing the body which is either to move or remain at rest. It is only as the body keeps pace with the changing position in space that it can be said to move. Hence, it is the change of position in space alone which is properly called motion.

We reach this result by the law of exclu-

sion, in first determining what motion is not, thus leaving only one possible idea for its definition. First, the body which moves is not the motion. All concede this. Second, the force which causes the body to move is no more the motion than is the body itself. Third, the space occupied by the body is not the motion, since the space itself does not move. What then is motion? Our answer is, as first defined in THE MICROCOSM, that *position in space changing* is all there is of motion, and this changing position in space, though absolutely invisible, except to our mental vision, becomes visible and tangible to our senses the moment a material or visible body occupying space keeps pace with such changing position in space. Hence, assuming a body in position ready to move, the motion of such body manifestly has no existence before it begins to change position; and, by the same logic, after it has moved its motion instantly ceases to exist on the body's coming to rest. No entity can be annihilated. Therefore motion is an absolute nonentity.

Motion, thus being demonstrated to be an absolute nonentity, can produce no sensible or other objective effect. though subjectively it may make a mental impression, just as a shadow or sudden darkness may produce alarm, or as silence suddenly changed from continuous noise, may awaken one from a sound sleep. Hence, as motion, *per se*, is nothing, and can effect nothing, we see the folly of calling any form of natural force, such as sound, light or heat, a mode of motion, and consequently we begin to perceive the necessity of the thorough overhauling and revolutionizing of modern science and philosophy which are so justly contemplated by Substantialism. Sound, light, and heat being forces of nature or forms of energy, by which bodies are moved and sensuous effects produced, must be entities reaching back and correlated to the primordial source and fountain of all force and energy. Hence, the overwhelming analogical proof that mind, life, soul, and spirit, and other forms of natural force by which bodies are moved, must also be substantial though immaterial entities, thus by a single sweep of logical necessity demonstrating the indestructibility of the soul and its probable conscious immortality.

The line of demarkation between the material and immaterial substances of nature is not very distinct, though of rational necessity it exists as much as does any boundary line between two material objects. The Substantial Philosophy teaches that the material has been evolved or synthetized from the immaterial essence of the universe by gradation processes from the infinite down to the grossest tangibility. Surely a thoughtful mind needs no stronger proof of this general proposition than the present marvelous gradation of material substances from the grossest and heaviest rocks and metals up through myriad degrees of solids to liquid substances, and on up through these to our air and the lighter gases till finally we reach odor, the most attenuated of all known material substances, and lying on the very border-land of the immaterial realm. The Substantial idea of creation consists simply in a change of substance from higher to lower grades of refinement. To say that matter is eternal is to assume a co-eternal substance with Deity and one different from himself, and hence, in that respect his co-equal. To assume the creation of matter out of nothing is either to make nothing equivalent to something in order to admit of such change of form, or else to force creation to an extremity of power and wisdom not necessary in reason, since of necessity it would seem easier even for infinite power to create matter out of something. however attenuated or immaterial in essence, than out of absolute nothingness. What irreverence can there be, then, in assuming the immaterial force-element of nature to have constituted from eternity God's exterior essence—his clothing or enswathement, so to speak—from which and out of which the material universe was evolved or transformed, as well as the immaterial forms of force, and thus consistently believe with the Scriptures that *all things are of him?* Substantialism does not insist upon this as a *sine qua non* in its articles of faith, but leaves all its adherents free to determine on the principles of rationality which view of creation is the more consistent to accept and the more easily grasped.

What is matter in its intrinsic sense? is a question of no trifling importance. The answer is, that matter is essential substance so synthetized or changed in form as to take it outside of the pale of substantial existence in its strictly incorporeal character, and thus to bring it under what are known as material conditions, such as weight, inertia, etc.

Some modern physicists have insisted that a point of matter *per se* is but a "point of force," because if you reduce a particle of matter by divisibility to a mathematical point, you have nothing but an intangible center around which matter of tangible form may collect and thus constitute a sensible mass. Now we answer all this by saying that we do not in any wise change the form or nature of a substance by reducing its quantity or size. A diamond would remain as purely and truly diamond in nature if one of its finest particles of impalpable dust could, by more refined processes, still be subdivided thousands of millions of times. Could we even isolate its smallest *atom*, supposed by present science to be absolutely insusceptible of further divisibility and composed of nothing but itself, we would have only to suppose that atom expanded by sufficient magnifying power till it becomes the size of an apple, and we would have no difficulty then in conceiving of it as a perfectly homogeneous mass capable of subdivision, *but in no way constituted of ultimate molecules and atoms!* We surely have as much right to imagine this diamond *atom* magnified to the size of a cannon-ball as we have to imagine the existence of the atom itself, since confessedly its very existence depends on the imagination of the physicist; and if a single atom thus magnified can be rationally imagined to be homogeneous throughout and not constituted of ultimate molecules and atoms, why not so view the original diamond itself of which that so-called atom constituted a part, since no such atoms or molecules are known to exist?

The explanation of matter as mere "points of force" gives little satisfaction even to those who urge it, since such mathematical point is either *something* or it is *nothing*. If it is nothing because it is infinitely reduced in size, it is plain that all matter is thus scientifically reducible to nothing, since the same explanation (?) makes matter consist alone of an infinite number of such points of force. But what is more confused in thus making matter consist solely of an infinite number of "points of force" is the fact that the very physicists who teach this lucid doctrine, make "force," including its mathematical "points," but molecular motion of some sort and nothing entitative, thus again reducing matter to nothing by first reducing it to "points of force," which in its last analysis is but a mode of motion, and therefore nothing absolutely. Physicists would save themselves an enormous amount of bewilderment and trouble should they adopt Substantialism at the start and have done with it, as they will be obliged to do in the end, unless they desire to live and die in scientific darkness.

In conclusion, we ask what are the so-called *phenomena* of nature? Few words in our language are more loosely employed and less understood than that word *phenomenon*. Strictly speaking, a phenomenon is neither a material nor an immaterial substance, nor is it the motion of a substance through space, nor even is it the impression upon our consciousness which we call sensation; but it is the *appearance* or *manifestation* of any object, so that we are enabled to recognize it by our sensuous observation, which, in the strict sense, may be called a *phenomenon*. For example, we say that we see a tree in the distance. In ordinary parlance this is true, yet in strict science it is not correct. We no more see the material tree itself than we smell the distant flower-garden or hear the distant church-bell, though in an accommodated sense they are all accepted as true. What is it that we see in the distance which we call a tree? We see the image of that material object pictured upon the retinal membrane by the reflection of substanial light-rays from that material tree to our eyes. In order to see the tree itself, that material body would have to be in the eye itself, and thus occupy the place of the reflected image. But even then such a material object, however small, instead of serving the purpose of an image, would mar the retina and impair the vision. Where, then, comes in the natural *phenomenon* of vision in the case of that tree?

Let us see again by the law of exclusion what it must be from what it cannot be. The phenomenon cannot be the tree itself, since that tree can produce no effect upon the mind at its distance without the intervention of the force of light. It is not the light which is the phenomenon, for that is the immaterial substantial medium through which the phenomenon is produced and recognized by the mind. It is not the image made upon the eye, nor is it the sensuous concept formed concerning it by the mind. These, though all intimately related together as adjuncts, are not the phenomenon itself. Thus we reach the only possible definition of the term, and that is, as already intimated, the *appearance* or *manifestation* of the distant object, produced first by the existence of the material tree, second by the force of substantial light, third by the image thus painted on the retina, and lastly by cognition taken of the image by the mind. thus completing the *appearance* or *manifestation*, which we recognize as the natural *phenomenon*.

Thus the *manifestation*, or odorous *appearance*, so to speak, of the distant flower-garden, as its fragrant force radiates and comes in contact with our organ of sense, casting its image upon our nasal membrane, is the *phenomenon* in the case of smell. The flower-garden and the emanating odor, though phenomenal, are not the phenomenon involved. The manifestation alone of that garden and its odorous quality through the substantial contact of its fragrant force with the nasal membrane, all combined to impress the mind and thus to produce the phenomenon in question. So it is with the distant bell, and thus it is with every phenomenon observed in Nature.

How important, then, as intimated at the start, that in the investigation of great scientific principles we first of all fix upon correct definitions of all the leading words to be employed! Thus shall confusion of ideas, much logomachy, and oftentimes much ill-feeling in scientific discussions be avoided.

A NEW LAW IN ACOUSTICS.

BY THE EDITOR.

IT is seldom that anything new, which may be justly called a *law*, is discovered in any branch of science. So few and far between are these finds that any such newly-discovered principle becomes at once a matter of public interest to the scientific world, and should be placed on record as a permanent addition to the general fund of human

knowledge, even if the discovery made, like that of the *phonograph*, should have no practical or commercial value. We claim to have made just such a discovery, and hereby announce it in THE SCIENTIFIC ARENA as the suitable place for its record, just as a Peters or Swift is justified in announcing the discovery of a new *asteroid* or *comet*. But, as in the case of a new star, which sometimes turns out to be an old one, it is possible that the scientific *law* here announced as *new*, may prove already to have been a matter of record. If such should prove to be the case, it is safe to believe that there are enough argus-eyed, scientific students in this country all the time on the alert, who would be only too happy to trip up the ambitious explorer in the realm of Nature, who may thus, mistakenly, have put his scientific foot in it, by pointing him to the chapter and verse where his pretended discovery stands already recorded. Such is the attitude we may now occupy, and we stand ready to be tripped up, and to make the proper acknowledgment in THE ARENA so soon as any kind reader of this announcement shall prove our supposed discovery to have been anticipated.

1. It is a well-known law in acoustics that a stretched *string* of a given length will give forth a pitch of tone, when thrummed or bowed, proportioned to its tension.

2. It is another law, that a string of a given *tension* will give forth a pitch of tone proportioned to its *length*.

3. It is a third law that a string of a given *length* and *tension* will give forth a pitch of tone proportioned to the mass of matter constituting the string.

4. Our new law is, *that a string of a given length and mass, if constituted of some highly elastic material, such as India rubber, will give forth the same uniform pitch of tone whatever the tension that may be produced, the counteracting tendency of the varying elongation and attenuation of the string itself exactly counterbalancing the varying degrees of tension!*

In demonstrating this law, great care should be observed that the elastic chord is of uniform thickness throughout, and that it has no defective spots to cause irregular attenution as stretched.

THE HARMONY OF VISION.

BY THE EDITOR.

DO we ever reflect upon the manifest analogy between the harmony which exists as the effects of sounds and sights? There is as true a discord in the appearance of an irregular and asymmetric structure, especially in architecture, to the conscious impression made upon an artistic mind, as there would be by the inharmonious jar of discordant sounds to a cultivated musical ear. A clock standing the slightest out of plumb near a fixed vertical line, produces the same discordant effect upon an accurate mechanical eye as will the clock's unsynchronous tick produce upon the rhythmical ear of the musician.

Discord, both in sights and sounds, consists fundamentally in the want of unity. Notes which, when sounded alone, will produce a discord to the ear, if complemented with other notes no more harmonious of themselves will melt into a pleasant chord, when blended, as the simple effect of unity. In like manner an asymmetric figure that would grate upon the eye of a geometrician, would instantly become the most exquisite form of beauty if exactly complemented with a counterpart discord of vision so placed as to hold a relation of unity to the first figure. By a little invention of our own we will now illustrate this principle of unity as the basis of all harmony both in sights and sounds, and thus prove that the absence of unity must be the real cause of all discord.

Let any reader of THE ARENA take a piece of paper with a straight edge and proceed to tear or cut it into irregular sawteeth, thereby forming the most ragged possible indentations imaginable. Then let him hold up the paper and contemplate its asymmetric form and its unpleasantly discordant effect upon the eye. But now, in order to convert this very visual discord into the most beautiful harmony, let him take another piece of paper, and instead of distorting its edge let him fold it once through the center and proceed to tear or cut the same irregular indentations into such folded edge, and though he may do his worst to produce asymmetry, yet when he shall unfold the paper and contemplate the figure all discord disappears from the sight, and the most exquisite harmony of view at once takes its place. To increase this concordant beauty, the reader has only to duplicate the folds of the paper before mutilating it, and thus producing his jagged and asymmetric figure along its edge, when the multiplicity of symmetrical unities will augment in proportion the artistic effect upon the eye, just as a multiplicity of sounds properly unified into harmonious relation will augment the concordant effect upon the musical ear.

"PLOD."

BY REV. ALFRED J. HOUGH.

OF the wise and holy Maker, of the good and gracious God,
Men can ask few higher blessings than the power and grit to plod.
Showy gift may be attractive, glibly talk of "going to do;"
But it takes the solid lifting of old Plod to "put her through."
He is mightier than all genius, greater than all boasted skill,
Having for his inspiration an indomitable will.
Genius is a passing meteor; Plod a never-setting sun;
Where all else hath failed and fainted, Plod has just gone in and won.
He hath reared the mighty cities, with a strength God-like, sublime;
Made a highway for the nations through the ancient hills of time.
He hath made the lightning serve him, counted stars and measured space:
Wealth and genius fairly beaten in the middle of life's race.
Hard to rouse and slow to action; but, when Plod once says "I will,"
He is just as sure to do it as the lightning is to kill.
He was busy at the building of the pyramids of old,
And, though kings sought deathless mention, 'tis of Plod their tale is told.
Never yet hath wand'ring pilgrim 'neath their gloomy shadows trod
Without feeling, and believing the omnipotence of Plod!
He hath yet beheld no mountain where his flag he dare not plant,
Just because he didn't whimper and sit down and say "I can't."
In the sober days of plodding, thirty, forty years ago,
We had more of solid progress, less of tinsel and of show.
Our old mothers taught their daughters how to scrub, sew, churn, and bake;
How to take a turn in haying, on the load or at the rake;
Milk and drive the cows to pasture, catch and harness up old Bill;
Crack the whip and take the produce to the market or the mill.
Never smarter, wittier lasses traded at the country store;
And they more than matched the saucy, smooth-tongued peddlers at the door.
Handsomer they were and nobler, in the neat and simple dress,
Than a modern lady, strutting in a satin wilderness.
They would rather go to meeting, sitting with a happy smile,
In the old pung, racked and broken, than to go in debt for style.
Not a dollar would they squander, not an extra ribbon get,
Till the parlor had been furnished and the farm was out of debt.
They'd have scorned the thought of sitting, dressed in frills and "boughten" curls,
While the house was run to ruin by a pack of hired girls;
Or, to be accomplished ladies, make an organ squeal and moan,
While their mothers, late and early, worked their fingers to the bone,
Yet, with all this sober plodding, Nature had no richer charms
Than she gave the happy maidens on the grand New England farms,
But this age of great inventions, deeper thought, and clearer light
Has produced a patent Lady, and Dame Fashion holds the right.
Not content with sober plodding, tired of loafing and unrest,
All the boys are taking tickets for the prairies of the West;
And they need but small persuasion to pull up their stakes and go
To where Nature yields a harvest if she's tickled with a hoe.
But I've somehow got the notion that a lad, with prospects fair,
Failing in New England valleys is a failure anywhere.
He may have the mildest climate, he may have the richest sod,
But it just amounts to nothing if he hasn't got the plod!
It may be the age is giving birth to more enlightened views;
But it doesnt do to farm it in a pair of patent shoes.
And it simply stands to reason that a man can't till his ground,
If one half the time he's loafing, and the other—riding round.
Barns well shingled, thriving cattle, stoneless acres, rich and broad,
Come from nothing else, believe me, but the steady, sober plod!

[The following, from the Burlington *Hawkeye*, is too good not to find a place in these colums.—Editor.]

A WORD FOR CRANKS.

CRANKS, my son? The world is full of them. What would we do were it not for the cranks? How slowly the tired old world would move, did not the cranks keep it rushing along! Columbus was a crank on the subject of American discovery and circumnavigation, and at last he met the fate of most cranks, was thrown into prison, and died in poverty and disgrace. Greatly venerated now? Oh, yes, Telemachus, we usually esteem a crank most profoundly after we starve him to death. Harvey was a crank on the subject of the circulation of the blood; Galileo was an astronomical crank; Fulton was a crank on the subject of steam navigation; Morse was a telegraph crank; all the old Abolitionists were cranks; John Bunyan was a crank; any man who doesn't think as you do, my son, is a crank.

And by and by the crank you despise will have his name in every man's mouth, and a half-completed monument to his memory crumbling down in a dozen cities, while nobody outside of your native village will know that you ever lived. Deal gently with the crank, my boy. Of course some cranks are

crankier than others, but do you be very slow to sneer at a man because he knows only one thing and you can't understand him. A crank, Telemachus, is a thing that turns something, it makes the wheels go round, it insures progress. True, it turns the same wheel all the time, and it can't do anything else, but that's what keeps the ship going ahead.

The thing that goes in for variety, versatility, that changes its position a hundred times a day, that is no crank; that is the weather-vane, my son. What? You nevertheless thank Heaven you are not a crank? Don't do that, my son. Maybe you couldn't be a crank if you would. Heaven is not very particular when it wants a weather-vane; almost any man will do for that. But when it wants a crank, my boy, it looks about very carefully for the best man in the community. Before you thank Heaven that you are not a crank, examine yourself carefully, and see what is the great deficiency that debars you from such an election.

OPTICAL DELUSIONS.

BY THE EDITOR.

To *see* a thing is one thing, and to know that you *see it as it really is* is quite another. We have read various accounts of visual deceptions, commonly termed optical delusions, but we have never seen or known of one more provokingly perverse and persistent in its deceptive tendency, even while the facts were absolutely *known* to be exactly the reverse of what they were *seen* to be, than one which came under our observation the other day. It is so simple and inexpensive to construct, and at the same time so instructive, that we at once resolved to describe it in THE ARENA, that the reader, if so disposed, may construct the device for himself, and then test his powers of defying false mental impressions.

The toy referred to was not used or intended to be used as an optical delusion at all, nor in fact do we know or believe that this strange characteristic was ever observed in its operation by any other person beside ourself; so we present it as new to the scientific world. It consists of a common wind-wheel made of four horizontal cross-pieces, say four feet long, constructed to turn around a pin passing through the center where the pieces cross each other, and with sails attached to their four ends so arranged as to cause the wheel to rotate continuously and rapidly under the action of a slight breeze. This is all there is of the device—a toy which is found in the back yards of many families, placed on the tops of outhouses or posts for the amusement of children. The wings may be constructed in various forms, so they will only shift to catch the wind on one side and avoid it on the other, thus securing continuous rotation *necessarily always in the same direction.*

Now the puzzle of puzzles is this: if you look at the wheel from a distance of twenty or more yards, with the line of sight a little below a horizontal level, in other words, so that the sail nearest to you will be slightly higher than those on the far side of the wheel, it will be seen to rotate in its true direction. But should you pass into an upper story of the building, so that the sails nearest you will be slightly lower than those on the opposite side of the wheel, no power of your imagination can ever make it appear to rotate in its true direction. Though you know positive that it is still rotating in the same direction, and the only direction possible for it to take, you *see* it actually going in the opposite direction in spite of all your mental effort to force the appearance to agree with the fact.

To confirm the beauty of this delusion you have only to place your eye on a level with the wheel and let an assistant tilt the post on which it is rotating, first toward you and then from you, so as to bring the sails nearest you alternately above and below the line of vision, and with the same regularity will the wheel shift its apparent direction first according to fact, then according to delusion; and although you know positively that no change in direction takes place, yet, in spite of your absolute knowledge, you see it do what you know it cannot do, and even when not more than twenty yards away.

This is what we call a scientific enigma *par excellence*, and if any man is capable of giving a rational explanation of this optical delusion in the columns of THE SCIENTIFIC ARENA, by any known or unknown law of optics, we shall be only too glad to allow him to do so.

DR. SWANDER'S GREAT BOOK.

"THE SUBSTANTIAL PHILOSOPHY."

IT is impossible to give in this number of THE ARENA a suitable notice of this revolutionary work, or such a notice as was intended, owing to the sudden indisposition of the editor-in-chief, who was personally to make the selections from the various chapters which would give a fair sample of the character of the work, all of which will appear next month. But as these casualties can neither be foreseen nor guarded against, we shall be obliged to confine our remarks to the mere fact of formally announcing the work in the present number, leaving its illustration by excerpts until another occasion.

We briefly noticed this book last month. We had then examined but a few of its chapters carefully. On the 10th of November the Doctor came to the city to superintend the getting out of the electrotype plates. In the meantime, Mr. Rogers, the office editor, had the contracts all completed with compositors, electrotypers, printers, papermakers, and binders, in readiness for Dr. Swander's appearance upon the stage, that the work could progress under the efforts of a score of men during his stay, and thus secure the essential part of his personal service for the superintendency of the proof-reading of the body of the book. This was, therefore, a busy week, and no more wide-reaching field in philosophical, scientific, and religious thought was ever canvassed and cultivated so thoroughly in the same brief space of time.

The various chapters were discussed in council almost continuously during Dr. Swander's stay, while the force of compositors were putting the work into type; and finally when the Doctor was compelled to bid us adieu for his field of operations at Fremont, Ohio, he expressed his intense satisfaction at the successful completion of the great mission for which he had come east, bidding us farewell on Wednesday evening, November 18th.

During Dr. Swander's stay we had the pleasure of hearing him preach in the church of Mr. Hudson at Lewis Avenue and Monroe Street, Brooklyn, on "The Lord is in His holy temple, let all the earth keep silent." Dr. Swander is as noble and grand a preacher as he is a solid, philosophical writer, and a genial, social, and reliable friend. This was our first personal acquaintance with the Doctor, having never seen him till on the 10th ultimo, though we had known him most intimately for years as the contributor of THE MICROCOSM and SCIENTIFIC ARENA, and as a most trusted and valued personal correspondent, several hundred letters having passed between us during that period.

It seems that Substantialism had found most congenial soil in the conscious receptivity of Dr. Swander's intellectual make-up. It came to its own, and its own received it with open arms. It seemed at its first introduction the very order of things, and the very system of philosophical, religious, and scientific doctrine that his mental longing had prepared him for. No other convert to the Substantial Philosophy, out of the thousands who have fallen into its embrace throughout the country, has more gladly received the word, or more substantially demonstrated a high appreciation of its revolutionizing character than has Dr. Swander. He has never flinched in avowing his convictions since his first great paper in the *Reformed Quarterly Review*, in July, 1882, in which he first presented the fundamental claims of Substantialism as unfolded in the "Problem of Human Life." Through thick and through thin—through evil report and through good report—he has stood by those early expressed convictions, even amidst such blazing fire as that from the pens of Prof. Stahr and other leading philosophical and scientific lights of his own brethren among the learned clergy and laity. Till at last the richest work of his life has culminated in giving to the world in the substantial maturity of his intellect and manhood this important and massive volume of 350 pages entitled the "Substantial Philosophy," thus giving the first systematized attempt at the formulation of that philosophy yet printed.

The book consists of fifteen chapters, as stated last month, each of which is replete with stores of knowledge on the various themes discussed, and the pith of which is put in the form of concise questions and answers. The 10th chapter is devoted to *Sound*, and the author deemed it fitting to submit that chapter to the special revision and control of the editor of this journal and the founder of Substantialism as the one most likely to determine its final shape in conformity with the general outlines of this philosophy as a system of doctrine and belief. Though that, by far the longest chapter of the book, constitutes a part of the main volume, it is to be published separately also as a "text-book on sound," for the use of schools and colleges, and by arrangement with the author will be issued in that form by, and for the exclusive benefit of, the founder of the Substantial Philosophy.

At first, as stated last month, the large volume was intended to be issued at $2. Finally, before Dr. Swander left for the West, it was decided between him and the publishers, Hudson & Co., to reduce the price to $1.50, by mail prepaid, thus to insure a larger sale to the work. Subscribers to THE ARENA, therefore, everywhere, should avail themselves of this fortunate opportunity to get the book, as it will be a necessity in the families of all Substantialists sooner or later. (We give notice of the "Text-Book on Sound" elsewhere in this number.) As the work goes to press immediately, it may be fairly announced as now ready for the public, at least by the time this number of THE ARENA shall have been examined.

Address Hudson & Co., Publishers, 23 Park Row, New York.

SPECIMEN LETTER FROM THE LEADING "FLAT" PHILOSOPHER.

BALHAM, S. W., Eng., Nov. 15.

Editor Scientific Arena:

SIR,—What class of readers must your paper reach if they can be fooled by your palpable and glaring misrepresentations of the facts of the zetetic system? If you have any scientific reputation at stake, how can you venture to describe a system of which you are evidently as ignorant as a child? You could not have been in your sober senses when you first ventured to attack us; but

now when you see that you have a hopeless task before you, you resort to the mean and spiteful style of argument which you dare not put in language that any one, friend or foe, can understand. Why do you insanely attempt to deal with a subject to which you are an utter stranger, and expose yourself by pretending to describe what is not within a thousand miles of the truth? The most unblushing falsehoods, the most preposterous misstatements, the disgraceful omission of every fact that you are too cowardly to face, and the whole of your November article is one tissue of fantastic absurdity. And I must say, if your readers are misled by such a style of argument they must be unworthy of the name of men. Yours truly,

JOHN HAMPDEN.

The above graceful and convincing argument in defense of the zetetic system of *ast*ronomy, is but one of frequent communications received at this office from the chief exponent of that system, and they all have been couched in the same exuberant language. The economy in the use of logic so manifest in the above, seems to be the leading trait of the author. For, while scattering with great prodigality *offers* of prizes to any one who can convince *him* of error, he has repeatedly sent to our office long, blustering letters smuggled through the mails at *third class rates*, and as constantly subjected us to the liability of paying for his dishonesty, should it happen to come to the attention of the post-office authorities. The capacity of our waste-basket is quite equal to the tax made upon it, by such idealess compounds of gas and vanity. But while we can excuse blatant ignorance and submit to the shower of paper upon which this flattest of all flat theorists delights to record his affliction, we do not purpose quietly to submit to an enforced partnership with his despicable dishonesty.

We may look with commiseration upon a man's inability to comprehend the simplest thought, and patiently regret his imbecility, but confirmed dishonesty is an element that calls for quite another treatment from all honest men.

ASSOCIATE ED.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

A few months ago "THE STORY OF THE ROCKS," by Prof. I. N. Vail, was noticed in our columns, and through a mistake the price was put at $1.00; it should have been $2.00.

"The Coal Problem," a pamphlet by the same author, has been received, in which he disputes the vegetarian notions concerning the formation of coal, and accounts for it by his annular or ring theory with which most of our old readers are familiar. All who are interested in the grand scientific strides of this age, should not fail to send thirty cents to Prof. Isaac N. Vail, Barnesville, Ohio, and receive his contribution to the field of geology.

THE "PHYSICIAN'S VISITING LIST."—The several essential qualities which a good visiting list should possess are, compactness, convenience of arrangement, and strength to resist the unusual hard wear it receives. These qualities are all combined in Lindsay & Blakiston's Physician's Visiting List. It is the most convenient for the pocket. Its contents are arranged in the most advantageous way, including a calendar, table of signs, list of poisons and antidotes, dose tables, rewritten in accordance with the sixth revision of the U. S. Pharmacopœia, Marshall Hall's ready method in asphyxia, lists of new remedies, Sylvester's method for producing artificial respiration, with illustrations; diagram for diagnosing diseases of the heart and lungs; explanation of the metric system, explaining the difference between it and the present system of weights and measures; a new table for calculating the period of utero-gestation, and the following new features which have been suggested by our experience and by those who have used the list many years; disinfectants and disinfecting; list of standard reference books; incompatibles and a cash account.

Its chief advantage is its size; it measures 6 1-8x3 7-8 inches, and the smallest size weighs but 3 1-2 ounces and is only 3-8 of an inch thick. The large sizes are a little thicker and heavier; it is, however, the smallest and lightest visiting list published; a very great advantage, when you consider the number of articles the physician has to carry in his pockets. Published by Blakiston & Co., Philadelphia Pa. Price, $1.00.

Publishers' Department.

Expired Subscriptions.

EARLY last month we sent a printed card to all the old MICROCOSM subscribers notifying them of the expiration of their subscription—similar notice having also been stamped upon the wrapper.

These were all addressed from the *old list turned over to us by* THE MICROCOSM *Publishing Co.*

Now it so happened that some of these persons had sent in their subscription to THE ARENA, and their names had been entered upon our *new* books; thus all such have been receiving two copies of THE ARENA each month, *one from each list*. We did not know this, and perhaps never should had not the notice of expiration startled many into sending us characteristic letters—some of alarm, some of censure, some of abuse—that led to an investigation showing this double entry style of bookkeeping. None of our friends need be alarmed with the fear that THE ARENA will discount their subscription.

Fifty cents pays for *twelve* consecutive numbers of THE SCIENTIFIC ARENA, and (D. V.) they will be sent regularly, persistently. Should one fail to reach its destination, a postal card sent to this office will start a duplicate number on its way at once.

We regret our inability to furnish the readers of THE ARENA with the sketch of Mr. Keely's life, and the accompanying illustrated description of his great work, as promised in our last issue. But we were wholly unable to obtain the sketch or the data from which to write it from any competent source, and one very important cut (the motor) not having reached us, we were obliged to submit to the unavoidable, and wait until another issue.

So much of the needed material is already in our possession, however, that we anticipate no difficulty in putting before the readers of the January issue some interesting facts touching this celebrated man and his widely discussed discovery.

Very many suggestions have come to us from interested students, many of them assuming that the stale theories of *stored power* had wholly escaped our thoughts, and that we had innocently swallowed the whole enterprise without stopping to taste, much less chew it!

But, gentlemen, be patient, resting assured that every line of possible solution known to science and mechanics has been canvassed and abandoned by many able and competent parties who have often witnessed the operations and examined the mechanism of this strange claimant for revolutionary honors as the coming motive power in mechanics. Meanwhile, any "explanation of the situation," regarding it all as a delusion or assuming its validity, to receive any consideration in the forthcoming article, should reach *this office* not later than the 15th of this month.

Popular Regard.

GEORGETOWN, TEXAS, Nov. 20, 1886.

HUDSON & CO.,—I have repeatedly read the "Problem of Human Life," every article in the volumes of THE MICROCOSM, and also of THE ARENA. I have read nothing from which I have received more profit, as a minister, if I except the Bible, than from these publications. You can consider me a lifetime subscriber. I have sent you several subscribers to THE MICROCOSM, and will send more for THE ARENA. Very truly,

ABRAHAM WEAVER.

Another sends nine subscriptions, and adds as follows:

NEWTON, ILL., Nov. 23, 1886.

MESSRS. HUDSON & CO.,—If every one of your subscribers will send you as many new names as I send you, THE ARENA will be booming. Substantialism is next to the missionary cause with me, in fact they should go hand in hand; heaven is a real, a substantial city, a home, a dwelling-place, or it is nothing. I would not exchange THE ARENA for all other periodicals combined. The world would be converted to the Substantial Philosophy if the evidence could only be placed within its reach. I have always believed in the substantial reality of the soul and heaven and "God." But the "Problem of Human Life" and Dr. Hall's other writings have thrown so much light upon the subject that my confidence and hope have been wonderfully strengthened, and my desires for heaven and eternal life greatly increased. My prayers are for Dr. Hall, and his co-laborers in this great work.

Yours in the faith,

C. D. KENDALL.

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Let me suggest that those ordering books with a view of securing the Encyclopedia as a premium should not fail to include a liberal supply of the "Problem of Human Life," and of the five bound volumes of *The Microcosm*, to be transmitted to posterity as heirlooms. Their providential appearance marks the grandest epoch in science and philosophy the world has ever witnessed. To be an appreciative possessor of these volumes will be a distinction of which any man may well be proud in the coming ages. In those ages no name will stand higher in science than that of the author of these works. Substantially yours,

RUFUS H. MOSS, Pastor of the Christian Church.

CLEARWATER, Kansas.

MESSRS. HALL & CO.,—* * * * * * The books came all right. I am much pleased with them, and would not take $50 for the set of Encyclopedia alone. With sincere thanks, I remain yours, etc.,

D. T. BOGARDUS.

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MESSRS. HALL & CO.,—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the Encyclopedia. I am more than satisfied with the books, and feel well paid for my labor. I would not take $50 for the Encyclopedia alone. You have my thanks for your kindness.

REV. A. MCA. PITTMAN.

HYDETOWN, Pa.

MESSRS. HALL & CO.,—The $50 worth of your valuable books have arrived. The sixteen leather-bound volumes of the Encyclopedia also came in good order, and I would not take $60 for the set. I told my people about your great offer in *The Microcosm*, and they at once urged me to go to work and secure the Encyclopedia for my library. They subscribed for your books and paid me in advance, so I could send the $50. Many thanks to the people on the Hydetown charge for their liberality. I feel sure if my brethren in the Erie Conference, as well as in others, knew of your offer, they would soon be at work on their various charges to secure this important accession to their library. Accept my sincere thanks for your kindness.

S. DIMMICK, Pastor M. E. C.

"DEAR DR. HALL,—The elegant half morocco set of 'Appleton's Encyclopedia' you sent me is a *gem*. I can buy books at low rates, but *I* could not have gone into the open market and bought this set for $60. Wife and I are actually proud of it, and have given it the chief place in our little library. How you can sell such valuable works at your astonishingly low prices, and not 'go over the hill to the poor-farm,' is a good question for any debating club to wrestle with.

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8. **Text-Book on Sound.** This is the key to Substantialism, and the culmination of the revolutionary work it has inaugurated. Every school-teacher, professor, and student of science should have it and study it. It demonstrates the wave-theory to be false and sound to be a substantial force. Bound in cloth; price, 50 cents.

This list comprises the books from which selection is to be made in order to secure a set of Appleton's Encyclopedia as a premium. A single copy of either of these works as a sample will be sent by mail or express prepaid at the price named. See testimonials elsewhere.

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It is the one desire of Dr. Hall before he dies, more than anything else, that every man and woman interested in his writings should own, as an heirloom to be transmitted to their children, a complete set of his books involving and setting forth the Substantial Philosophy. These books consist of the five large volumes of *The Microcosm*, bound in cloth, price $1.50 each ($7.50 for the five volumes); the "Problem of Human Life," price $2; and the "Text Book On Sound," price 50 cents: amounting in all exactly to $10. "Our special offer" is to send this full set of books, in seven volumes, by express, to any person who will at once remit us $5, or one half the price, which sum will not cover first cost.

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Any person purchasing a quantity of our books with a view to obtaining a set of *Appleton's Encyclopedia* as a premium, as offered on this page, may include one or more copies of the bound ARENA in his order, at $1 each. The editor of this journal has also directed, with the view of permanently spreading the principles of Substantialism, that any person who shall, after seeing this notice, accept the above "Special Offer" for his seven scientific volumes at $5, will receive the bound ARENA in the same package, *free of charge*. Address,

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Scientific Arena

(SUCCESSOR TO THE MICROCOSM, FOUNDED 1881.)

A MONTHLY JOURNAL

Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph.D., LL.D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

HENRY B. HUDSON, Associate Editor.
ROBERT ROGERS, Office Editor.

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SKETCH OF ELD. THOMAS MUNNELL, A. M.

BY THE EDITOR.

THE subject of this sketch is of French extraction, his ancestry, according to the best information available, having fled from France to the southern part of Ireland during the persecutions of the Huguenots. From that island three of his grandparents, during the latter half of last century, emigrated to America and settled in Washington Co., Pa. His maternal grandfather, Jehu Stevens, a man of unusual energy of character, was born and reared in Maryland. The mother of Prof. Thomas Munnell was second cousin to both Thaddeus and Alexander Stevens. The subject of this sketch, whose likeness appears on the first page of this ARENA, was born in Washington Co., Pa., February 8, 1823; but in 1825 his father, Thomas Munnell, Sr., moved his family to Ohio Co., Va., near the city of Wheeling, where the son was brought up and lived till he went to Bethany College, then presided over by the world-renowned Alexander Campbell, and in which he graduated with high honors in 1850. He married Miss Mary L. Forbes, of Wheeling, Va., who proved herself to be a lady of superior natural endowments of both head and heart, and his firm support in every good work.

It was there and at that time that we first became acquainted with the ambitious young Bethany student, and shall never forget the singular tendency of his mind to inquire into and sift the philosophical relations existing between science and religion. Nor shall we cease to remember the energy with which he insisted upon the absolute necessity of complete reconciliation between the two before the church could expect to make more than a sickly headway against the defiant onslaughts of materialistic atheism. Much of our own proclivity in that direction we can trace directly to the numerous discussions in which young Munnell took part at the house of our mutual friend, Archer, in the village of Belair, Ohio, where the students of Bethany College were in the habit of meeting on Sundays. These habits of thought then developed have since shown themselves in the philosophical writings of the same master mind as so frequently evinced in the pages of THE MICROCOSM during the entire five volumes, as also in THE SCIENTIFIC ARENA.

The Christian ministry, several years before his graduation, had been chosen as his life-work, upon which he entered fully and at once upon leaving the halls of Bethany College, but in a few months he was elected Professor of Ancient Languages of Hiram College, Ohio, where he labored for five years, uniting the work of preaching and teaching. His energy of character, his didactic ability and success as a Professor soon secured for him a place in the confidence and hearts of the people seldom attained by any one who undertakes to do two men's work. Here it was that James A. Garfield became a pupil of Prof. Munnell, and received his first lessons in Latin and geometry from him.

ELD. THOMAS MUNNELL.

The double work of teaching all week and preaching every Sunday proved to be rather burdensome to a temperament so ardent, and a will so indomitable, and in the winter of 1858 he became the pastor of the Central Church of Cincinnati, Ohio, then worshiping on the corner of Eighth and Walnut Streets. His earnest labors in this city both in the Sunday-school and church, his devotion to the poor and hitherto neglected members, his unfailing labors in all the details of a pastor's life in season and out of season soon brought him prominently to the front as one of the best pastors among all the ministry of the Christian Church (Disciples). After having in two years brought up all the working forces of the church into good order, and from an audience of about seventy-five regular attendants filled the house with a large and interested audience, he removed in 1860 to Mount Sterling, Kentucky, which has been his home and the headquarters of his ministerial activities ever since.

In 1863, Eld. Munnell was chosen by the Christian Missionary Convention of Kentucky their first State Evangelist, to organize and manage the general interests of said church in that state, and in this capacity served his people for twelve years in all. His well-known executive ability and his general knowledge of affairs and of "the business side of things" fitted him peculiarly for this position as attested by the scores of Sunday-schools and churches established, the thousands of converts won to Christ, and the tens of thousands of money raised and sacredly appropriated by his own personal labors and by the instrumentalities he set on foot.

Having gained no little reputation as a general manager and organizer in mustering the church forces for evangelistic labor in his own state, he was chosen corresponding secretary of the general convention for home missions in the states and territories, a position he filled for nine consecutive years; and such had been his energy and efficiency that at the end of the first year's labor a convention of more than 600 delegates assembled in Louisville, Kentucky, and organized a general plan of co-operation to unite all the churches of the States in one grand movement for the cause of Christ—a thing that no man had ever attempted before. This organization, although in the merest incipiency, yet at the close of the nine years it was found that 275 churches had been organized, 43,123 additions made in members, and $480,000 raised and appropriated in various ways in the interests of the Church. To be indorsed as Eld. Munnell was by an annual election in twenty-one states and general conventions, by delegates from all parts, ought to satisfy the ambition of any man, especially when said elections placed him in one of the most difficult and responsible positions ever held by any minister in the Church.

The work to which Prof. Munnell was committed so ardently for so many years naturally caused him to study anew and more carefully than ever before the mutual relation of ministers to the churches, and especially the qualifications and duties of Evangelists to the weaker churches. This embraced not so much the doctrine but the business view of an Evangelist's duties as to "setting in order the things that are wanting," and the proper ministerial care of feeble congregations, till they should be properly supplied by a competent local ministry. To communicate the results of this experience to others he published two tracts —one on "Evangelists and their work in the churches," and the other on "Setting churches in order: How to do it"—tracts that have gone through a number of editions, and are still utilized by many ministers in their personal labors, besides giving direction to Evangelistic work in many of the state organizations.

At the close of 1884, Eld. Munnell surrendered the work he had prosecuted with so much vigor for twenty-one years into other hands, in order to have more time for quiet study and home preaching, and for the preparation of several works for the press, that seem to be needed by the church; chiefly, a work on "Evangelistic and Pastoral Theology," which has been specially requested by two State Conventions before which he had lectured on these subjects.

The subject of this sketch is sixty-three years old, in full health, well preserved,

ruddy and cheerful, five feet nine and a half inches in height, with a tough, active constitution, and a brain that can execute an immense amount of deep thinking without weariness or pain. As a preacher he is chiefly didactic, not boisterous, but earnest and convincing, fond of illustrations of divine truth from history, science and philosophy. While his chief work has been that of a field marshal among the hosts, he has by his own personal labors as pastor and Evangelist added several thousands to the church.

Though a ready speaker, by general consent his ability to think and write far excels his powers of extemporaneous speaking. For many years reports of his writings enriched nearly all the leading periodicals of his church-weeklies; monthlies and quarterlies. He has always been considered by the editors of Lard's *Quarterly*, the *Christian Quarterly*, and the *Christian Quarterly Review* as one of their strongest contributors, always uniting strength, clearness, and a kind of sprightliness in treating the profoundest themes that always secured an early reading of anything that came from his pen. His articles on "Indifference to Things Indifferent;" "Woman's Work in the Church;" "Christianity on the Planet Mars;" "The Law of Divorce;" "The New Heavens and the New Earth Scientifically Considered;" "The Atonement," etc., may be taken as samples of his remarkable clearness, strength, and profundity of thought.

In the year 1869 the "Problem of Human Life, Here and Hereafter," accidentally fell into his hands, and out of a deep and abiding respect for its author, growing out of a personal acquaintance more than thirty-five years before, he decided at once to examine it very carefully, and like hundreds of others found it met a want in his own mind that seemed wholly unprovided for by any previous work. His whole soul was at once filled with the revolutionary teachings of the Substantial Philosophy, of which he has given abundant proof in the numerous, clear-sighted, and profound contributions to THE MICROCOSM and THE SCIENTIFIC ARENA, such as "Analysis and Synthesis;" "The two Hemispheres," and many others. The editor of THE MICROCOSM, in noticing one of Prof. Munnell's contributions to that paper, pronounced him "one of the best thinkers of the century on religio-philosophic subjects." As a standard-bearer of the new philosophy, he has the most implicit confidence in its principles as both harmonious and coincident with that religion which he has been preaching to the world for more than forty years. And if we are not mistaken in our hopes of Eld. Munnell, in future THE ARENA readers will see in its volumes yet to come many scientific and philosophical scintillations from the same pen which has been such a fearless exponent of Substantialism when it was in its very incipiency. For the past thirty-two years we have not had the pleasure of personally meeting Eld. Munnell, though having been in constant and intimate correspondence with him for the past six or seven years. If by any concurrence of human events our paths should converge to the same point either here or in the Far West, where he is now laboring, there is no man on this green earth whose hand we could grasp with more heartfelt pleasure and gratitude than that of Eld. Thomas Munnell.

METROPOLITAN IMPRESSIONS.

BY J. I. SWANDER, D. D.

ACCOMPANIED by his companion in tribulation and hope, the writer of this communication recently visited New York City. Thirty stormy years had rolled away since he had seen his country's great metropolis. Through the kindness of Providence and the reliable arrangements of the New York Central R.R., we arrived at our objective point on schedule time. Having provided convenient and comfortable quarters for ourselves during our week of sojourn in the city, we hastened down Broadway full of anxiety to see the editors and publishers of THE SCIENTIFIC ARENA. Four years had passed since our first introduction to the Substantial Philosophy through THE MICROCOSM and the "Problem of Human Life." During that time we had applied ourself with persevering effort to master Substantialism, and appropriate to our edification and comfort all that is fundamentally involved in that beautiful system of philosophy. We had had considerable business correspondence with Hudson & Co., which increased our desire to see the several individuals of the concern and to look the firm in the face. That desire was gratified; and we are proud to say to the many readers of THE ARENA that their subscriptions, as well as the grand cause represented by our sprightly magazine, are in safe Christian hands. They sincerely regret the suspension of THE MICROCOSM, though they were in no way responsible for either the enterprise or its failure. There is no reason to fear a recurrence of such failure in the case of THE ARENA. It was started upon a proper basis. Its popular form responded to a popular demand. Money advanced to put it before the public is all refunded. The circulation is increasing daily. Out of love for the principles which it advocates new friends are coming to its support. In short, the cause with which it is identified is sinking its roots into some of the best intellectual soil of our country, and spreading its branches throughout the civilized world.

It was our privilege on the Lord's Day of our sojourn in the city to accompany Dr. Hall and our young friend, Robert Rodgers, to the church in Brooklyn of which Rev. Mr. Hudson is the pastor. What a blessed thing it is for Christians to leave the ragged edge of denominational narrowness, and leap over all denominational bounds into the hallowed and healthful embrace of a wider Catholicity where kindred spirits may blend around one common mercy seat. The writer believes that his own denomination is second to none in its heavenly origin, apostolic succession, legitimate history, sound doctrine, and pure martyr-blood; and yet he is not willing to believe that his own church is the absolute custodian of all orthodoxy, and the garden of all the flowers that bloom in the sunshine of the Redeemer's gracious smiles. The age in which we live and the millennial threshold at which the church is now probably standing is not favorable to the development of such exclusive bigotry. The service in Pastor Hudson's church was not the vaporing of sanctimonious narrowness. It was good to be there. Peter prayed for three tabernacles, but we were satisfied with one. It was the writer's privilege to preach the sermon and to join in the other parts of the service. The antiphonal reading of Scripture was just what it should have been. The proper use of a proper liturgy is gradually getting into all our Sunday-schools and churches. American worshipers are no longer to be scared by the cry of "ritualism in the garret," since God calls upon *all* the people to praise him with harp and heart and tongue. By all means give Protestant worshipers something to do. The inner spirit must take outer form. The music, led by the pastor's wife, was well adapted to the purpose for which it was rendered—high in its order, without being cold and stiff with mechanical stiltiness.

The main purpose of our trip to New York was to hold consultation with Dr. Hall upon a few scientific points discussed in our book, already then in the hands of the printers, and now before the public. We had undertaken to give a fair and faithful representation of the fundamental teachings of Substantialism, and felt that it was but proper and right that we should hold a personal interview with the apostle of our scientific faith before giving our formulation of the Substantial Philosophy to the world. Besides, we were exceedingly anxious to see and size up the man who now stands at the head of the greatest scientific revolution of the nineteenth century. About 400 letters had passed between us, and yet neither of us was satisfied with such an epistolary acquaintance. There was a mutual desire to see each other's face in the flesh, congratulate each other upon the progress of the cause, and make further arrangements for the toil, tribulation, and inevitable glory of the future. The meeting filled the writer with an emotion of joy which can neither be expressed by his stammering tongue nor recorded by his spluttering pen. The gratification was surpassed only by the agreeable surprise with which it was accompanied. Dr. Hall did not seem to us to be as near the kingdom of glory as he at times had intimated in his correspondence, and as his disciples had reluctantly believed. True, there is no telling what a day may bring forth when one is swinging around life's circle on the home-stretch of three score years and ten; yet by reason of reserved strength and well conserved manhood it is not unreasonable to hope for a continuance equal to that which was granted to Hezekiah. It will be a dark day for the cause of Substantialism when its founder is called to pass the pearly portals, for there is no man now living who can wear his mantle and keep the wrinkles out. To the writer, however, it does not appear that that day is yet at hand. Dr. Hall in all appearance is remarkably well preserved. He is as plump as a partridge, as straight as an arrow, and moves with an elastic step. He seems young for his age. This is doubtless largely attributable to his mode of living. It was noticeable that he eats no highly stimulating food, and tarries neither long nor short at the wine. The man who has extorted startling secrets from Nature's heart is strictly true to Nature's laws. Substantialists may well indulge an emotion of proper pride that the apostle of their profession is a worthy leader even in the matter of practical diatetics. The writer really wondered how 225 lbs. of personified Substantialism could subsist on his favorite dish of milk-toast and apple-dumpling. And yet such seems to be his style of living, even while he is engaged in solving the puzzling paradox of hydrostatic pressure, or, for that matter, any other problem which, with the key of Substantialism, he is able to unlock. Let the readers of THE ARENA and the friends of the cause take new courage from the favorable outlook which is now beckoning them on to victory.

During our stay in the great commercial center of our country we visited many places of interest. Although our time was chiefly occupied in reading and correcting the proof-sheets of our book, and in making arrangements for its presentation to the public, we still found time to take a general view of the city. Our ramblings reached from Central Park to the Battery; from Bedloe's Island, with its Bartholdi monument, to where the remains of our first soldier now rest at Riverside. Crossing over the East River on Brooklyn Bridge, we were filled with wondering admiration for the triumph of human ingenuity and skill. If this is the work of puny man, why should man doubt the ability of Jehovah to span the opposite banks of death's deep Jordan? A visit to the Stock Exchange on Wall Street gave us a low estimate of human nature, as it lay prostrate with its heels upward before the seductive god of Mammon. We also attained to an advanced idea of "bulls" and "bears"—howling and growling like a cage of wild beasts over the flesh and bones of fleeced "lambs." "How like a mountain devil in the heart rules an unreined ambition!" In this place it seems to "put on the very pomp of Lucifer." Stand-

ing at the base of the Egyptian obelisk in northern Central Park, we felt, like Napoleon Bonaparte at the foot of the Pyramids, that forty centuries were looking down upon us. A stroll through the United States Sub-Treasury afforded us an opportunity to see something of the commercial media and financial machinery by which the fiscal features of our government are made to wear a golden grin. Passing through the Custom House our national pride lowered its mercury several degrees in contemplation of the fact that we, the greatest nation among the peoples of the earth, are standing like an overgrown baby crying across the Atlantic Ocean for other powers to protect us from ourselves. And oh, the seething, surging, busy, bustling masses on the streets! One is almost led to believe that New York is in some sort of communication with every cardinal point of the universe—except heaven! And yet heaven is not so very far away from the good in that great city. There is much regenerated humanity on Manhattan Island, and in its populous suburbs. Thousands of consecrated Christian men and women are constantly at prayer and at work in their unselfish efforts to raise the fallen and to roll back the terrible tide of iniquity which threatens to ingulf the pleasure-seeking and money-making masses. As a rule these Christian philanthropists are not the most conspicuous characters in society. As the deepest problems of science are now being solved in comparative retirement from the scholastic world, so the greater work is now being done for God and humanity by men and women whose names are found at the bottom of this world's great page. To be popular is to be on a social level; to be noble is to be out of the reach of the fool's trumpet of adulation. "The bird that soars on highest wing builds on the ground her lowly nest." So with the truly good. And yet some good and noble men and women have high positions in the public confidence. These are they who observe the code of the Nazarene, and dare to do right without cringing cowardly before the tide of popular sentiment. It was our privilege to meet a number of such, and to make their agreeable acquaintance. Among these were Dr. Ward of the *Independent*, Drs. Abbot and Maybee of the *Christian Union*, Mr. T. J. Shanks of the New York *Witness*, Dr. Deems, President of the American Institute of Christian Philosophy, etc. It was at the monthly meeting of the Congregational Club, consisting of Congregational ministers and intelligent laymen from New York, Brooklyn, Connecticut, and New Jersey. This is a Christian society of progressive Puritans. Some of them show that they have been dipped with the so-called new theology of Andover. It will not hurt them. Through the courtesy of Mr. Hudson and wife, Mrs. S—— and the writer were invited to be in attendance at the regular monthly meeting of this club. We liked it all but the name. For some reason we never did like to be clubbed. Two hundred guests sat down to a sumptuous feast. We soon observed that these Puritan brethren have a relish for something more than clambakes and Boston beans. Dinner was served at six o'clock in the evening. What an hour for ordinary mortals from the country to dine! For us there seemed to be no time for supper without having it served next morning after breakfast. After dinner the party returned to the capacious and elegantly furnished hall to engage in religious service, and to discuss the subject assigned for that part of the evening's entertainment: "The Relation of Religion to Literature." The first address was made by Rev. E. Eggleston, author of the "Hoosier Schoolmaster." It showed wit, as well as a thorough knowledge of the subject discussed. He was followed by Dr. Ward, who had just returned from Babylon, and whom Mr. E. introduced as the great Babylonian Mugwump. Dr. Ward is a man of versatile scholarship. The discussions combined edification and entertainment for all. The parting was with many regrets, and yet not without the comfort of the blessed hope that Christian acquaintances on earth shall be renewed in heaven. With this well-grounded assurance we completed our sojourn in the city, and returned to our home upon the bank of the Sandusky River. We believe in the veritable communion of all saints in earth and heaven. Farewell, New York! Welcome, New Jerusalem!

FREMONT, O.

THE PLATONIC PHILOSOPHY AND CHRISTIANITY. No. 1.

BY J. W. LOWBER, M. A., P.H. D.

PHILOSOPHY is the highest and truest science, for it specially pertains to causes, effects, and principles; it has for its object the investigation of those fundamental principles upon which all knowledge and all being ultimately rest. Various definitions have been given of this science of first principles by the philosophers of the past. According to Ueberweg, one of the most full and complete writers on the history of philosophy, philosophy is the science of first principles; it is included under the generic name of science, but differs from the remaining sciences, in that it is not occupied with a limited province of things, but with the nature and laws of whatever actually exists. Lord Bacon confines philosophy to that part of human learning which specially pertains to the reason. Sir William Hamilton substantially accepts the Aristotelian view of philosophy, that it is equivalent to a knowledge of things in their origin and causes. The word philosophy, which means a love of wisdom, is first found in the writings of Herodotus. It is attributed to Pythagoras, who selected it as a more modest title than sophist, or wise man. The word was appropriated and first popularized by Socrates. He preferred it as more modest than the arrogant designation of the sophists. The name was originally assumed in modesty, but did not retain its Socratic meaning; it returned to the pretentious pride of the sophists.

Strictly speaking, philosophy took its origin among the Greeks. It is true that the Orientals philosophized, but their philosophy is always blended with their mythology. There are also mythic cosmogonies of the Greeks, belonging to the Homeric age, that we do not include in philosophy. They belong to Greek mythology; the writings of Homer may be called the Bible of the Greeks. Although the Orientals had a high culture, philosophy could not have originated with them; because they held this culture too much in a passive state. We cannot look to Northern Europe for philosophy. Although the Northmen were eminent for courage and strength, they were devoid of culture. But the Hellenes combined a wonderful culture with an extraordinary courage. There was no lack of activity on the part of the heroic Greeks.

The great philosophic center among the Greeks was the city of Athens. It was really the university of Greece. The greatest of all the monuments of Athens which has survived the wastes of time is her philosophy. The Parthenon of Minerva, and all the beautiful gems of Grecian architecture, are now in ruins. The works of the Phidias, which adorned the temples of the gods and godesses, and crowned the platform of the Acropolis, are now no more, except a few fragments which have been taken to other countries, and remain as relics of the departed greatness of the once proud city. While the fingers of time have crumbled the Pentelic marble, and the glorious works of art have been broken by Vandal hands, the philosophic thought of Athens, which culminated in the dialectic of Plato, still remains. The criticism of more than two thousand years has not improved much upon the method of Plato. As a great writer very truly says, "Platonism is immortal, because its principles are immortal in the human intellect and heart." Greek philosophy has received various classifications. In view of the prevailing spirit and tendency of the different schools, Cousin, the great eclectic philosopher of France, has classified them as the Sensational, the Idealistic, the Skeptical, and Mythical. Preceding the Platonic philosophy, we have the Ionian and Italian schools, the Sophistic philosophy, and the Socratic. There is a tendency in the human mind to extremes; it is only the greatest and best balanced minds that can avoid them. The Ionian and Italian schools both represent extreme tendencies in thought, and they were the opposites of each other. They prepared the way for the Skepticism of the Sophists. The world, then, needed the great Socrates.

Socrates agreed with the Sophists in making man the special object of study; but he differed from them in directing his attention to knowledge and virtue, instead of directing it to perception, opinion, and egotistical desire. Socrates was the first to introduce induction and definition into philosophy. He did this with an amazing skill. The great martyr philosopher was no writer; he was simply a teacher, and his teachings were very intimately connected with his life. We must depend upon Plato, the greatest of his disciples, for a full and complete development of the many sides of the Socratic spirit. It is quite certain that Socrates occupied the golden means between the philosophical extremes that were a fearful cause of skepticism in Ancient Greece. His ideas of mind and spirit are in perfect harmony with the fully developed Substantial Philosophy of the nineteenth century.

A LIMIT TO THE HEIGHT OF THE ATMOSPHERE.—No. 2.

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

IT is well known that the earth, by its revolution on its axis, has on its surface at the equator an acceleration of 0·112 foot (3·3908 cm.) per second directed toward the center of the earth, and therefore in the same direction as the acceleration of a body falling *in vacuo* at the equator, which is 32·2 feet (978·1028 cm.) at sea level. The absolute acceleration of the body is therefore the sum of these two, or 32·3112 feet (981·4036 cm.) per second, hence this would represent the *true* intensity of gravity at the equator, which would be demonstrated if the earth ceased to revolve around its axis.

The weight of all bodies would be increased (981·4036 + 3·3908) in the ratio of 288 to 289.

It therefore follows that if the earth revolved $\sqrt{289}=17$ times faster than it does now, loose objects at the equator would fly off its surface.

To ascertain the height above the surface of the earth the atmosphere would have to be so that the upper layer would have a velocity 17 times greater than the velocity of the earth at the equator, is a very simple calculation, and we find that a globe having a radius of 67,384·3 miles (108,432·63 km.) would give the result required. This would give the height of the atmosphere, *in this case*, 63,420·88 miles (102.054·24 km.), the outer layer of which would have a velocity of (1,521·8476 × 17) 25,871·409 feet (7,885·6 meters) per second; but no such velocity or height is necessary, for the centrifugal force generated is 1·881 ft. (0·573 meter), which is too great for the attraction of gravitation at this outer layer, which is only 0·1114 ft. (3·395 cm.), while at the earth's equator it is 32·2 ft. (981·4036 cm.) per second; so that a

body weighing one pound (453·55 grms.) on the earth's surface at the equator would only weigh 24·2 grains (1·568 grms.) at the height of 63,420·88 miles (102,054·24 km.).

As I have had occasion to use the term "centrifugal force," and will have to use it again, and as long as there has been considerable objection raised by Tait, Daniel, and others to the expression, it may be well for me, before proceeding, to explain what I mean by such an expression.

If a stone be whiled around like a sling-stone by a string, the tangential velocity may be resolved into two components—one acting along the circle, and one away from it. The tension or stress in the string balances the centrifugal component of tangential velocity at every moment. If the string should snap, the stone flies off in a tangential direction, and not from the center, hence some physicists have been led to say that there was no such thing as "centrifugal force," as no such force is counteracted by the tension of the string.

Now, the fact is, the stone exerts a force upon the string which is necessary, or it would not deflect into a curve, but would persevere in rectilinear motion. This force exerted is, in my judgment, properly designated centrifugal force, as the derivation of the word indicates. It is not a force acting on the stone, but a force exerted by the stone on the string. It must be perfectly evident that if there had been no circular motion around a center (from which the word centrifugal is derived), there could have been no tangential effect on the stone when the string snapped: it therefore follows that scientists should not quibble on the application of this term.

Now to proceed: When $\frac{v^2}{r}$, that is to say, the centrifugal force due to the earth's rotation, is equal to g, gravity then is equal to 0 ($g = 0$). It is interesting to know, then, at what height above the earth's surface will $\frac{v^2}{r} = g$.

By the following formula, deduced by my associate, John Higgins, we arrive at the result.

Letting x = the number of times the earth's radius at the equator must be taken for the requisite height, we have:

$$\frac{32{\cdot}3112}{x^2} = \frac{v^2}{r}$$

$$\frac{v^2}{r} = \frac{\left(\frac{2\,\pi\,r}{86{,}400}\right)^2}{r} = \frac{\left(\frac{2\,\pi\,3963{\cdot}42\,x}{86{,}400}\right)^2}{3{,}963{\cdot}42\,x}$$

$$\frac{32{\cdot}3112}{x^2} = \left(\frac{\left(\frac{2\,\pi\,3{,}963{\cdot}42\,x}{86{,}400}\right)^2}{3{,}963{\cdot}42\,x}\right) \times 5{,}280$$

from which we deduce

$$x = 6{\cdot}634 \text{ nearly;}$$

then, when

$$x = 6{\cdot}634,$$

we have

G = 0·73418 feet per second.
C. F. = 0·73419 " "

Hence, if we imagine the atmosphere to extend 22,329·908 miles (35,928·82 km.) above the surface of the earth, then the velocity of the upper layer will be 10,085·06 feet (3,073·93 meters) per second.

But the centrifugal force $\frac{v^2}{r}$ at that height is 0·7841, while the attraction of gravitation is also 0·7841. Hence, at a height 6·634 times the radius of the earth from its center, $\frac{v^2}{r} = g$. Now for the application of this result: Since the centrifugal force is equal to or slightly greater than gravital attraction in the upper layer of *such an atmosphere*, it naturally follows, if matter is regarded as heterogeneous—composed of molecules and atoms—and not homogeneous, any block or layer of air above this height would be whirled off into space. Hence we have demonstrated that unless the atmosphere fills the whole of space, it could not extend above the earth to a height exceeding 26,293·328 miles (42,305·96 km.) above the center of the earth, or 22,329·908 miles (35,928·82 km.) above the surface of the earth at the equator; for if any attempt were made to so extend it, each layer or block of atmosphere added would, as just stated, be whirled off into space, thus leaving the height of this *supposed* atmosphere always less than 22,329·328 miles (35,928·82 km.) in height. The weight of a mass of matter weighing one pound (453·50 grms.) at the earth's surface would be at this height 159,065 grains (10,396 gms.).

I will now proceed to show that there is a limit to the height of the atmosphere, and thus comply with the second proposition.

Williams* claims that the elasticity of the atmosphere is unlimited: and Daniel† says: "Thus a gas, with its *tendency to indefinite expansion*, has elasticity of volume.

Now it becomes necessary, in studying the true height of the atmosphere, to investigate the question of *unlimited elasticity* and *indefinite expansion*, and this leads us to the consideration of bodies deprived of all heat, or at the absolute zero of temperature. In this condition, if the body was free from porosity, we should find the most compact condition that matter could exist in. Just how many heat units would have to be taken from a body to reduce it to absolute zero is not known as a fact; it is, however, assumed that as gas expands 1-273 of its volume for every Centigrade degree (or 1-491.4 for every F. degree) of added heat, therefore—273 deg. C. (—459 4 deg. F.) would represent the absolute zero, so that at—274 deg. C. a body would be totally deprived of heat; whether this temperature is correct or not we do not know. The *normal* condition, then, of *all* bodies is the solid deprived of heat, and this was first pointed out by Dr. A. Wilford Hall. A liquid or a gas is an abnormal condition of matter, and they owe their existence as such to the heat within them. If sufficient heat were to be taken from a gas, it would become a liquid; and if taken from a liquid, it becomes solid; and if all heat be taken from the solid, the *normal* contracted condition of matter is arrived at.

Heat, therefore, expands matter, and changes its form and properties. Before proceeding, it will be necessary for me to state that I consider matter perfectly homogeneous throughout, containing, in most cases, porosity, but being free from *supposed* molecules and atoms, and I claim that experiment and reason dictate that matter is theoretically infinitely divisible.

I also claim that the forces of nature are entities, real, objective things, although not material. We give to matter (for one reason) objective existence, because it cannot be destroyed—its quantity cannot be altered. We must be just as consistent with respect to *force*, which is likewise indestructible, and the quantity of which cannot be altered. I define *energy* as the power or ability of doing work possessed by force.

Force is the entity, not energy. Without further elaborating these points, I will proceed. Heat expands matter, but the expansion is not the result of separating portions of it from other portions, but every portion, however small, down to infinity, is expanded, just as a rubber balloon is expanded by blowing air into it, and it will remain *definitely* expanded so long as a *definite* temperature is maintained. Just, then, as a piece of iron occupies a given definite volume at a fixed temperature, so will a gas occupy a given definite volume at a fixed temperature—*other* forces not acting on it—no matter if such a statement is contrary to modern theories. I am perfectly well aware of the fact that the molecular theory *assumes* there is no cohesive force present in a gas which is allowed freely to expand, or in a gas unless subjected to considerable pressure.

In my judgment, there is not a particle of truth in such a statement. When water at 212 deg. F. (100 deg. C.) is converted into steam of 212 deg. F. (100 deg. C.) it expands 1,695 times its own volume. In each volume of steam, in my judgment, there is just 1-1695 as much cohesive force at work as there was in the water; and to prove this we have only to withdraw the heat, when the cohesive force *contracts* the steam sufficiently to convert it back into water containing as much cohesive force as it did at the start. To proceed: If a vessel be filled with oxygen containing sufficient heat to enable it to exist as a gas (for less heat would permit it to exist as a liquid or solid), and the temperature of the gas, the vessel, and the surrounding air be found to be 21·11 deg. C. (70 deg. F.) the oxygen at this temperature will exert a given fixed pressure on the sides of the containing vessel, owing to the heat present in it, which has expanded (stretched it, so to speak) to that extent; it is the expansive force due to heat that produces the pressure. To prove this, we have only to add more heat to produce greater pressure, or abstract heat to produce less pressure.

The idea that a gas possesses the property of infinite expansion without the exercise of an infinite amount of heat is contrary to all that experimental science has deduced or reason could dictate. After solid oxygen has received sufficient heat to permit it to be a gas at 21·11 deg. C. (70 deg. F.), it can expand no more than to a definite fixed volume, unless acted upon by some force which could overcome the forces of cohesion and gravity, which tend to prevent any increase in bulk. It must not be assumed that, because such a gas when liberated in the atmosphere goes on distributing itself throughout the air, such action is evidence that oxygen has no fixed volume at 21·11 deg. C. (70 deg. F.). It might just as well be said of a piece of India rubber four inches in length that such a piece has no specific form at 21·11 deg. C. (70 F.), because, if a force is applied at both ends in opposite directions, it can lengthen to twelve inches.

The fact is that the minute the oxygen under consideration, or, in fact, any gas, is liberated in the air, such gas is immediately acted upon by the attraction of adhesion, which tends to make it distribute itself as sugar is dissolved in water. But the extent of its distribution would be limited to the bulk of the air, as its volume is limited, and is kept so by the attraction of cohesion and gravity.

This brings us to the consideration of elasticity, and to disabuse our minds of the idea that elasticity is a force, and, therefore, can do something.

Elasticity, so far from being a force, is but an accidental property of a body, which within certain limits permits the same to expand after being compressed, or *vice versa*.

Bodies at absolute zero of temperature can have no elasticity. No non-porous body could be compressed at absolute zero, nor can it be compressed until it is expanded by heat; there can, therefore, be no elasticity until a body is expanded.

Elasticity is, therefore, a property matter possesses in virtue of its heat and cohesive force. Solids, liquids, and gases may be condensed in volume by the withdrawal of heat, cohesive force acting as the contracting power, or they may be reduced in volume by the expenditure of mechanical energy; in all such cases the body will become heated, owing to the *crowding of the heat into a smaller volume.*

As we might expect, the extent of elastic-

* Science in Short Chap., p. 75, Standard Lib.
† Prin. of Phys.

ity in solids is less than in liquids, and still less than in gases.

Perfection of elasticity and the *quantity or extent* of elasticity must not be confounded.

Dr. Hall gives as a definition: "The *amount* of elasticity in any given body consists in the extent to which that body can be compressed with a given force, while possessing still the innate property of restoration to its original form when released from pressure."

The *quickness of recovery* is principally dependent upon the mechanical energy stored up as force, and also upon the *quality* of the elastic property of the body in permitting the reaction among its infinitely small particles by this stored up force, and not at all upon its *quantity or amount*.

When mechanical energy is used to compress a body, such energy is either stored up in the body or is converted into some other form of energy. In a body within the limits of its elasticity, the mechanical energy applied is stored up; when this limit is passed, the mechanical energy is converted into some other form of energy in the body, probably entirely into heat.

It is evident, then, that a gas is not possessed of *unlimited elasticity*, but is possessed of a limited amount of elasticity, dependent upon the extent to which the cohesive force has been overcome by other forces. I say other forces, for besides heat the force of adhesion in mixtures may have some indirect influence. Now let us apply this information to the problem before us.

The atmosphere is acted on principally by four forces, the attraction of gravitation, of cohesion, of adhesion, and by heat. The heat in the atmosphere tends to expand the air, and the temperature becomes reduced as the heat is made to do the mechanical work of expansion, which the attractive forces of cohesion, adhesion, and gravitation tend to resist; and when the heat remaining in the air can no longer overcome the action of these attractive forces, a limit is reached to the expansion of the air, *and the true height of the atmosphere is obtained.* It must not be forgotten, however, that the atmosphere travels around with the earth, and that the centrifugal component of tangential velocity tries to overcome the tension of gravity, and when it accomplishes this, any air which by some reason had lodged at such a height would, as has been already shown, be whirled off into space.

So, then, as I have proved the height of the atmosphere to be limited—as its volume depends upon the amount of heat in it—such height must be less than 22,329·908 miles (35,928·82 km.) as I have also demonstrated.

HERBERT SPENCER.

BY REV. J. J. SMITH, D. D.

As I find there are quite a number of persons, especially among the young, who, because Mr. Spencer denies being an atheist, are ready to welcome him as a theist, and consequently to trust him where they cannot understand him, and, therefore, are unguardedly led to embrace premises that directly lead them to adopt the most dangerous conclusions, it may not, therefore, be amiss to call attention briefly to his atheistic agnosticism.

The danger of his writings arises in a great measure from his apparent candor; his frequent hoverings in the neighborhood of religious truths; his professed hesitations and balancings upon the line that separates *theism* from *atheism*; his energetic battlings, now and then with sturdy blows, against some manifest phase of sophisticated error in the writings of Kant, Sir William Hamilton, and other skeptics. These facts, coupled with his denial of being an atheist, are calculated to allay all suspicions and to lead the Christian reader to hail him as an able ally, rather than a subtle and insidious foe.

Atheists are properly divided into two classes: the *positive* and the *negative*. The former declare boldly that there is no God. The latter, in order not to repel, more artfully affirm that it is impossible to determine whether there is, or is not; and, therefore, that there can be no rational belief, or, indeed, any belief at all in such a Being. This latter view, while it seems at first sight less harmful than the other, is, after all, in its religious bearing, just as pernicious, if not more so, than the *positive*. For while the New Philosophy is more plausible in appearance, and more specious in argumentation, it inevitably leads to the same result, and to this class Herbert Spencer unquestionably belongs. For to affirm, as he does, that we can only know and take cognizance of natural phenomena, and that all beyond is unknown and unknowable, is to exclude the Supreme Being entirely from the universe as an article of belief.

Besides, where is the chapter, or page, in which he recognizes in any form, in accounting for natural, or intellectual forms, and processes of thought, the will and power of a personal, self-existent and an intelligent Being, who has created or originated all the differentiating forces of organizations, life, activities, instincts, sensations and reason? The spiritual realm, with all its superior grandeur, its heaven-born assimilations, and its angelic tendencies and glory, is sunken and merged into the material, and the Creator is utterly ignored; or, at most, is only a provisional hypothesis to explain certain outstanding facts until such times as advancing knowledge shall have displaced Him, which event, he tells us, is sure to come. To get rid of the idea of a God, he discards intuition as deceptive and unreliable, and yet he accepts propositions incapable of verification, except on intuitional principles. For the same reason, he teaches that the relation between mind and matter (body) is one of identity, instead of one of union, although their properties are essentially different and distinct. Thus he is constantly seeking to make the spiritual defer to the material: to underrate the subjective, and to overrate the objective.

Besides, he is an out-and-out evolutionist of the most atheistic type, who utterly discards the idea of an intelligent cause of anything in the universe. He affirms and teaches that evolution is the only rational theory to explain natural phenomena. What is this but rank atheism? This postulate at once necessarily saps the very foundation of the whole Christian fabric, for evolution necessarily ignores all accountability and morality except that of the low, objective form. It at once drags down all virtue, and trails it in the dust, by dragging down its agents to mire and dirt. For, if man has had no Creator, but that away back in the misty, shadowy realm of primordial times, he emerged by slow degrees from a tadpole, or some other low, primitive form, then the moral sense or faculty has also been developed in the same way. It, therefore, inevitably follows that man has been at each successive stage of his being, in all respects, just what the preceding material forces have made him. Hence his conduct, whatever it may have been, must necessarily have been the product of this law-force, and, consequently, could not have been its violation. It is, therefore, manifest on this theory that each one of the human family, being the subject of these forces that have originated, formed, developed, and controlled him, is no more accountable for his acts than he is for his being, form, size, complexion, and nature; for they are all alike the direct result of forces that he could not resist nor modify.

And thus we have a system of absolute fatalism, worse, if possible, than Grecian stoicism, as the legitimate outcome of evolution. It makes right and wrong mere conventionalisms. The idea of sin, as well as virtue, is thus excluded by being made impossible, and consequently all the remedial agencies of Christianity an absurdity.

The foundation of the whole of this theory is laid away back in the dark period of archæan ages, where fancy can roam at pleasure, without being jostled or confronted by antagonizing facts. But it is glaringly illogical and utterly without warrant, and can only be entertained by minds at war with the whole Christian system. Evolution as yet is found only in the region of hypothesis, where antagonizing facts meet it at every step. The unbridged chasms between mind and matter, life and death, and all the species, still yawn as deeply and widely as ever, while the gratuitous assumption of a series of self-evolved and self-evolving forces is beginning to be generally understood as neither proving nor explaining anything.

TOMPKINS COVE, N. Y.

CHRISTIANITY ON THE PLANET MARS.*

BY ELD. THOS. MUNNELL.

THE object of the adventure here proposed is to place the religion of Christ at such a distance that our reasonings concerning it may not be embarrassed by habitual proximity. This visual distance is fixed upon to avoid, if possible, the old ruts of thought that heretofore may have controlled our logic; and if our religion looks well so far away from home, we shall feel still more certain that our faith is not the result merely of a smothering nearness of the evidences. The planet Mars is selected, because it is one of our nearest neighbors, and in many of its physical features is well known to resemble the earth more than any other world. Possessed of land and water, an atmosphere, four seasons in its year, and circling around the same center, its habitation by intelligent beings verisimilar to our selves is by no means improbable. Its day is only thirty-nine minutes and twenty-one seconds longer than ours, and the inclination of its axis nearly the same. Its seas are greenish, and its soil ochery, reflecting the reddish hue that our red sandstone districts may possibly manifest to them. Snows cover its poles alternately in winter, and melt away in summer. Its atmosphere is lighter than its water, and so lies above it. Hence, evaporation must take place; hence, thunder-storms, rains, springs, rivulets, rivers, agriculture, fruitful seasons, droughts, high prices, and occasional famine. With a geography and meteorology so much like our own, it is not unreasonable to suppose their bodily organization similar also—with similar locomotion, with five senses, acquainted with letters, music, poetry, mathematics, and the mechanic arts. They live in houses, care for their children, have civil and military organizations, commerce, international laws, elections, congresses, lobbyists, bribery, and possibly whisky. They are born, grow up, marry, amass fortunes, lose them, grow old, die, and submit to tombstones, as we do.

With all these facts favoring our purpose, the assumption of intellectual and moral similarities will not be thought extravagant. They probably have desires, sensibility, and will; consciences, sense of right and wrong, and belief in a supreme being. What, then, of their form of religion? How would Christianity suit them?

Before considering this subject, the plausibility of several other questions must be determined. Whether they were *created outright*, as is believed of our Adam and Eve, or sprung originally from the larvæ of the low-

* This article was written thirteen years ago, and has never been printed except anonymously.

est animal organizations—crawling through the mud of vast geological periods, with bony fins, stolid snout, and serpent tail—ought first to be settled with a reasonable degree of certainty.

If the ambitious little creatures hung on to the rights of their primogeniture all the way through, from their lizardhood up to their monkeyhood; and then, by a bold *coup de main*, made the last milestone in the course, and demanded a conscience, intelligence, and a religious nature—they deserve our profoundest respect. Or, as Mr. Huxley would seem to have it, in his "Physical Basis of Life," if the protoplasms that constitute the snail or snake, by a little adjustment or polarization, may constitute for man very respectable "moral feelings" and a good enough conscience, it is possible that the inhabitants of Mars have had no higher origin. And yet there steals over us an uncontrollable feeling of greater respect, both for Creator and creature, when we think of an immediate act of Divine power in the erection of this noblest of all the tenantry of any physical world. But if we consult the dicta of physical science, no proposition is more fully demonstrated than that *dead matter* never produces *life of any kind*—not even the larvæ; and the problem as to the origin of the lowest forms of life and that of the highest, is just the same. If dead matter, cleared of all seeds of vegetable and animal life—as shown by Frankland and others, and admitted by all evolutionists—is incapable, under the most favorable temperature, of producing the least sign of life, it follows that the presence of a fossil lizard in the primary formation commands our belief in a divine act of creation, whether the argument be made upon the earth or on Mars. The seeds of plants and the spermatozoa of animals are indispensable to the production of other plants and animals; and it would have been no less a direct act of creation to fill the world with these germs of life, separate from vegetable and animal bodies, than to create the organized bodies containing them, as they contain them now. If, therefore, a sovereign act of creative power is necessary to bring even the seeds of life into being by either of the above methods, it was no more difficult, and fully as respectable, to speak the Marsians into glorious manhood at once, as to have dragged them through the slime of ages to reach their present state. Moreover, as that world so much resembles ours in other respects, it is probable also that its fossil-beds argue as stoutly against the development theory as ours do—showing that each period produced the largest and best specimens of animals *at the first*, while the feeblest and most imperfect always appear at the close of each period. "The magnates walked before." This leaves no chance for the lower to develop by gradual growth into the higher forms of life, breaks the backbone of Darwinian speculation, and gives coutenance to the old Bible doctrine of the immediate creation of an Adam and Eve, which, placed at a distance of forty-seven million miles, loses nothing of the reasonableness it possesses upon the earth.

The origin of evil has long been an enigma to philosophers in this world owing in part to the hampering proximity of the difficulty. Seen at a distance, it may not be so perplexing. Like all other *creatures*, the inhabitants of that world are finite in all their capacities, physical, intellectual, and moral. Otherwise, they would all be infinites. They need some guidance, therefore, in the form of law, to supplement their ignorance as to what course of conduct is best for their future interests. We know the law of gravitation, and other physical laws, hold sway there as well as here; and why not moral laws? Their ignorance and carelessness have often caused them to fall from a precipice, to eat or drink intemperately, to cut their flesh with edge-tools, and to suffer the consequences. They are *liable* to sin, and therefore probably have sinned; and the origin of sin and pain, in persons pure from the hands of their Maker, is no more mysterious than the origin of a festering sore by a wound in flesh that was perfectly sound. This liability to sin does not palliate the guilt of sin, any more than liability to get drunk excuses the guilt of drunkenness. The very establishment of a moral character requires that we be liable to sin; and hence the saying that "all have sinned, and come short of the glory of God" loses nothing of its reasonableness by being transferred to another world.

The question of sin is of but small consequence until that of their probable *immortality* is considered. Physically contemplated, we might say of them, "Lord, what is man, that thou art mindful of him?" Looked for from this distance, he may be a million times smaller than the least of our animalcula. But no creature, world, or even system of worlds, is great when compared to all things, and especially when compared to space. Millions of the mightiest spheres, and even universes, are beyond the reach of our strongest magnifiers, so that even they to us are of animalcular dimensions. As a thousand years is no more an appreciable part of eternity than a day, so the bulk of the largest world falls about as far short of being significant in space as an inhabitant of Mars; so that, on that ground, no proper estimates can be made of man's real consequence among created things.

The fact that, with only three or four pounds of brain to work with, man can accomplish such intellectual wonders, is no feeble intimation of his more than corporeal nature. To do a very large business with a very small capital, throwing out the sides of his triangles to sun, moon, and stars, fixing their distances, calculating their eclipses and their periods to the moment, weighing their avoirdupois, determining their densities and deciding with unerring precision the very material of which they are composed, with so small a base of operations as a human brain, indicates that something immortal handles the feeble instrument of all these achievements.

To consider his powers of wonderful abstraction, generalization, mathematics, æsthetics, moral discriminations, and conscience, and to find all these energies issuing from a source, physically considered, so diminutive, more than answers the objection to his immortality and consequence in the universe drawn from his animalcular proportions. The feeding of five thousand from five loaves and two small fishes, as a development of great results from small resources, illustrates the same immortal powers by the physical disparity between the apparent cause and the manifest effects.

The most plausible argument ever offered by materialists against our natural immortality, is based in the fact that some of the mental endowments of man are found also in the brute creation—memory, fear, resentment, affection, and a degree of understanding. It is admitted that man passes on in his development to much higher qualities of mind; but the fact that the two overlap each other on one side of human nature is supposed to show, that if death can drag down some, it can and will destroy all, mental endowments. This would be true if it were first proved that the two natures belong to the same class of things. A small tree and a large one are one in nature; the drought, the ax, or the fire that will destroy the one, will destroy the other; and the fact that the one has begun to bear fruit and the other has not been so far developed, will be nothing in the way of a like destruction from the same cause. But heat and wood belong to very different classes of things, and that which destroys the form of the one only evolves the powers of the other. The atmosphere is the medium through which sunlight operates in this world; but the utter destruction of the atmosphere would not disturb the existence of light. There are worlds that have no atmosphere; but that has never disturbed the sun; nor would it, if the Creator should instantly retire every atmosphere in the universe into nonentity. So may the immortal part of man use a human body, and even some of the animal endowments, as accompaniments of its own powers, without losing anything essential to itself when death dissolves the temporary connection.

But if the mere overlapping of similar capacities is to prove identity of Nature, then may we not prove that vegetables and animals are one and the same? The plant has organization, circulation, respiration, and even incipient sensibility. Some plants have organizations even superior to some animals, and the same logic would prove both to belong to the same class of things. Notwithstanding a plant is *not* an animal, the very fact that the sponge is a connecting link between these two kingdoms of nature shows that there is a division-line that must be passed in going out of one territory into the other; and while God has left no gaping chasms in creation, he has left no doubt as to the different ranks in creation. It is true these lines of separation are not very distinct. Neither is it easy to tell just where night ceases and daylight begins, nor to mark the exact time when the irresponsibility of child hood ceases and responsibility begins; but that the one differs broadly from the other, that night differs from day, that animals differ from plants, and man from the brute, must be admitted by every fair thinker, who is not spoiled by "vain deceit" and by "philosophy, falsely so called."

The true differential between men and animals is not found in the body, nor in the understanding which Coleridge claims for animals; but in the conscience, the moral sense of right and wrong, of which there is no evidence that brutes possess the least.

Whatever force may be in the above reasonings, applies to the inhabitants of Mars as well as to us, provided they, as we assume, have plants, animals, day, night, responsibility, and irresponsibility, like ourselves, and leaves us to predicate immortality of them without involving the least absurdity. And, indeed, without assuming any greater intellectual capacity for them than we possess, we may believe them to have accomplished much more in astronomical observations than we shall ever be able to achieve. It was a magnificent movement to discover the relations of the angles and sides of a triangle to each other, and thereby found the science of trignometry, even when its use was confined to the measurement of distances on the earth; but when man conceived the idea of making first the semi-diameter of the earth his base-line to measure untrodden space to distant worlds, and then, by a diviner endeavor still, seized the diameter of the earth's orbit as his base-line, he exhausted forever this element of his calculation of celestial distances. This diameter of 190.000,000 miles multiplied by 160,000 gives 15,200,000,000,000, which is the utmost distance to which we can ever throw our measuring lines into space—a parallax beyond that being impossible while our orbit remains the same. But our neighbor geometers, no more content with the semi-diameter of their little world (4100 miles) than we were, have probably, ere this, seized the diameter of their orbit (284,000,000 miles) and multiplying this by the above factor, have been able to throw out the side lines of their triangle to the amazing distance of 7,520,000,000,000 *beyond the last star whose distance we can ever measure*; and whether we admit the immortality of the Marsians or not, such capacity would be no disgrace to an immortal spiritual being. And even if the approximation of animal understanding

to that of man should discount the belief of any one in human immortality, he must admit that the addition of an immortal spiritual nature to such exalted mental capacity, would be no more remarkable than the union of a Newtonian intellect with a material body. The disparity can be no greater between immortal spirit and mortal mind than between such mind and inanimate matter. Besides this, as has often been said, God furnishes satisfactory responses to all other natural desires of his creatures; such as hunger, thirst, desire to possess, to know, and to be great; and it would be unreasonable that he should satisfy the desires of that people as to eternal life, reunion with friends after death, and illimitable enjoyment in heaven. To say the least, our hopes of immortality do not become absurd when looked at on another world, and relieved of the influences that may have controlled our logic here.

Allowing that their immortality is neither unthinkable nor unreasonable, would the assumption that God has in some way written or spoken his will to them appear so? The assertion in our Book that no man knows the things of any given man except his own spirit, and that to know God's will you must have the spirit of God, as the apostles and prophets had, would not be absurd if predicated of a distant world. It would be absurd to argue that he who created a mind like Paul's, with such wonderful capacity and intelligence, could not manage to inform it of its own nature, duties, and destiny; and assuming that he purposed to speak to them at all, the inspiration of such men would be a more successful method than to amaze and bewilder them with the uncovered brightness of a messenger direct from heaven.

[CONCLUDED NEXT MONTH.]

THE USE OF WORDS.

BY J. I. SWANDER, D.D.

In expressing our ideas, whether orally or otherwise, it is best to avoid, as far as possible, the use of all ambiguous terms.

Doubtful and indefinite phraseology is undesirable. It is the highest function of language to express thoughts and to serve as a media of communication between thinkers. Language must therefore accommodate itself to thought; and to the proper idiosyncrasy of each individual speaker or writer. Such constitutional peculiarities dare not be indulged beyond certain limits. Some regard must always be had to the etymology of words, their common usage among mankind, and the age of the world in which they are employed. This implies that language has a history. Such history involves growth and change. Truth cannot change; neither can an absolutely full and correct apprehension of a fully matured idea undergo any modification; yet the outward form of the idea may be modified with the advance of the ages, or give way entirely to make room for something better. As the tree by its growth throws off its bark and leaves, and takes on new forms to express its inner life, so does the world modify its language in proportion as it reaches forward toward the attainable goal of its perfection. Such progress is the law and order of development in all finite life. Human language will change in the exact proportion that the human race becomes purified by Christianity, advanced by a knowledge of true science, and polished by literature and the fine arts in general. Great revolutions in the world's prevailing sentiment produce changes less gradual in their nature. The entrance of the absolute religion the revival of letters, the reformation in the church, and the great scientific discoveries in all ages of the Christian Era, have produced corresponding changes in the lexicology of the civilized world. These changes, however, are always wrought out according to a law of growth. New ideas born of revolution, like infants, require time to get out of the cradle and recognize themselves: and it is only by way of gradual process that they come to clothe themselves upon with appropriate words.

The foregoing remarks may be applied to the great scientific revolution now known as the Substantial Philosophy. That new terms will be called into use is to be expected according to the general law of history. Such outcropping is inevitable. Substantialists know it, and the world may look for it. Terms formerly employed in expressing ideas and concepts of entities will come to have a new shade of meaning. Such words as *substance, force, energy, power, element, static, tangibility,* and others are already being used with a shade and breadth of meaning which they never could have had outside of the new system of philosophy, in whose cause they are called to render peculiar service. In view of this fact, it is one of the first duties of Substantialism to define, as clearly as possible in this early stage of its development, the terms whose shades of meaning are destined to undergo more or less modification. This work is probably as important as the formulation of the truths and application of the principles of the Substantial Philosophy. Pending such proper definition of terms to be employed in expressing new ideas and new apprehensions of the truth, it would be well for all Substantialists to be a little patient. The cause will triumph gloriously, but its early success depends somewhat upon its friends keeping the unity of the spirit in the bonds of peace. We are not disposed to doubt the wisdom of Providence, and yet we wonder whether the prosperity of the Apostolic Church would not have been greater had Paul been able to avoid the occasion of disputing with Peter concerning some points which the new religion involved.

So, too, in the Reformation. We are not willing to believe that the great sacramentarian dispute between Luther and Zwingle advanced the cause whose prosperity weighed so heavily upon the heart of its great high priest when he prayed so fervently for the unity of his church. So, with the divided state of Protestantism to-day. Who will say that it is the most normal condition of evangelical Christendom? If, therefore, divisions are not beneficial in religion, they cannot be regarded as having a salutary effect upon the early age and most formative period in this new school of philosophy which, in the judgment of its intelligent friends, stands next to Christianity itself in the category of God's means and methods for emancipating the human race from the thraldom of sin and error.

During our recent visit to New York nothing gave us greater pleasure than to learn that the friends of the cause were generally in agreement respecting its fundamental principles, and the conditions essential to its success. There seems to be no unhallowed ambition for prominence or place. Substantialists differ upon some points involved in their philosophy, as well as upon the question of correctness and propriety in the use of certain terms; and yet they agree as to the wisdom of an effort to move convergingly toward an objective point of more general agreement. Here, as among true Christians, it is agreed to be governed by the excellent motto: "In essential things unity; in nonessentials liberty; in all things charity." There is a difference between some as to certain principles supposed to be involved, as well as to the most proper terms to be employed in speaking of certain entities and phenomena; and yet there is neither special pleading nor obstinacy of purpose manifest in any of their earnest councils. Honest differences are among the signs of promise. They are the manifestations of scientific life and earnest inquiry after the truth. Good Lord deliver us from scholastic sloth and sepulchral silence!

The terms whose definitions were most thoroughly discussed during our recent presence at 23 Park Row were *force, form of force, static* force, and *force element.* In this discussion Drs. Hall and Mott took the lead. The friendly debate included considerable philosophic subsoiling; and as the plowshare went deep into the merits of the questions under consideration the soil of fresh truth was brought abundantly to the surface. The writer in the preparation of his book anticipated some such variety of views, and the readers of "The Substantial Philosophy" will observe that some terms, *e. g.* "Forms of force," and "force element," are used somewhat interchangeably. We also used the term "static," as applied to elasticity, heat, and other forms of force in nature. The question is well worthy of consideration as to whether there is such a thing as static force. Materialism teaches that the molecules of matter are in constant motion. While Substantialism denies the truth of such teaching, it may well ask whether force is ever static or at rest. And yet we must use language with which our readers are familiar, and which may serve the purpose of communicating to them an approximate idea of the truth. The Scriptures were infallibly inspired, and yet they speak of the "rising of the sun," and the "going down of the same," when, in fact, there is no such thing in strictly scientific parlance. So do we who live under the Copernican system of the universe still speak of "sunrise" and "sunset." Such phraseology is not scientifically true, but is it absolutely improper? We think not. Even though there be no such thing as *static* force, the continuation of the use of the term seems called for under the new *regime* which the Substantial Philosophy is now inaugurating. We must use language most serviceable to those whom we address. If the term *static* better than any other conveys our idea of force unliberated or undeveloped, even though such force in its undeveloped state be not absolutely at rest scientifically speaking, the word may yet be thus properly employed until something more fully sufficient is substituted and admitted into general acceptance and use. In the meantime the writer will be content to believe that unliberated force is relatively static.

FREMONT, O.

EMISSION OF ODOR, AND MUSCULAR EXERTION.

BY PROF. G. R. HAND.

PHILOSOPHERS assembling at Athens, spent their time in telling or hearing some new thing. That is, they came to the literary metropolis of the world, to report, or hear reports of new discoveries in philosophy and science. They had no telegraph or printing-press then. Now THE SCIENTIFIC ARENA furnishes those facilities without going to Athens.

I venture to throw into THE ARENA, a thought, rather in the interrogative form, which I do not remember to have seen discussed. Is there a relation between the emission of animal odor, and muscular exertion? and if so, what is that relation? Or, it might be expressed as: the relation between scent and speed.

In reading the article on "The Wonders of Odor," in the September number of THE ARENA, I was struck with the wonderful acuteness of the scent, that enables those hounds to pursue the trail of the convict with unerring certainty, through all his meanderings. A gentleman present, somewhat familiar with fox and deer-hunting, and the habits of hounds, told me that he had known the hounds, while following the

trail by the scent, to pass close by the animal itself, and never discover it as it lay concealed near by.

In this case it looks like the scent left by the animal at full speed, on the track, was sufficient to lead the hounds, while the animal, having doubled its track in some way, and quietly lying concealed within a few yards of the hounds, did not emit odor enough to catch their attention. Now, if the hounds scent the animal, why did they not discover its presence when in close proximity to them, while at the same time they could scent the trail after the deer or fox had sped miles away?

At this point the thought struck me that a state of rest might not be as favorable for the emission of animal odor, as a rapid flight, and that there might be some relation between speed and scent.

Then if rapid motion generates the fleeting scent, may it not be that the animal odor is, to some extent, generated by muscular friction somewhat analogous to the electrical machine, or the emission of sound pulses by the tuning fork, or sonorous strings. Perhaps some scientific hunters can throw some light on the subject, from their experience and observation.

JOHN W. KEELY.

(See portrait in Dec. Arena.)

FROM a personal interview had with Mr. Keely in his laboratory in Philadelphia, the associate editor of THE ARENA gathered the data for the following brief sketch of his life and labors.

Born in Philadelphia, September 3, 1837, he suffered the loss of both parents in his infancy, his mother never recovering from his birth, and his father dying before John was three years old.

From this time his home was with his grandmother and an aunt. But the latter dying before he was sixteen, and the former a year later, the young man was thus early thrown upon his own resources. His educational opportunities were limited to the city schools of Philadelphia, which he left at the age of twelve to take up the battle of life, not as "the dumb driven cattle," but "as a hero in the strife."

Mr. Keely states that from his earliest recollection he was drawn to the study of sound as related to force, and commenced his first systematic investigation when hardly ten years of age, making his first encouraging discovery at thirteen. As a child he noticed how powerfully windows often were agitated by the heavy tones of an organ, and this led him to place various objects about the room, suspending glass dishes, etc., and then watch for any effect that might be produced by the various chords he was able to secure by the combination of different tones. He soon found that certain chords invariably resulted in the forcible agitation of objects at a distance. His earliest mechanism for noting the uniform force of sound vibrations was a steel bar set full of pins of various lengths, while his first "resonator," or "intensifier," consisted of a shingle screwed to two hollow wooden tubes. The first "engine" was a simple ring of steel with 300 pins set into it, and this first wheel ran in an open box, into and through which an observer was free to look while the wheel was in motion.

For upward of sixteen years Mr. Keely pursued his investigations in the effort to work out his discovery, using the two elements *water* and *air* in connection with sound vibrations.

And during this period of progressive research, writes the inventor, every medium known to science was thoroughly investigated to find what, if any, sympathetic link of association could be brought to bear on the phenomenal conditions that controlled this true but then paradoxical medium, but all the highest concentrative efforts proved unavailing toward inducing even the lowest condition of molecular sympathetic association or assimilation.

The sympathetic atomic flows induced even by the first order of vibratory disassociation, using an atmospheric medium in conjunction with an aqueous, one of thirty-three per cent. showed a condition of tenuity infinitely greater than electricity. These conditions have been successfully proven by passing the flow through fifteen inches of solid glass with as much freedom as if the glass was not present—using a steel rod, three-sixteenths of an inch in diameter and three feet long, as a transmitter, the steel rod being pointed at one end, and having the point bearing on the center of the glass-plates, the plate being two feet square. If this is not a triumph over electrical tenuity, where will you find it?

And, again, in passing into the first etheric by certain compound chords vibratorily induced even by percussion the luminous field is revealed and an etheric light of a most beauteous character is evolved (not phosphorescent if you please), but one that passes through opaque bodies—leaving no shadow. I am reserving these experiments for my closing exhibitions which I intend associating with and showing up the conditions governing planetary suspension, and the music required to harmonize with the spheres—celestial music. I call it.

In the liberation of etheric ozone an apparatus of wonderful strength and peculiar mechanical parts had to be used, and the difficulty of conceiving such a one can only be appreciated properly by knowing that an atomic percussive resistance has to be controlled of over 110,000 pounds per square inch to effect it. At this point the second order of etheric luminosity presents itself of wonderful intensity.

The condition necessary to produce this effect is to induce an antagonistic relation between the liberators, chords of masses, and chord mass of one of the steel spheres, used for that purpose (of which there are two), the negative one as the introductory one, of 33 1-3 against 66 2-3, or 66 2-3 against 100=of the volume of 100, on any and all molecular masses.

These conditions produce the highest order of repellent antagonism at the point of union. The fact of the sympathetic chord leading the antagonistic ones on the triple introductory vibratory impulse accounts for the wonderful percussion that takes place at the point of repulsion and thus breaks up and subdivides on the compound etheric position, and it is at this point that high luminiferous ether is evolved, as also etheric ozone. The spheres that carry this rotating force contain each nearly four hundred pounds of decarbonized steel to carry a volume of the size of an ordinary billiard ball. Three years of experiment was absorbed in getting the proper transmitting leads and compressors necessary to hold under control the force during its evolution, and yet the cry has been, why don't Keely hurry up and get through?

I thank God that the season of experiment is over, and that the great finale is near at hand.

Here is Mr. Keeley's statement of the manipulation of liberators to produce the effect above described:

"First, the arrangement of the quadruple chords—on turret—first, A flat, first octave; second, B flat, second octave, 33 1-3 of a tone below the harmonic; third, B flat on the third octave, 66 2-3 of a tone above the inharmonic: and fourth, E flat on the fourth octave, 1-3 of a tone below the full harmonic. This arrangement coincides with the chord-mass of the wave-plate when free of percussion; but percussion induces in conjunction with the intensification of the 640 forks—a compound degree of atomic antagonism, which must be governed by the rotating nest of sympathizers in the head of liberators to induce sympathetic disassociation by sympathetic association. This setting only applies to the liberation of ozone. The settings of the liberator can be varied hundreds of millions of times."

The first gratifying result in the direction of a solution and its practical application was called the "Hydro-Pneumatic-Pulsating-Vacuuo-Engine." With this device Mr. Keely was able to produce a power of 500 pounds to the square inch, as shown by the best pressure gauges. Out of this first success sprang the present enterprise in 1872. Before discarding the use of water in the production of his force, twelve "generators" were constructed varying in weight from 175 pounds up to 84,000 pounds, with a "receiver" weighing 7,000 pounds additional! and by which he was able to develop the enormous power of 30,000 pounds to the square inch. For this "generator" seven or eight engines were constructed, with varying success in their operation. They all would "run," but not to the satisfaction of this indefatigable worker. At last, about four years ago, the discovery was made that air alone was better than the combined air and water before employed. This at once resulted in important changes in the mechanism. The clumsy generator of several tons weight gave place to the lighter "liberator." Of these, three have been constructed, each one more slight than its predecessor, until that at present in his laboratory weighs less than 150 pounds, while the inventor has in process of construction the fourth and last one, which "is a perfect machine of its kind," weighing less than seventy-five pounds, and with which he expects to produce a greater force than has ever before been shown.

Some idea of the wide experimental field that has been covered by this tireless man may be gained by Mr. Keely's statement that "since 1872 there have been over thirty changes in the progressive development of the *mechanical* to reach the present, and what I call the perfect, system." And as many as 124 different machines or "engines" have been constructed in experimenting with *one* "liberator." The reader will readily believe Mr. Keely's statement that these researches and experiments have "absorbed over a quarter of a million dollars, along with more than twenty-five years of the most intense study and unremitted application."

In trying to get a clear idea of the nature of his new force from the lips of the only man living capable of explaining it, the discoverer himself, one must labor at the outset with this—to me—insurmountable difficulty, Mr. Keely talks with the rapid fluency begotten of his thirty years' study, and consequent familiarity with a subject that is wholly new to his listener, while his thoughts are often clothed in words rarely joined together in framing a sentence. As an illustration. In giving a description of the nature of his force and what has been involved in the multitudinous changes necessitated in its *development—omitting all thought of the methods of its practical application*, which has ever been a problem by itself—Mr. Keely says, "The different conditions include the change of the mediums for disturbing equilibrium under different mediums for intensifying vibration as associated with them progressively from the molecular to the interetheric: first, percussion; second, undulation; third, vibratory undulations; fourth, vibratory percussion; fifth, water and air; sixth, air alone." Now let the reader imagine the above statement poured into him at the rate of 250 words per minute, with no stop for refreshments, and he will experience solid relief to be assured by Mr. Keely that he is preparing

(*Continued on page* 123.)

THE SCIENTIFIC ARENA.

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CAUSE AND EFFECT.

DR. JONES ON SENSATION ONCE MORE.

BY THE EDITOR.

THAT any intelligent investigator, capable of reasoning philosophically on scientific subjects, should conceive it possible for a mechanical or sensuous effect to occur without a substantial and objective cause for its production, is one of the marvels of this age of scientific pretention. Yet we have the proofs right before us, plain as holy writ, in numerous communications from educated, yes, *learned* correspondents, in which this very absurd reasoning is indulged, with all the nonchalance and assurance of mathematical demonstration, leaving the virtual conclusion to be drawn, that the best observed effects in nature may exist, either without cause, or else may be themselves their own causes.

Really, one is sometimes inclined to ask, if the popular scholasticism of this age tends directly, as it appears to do, to such confusion of scientific tongues, of what advantage can such respectable kind of education be to the world? It often seems to us that the more learning a man has in the curriculum sense of that term, unless he possess the native common sense to utilize it in the acquirement of true knowledge, the worse he is off, for the greater will be his facilities for leading others as well as himself astray. With even the greatest scholastic advantages, and no original common sense for their practical direction, the storehouse of nature will remain forever locked, while with a good supply of original common sense its possessor may easily invent and forge a key that will unlock its securest safe-deposit vaults, and appropriate to his own use and the benefit of others their richest treasures of knowledge, even should he never have had the honor of looking inside of a college classroom.

Our attention has been freshly called to this startling phase of modern scientific thought by a long and self-contradictory reply from Dr. W. S. Jones, of Claypool, Ky., to our remarks in the October ARENA on "Sound, Light, Heat, Odor, Flavor," etc. The Doctor seems not to have been satisfied with those concise, and, as we consider, conclusive points made against his former suggestion that "sound can exist only in our sensations," because manifestly he did not grasp the force of our reasoning. Indeed he missed its very aim and intent. He therefore claims still that *sound* can exist only in our sensations, because, forsooth, *hearing* cannot exist outside of our sensuous organism, thus jumbling *hearing*, the effect, with *sound*, the cause, making them both one and the same, and thus obliterating the natural relation existing between cause and effect in all our sensuous impressions. In other words, the Doctor cannot bring himself to realize that *sound-force*, as a physical cause, must exist outside of us before *sound-sensation* as a physical effect can exist inside of our conscious being.

Of course, it will be understood that when we speak of *sound-force* in this discussion we mean *sound itself* or sound in its primary signification; and when we speak of sonorous sensations in our consciousness, we mean *sound* in its metaphorical sense—the one being the *cause* and the other *effect*. Precisely in the same manner we speak of *heat* literally when we mean the external heat-force whose various effects are the expansion of material bodies, the consumption of combustibles, warmth in our sensations, etc. Surely nothing can be plainer than this! though Dr. Jones, as we shall presently see, has as yet formed no true conception of this two-fold signification of sound—one being its primary meaning, as the cause of all sound-phenomena, and the other its secondary meaning as its effect upon our sensuous organization.

As the Doctor's letter is too long to print, we will give its salient features *verbatim*, which will be all-sufficient to indicate their self-destructive character. Even without a single extract, however, one has only to look at the naked fact as claimed by Dr. Jones, that sound exists *alone* as a sensuous effect in our consciousness, thus being a physical effect without a cause to produce it, to realize the necessarily unphilosophical character of all that could possibly be said in favor of such an assumption. If hearing, for example, is a sensuous effect, there must, in the nature of things, be a substantial and adequate cause external to our conscious being, or by the elementary principles of logic no such effect as hearing could result, on the well-known law that "no effect can exist without a cause." If sound, metaphorically, exists in our sensations at all, it must, of course, exist as *hearing*, or as the *effect* of physical sound outside of our sensuous organisms. This we purpose to show so clearly in this paper that even Dr. Jones will see it, unless he intends to resist the inroads of Substantialism upon his consciousness at all hazards; and this necessary dependence of every sensuous effect upon some cause external to our conscious being we intend to demonstrate from the words of Dr. Jones himself, how much soever it may conflict with other parts of his letter.

After asserting, in various forms of expression, exactly what he stated in his October letter, that "Sound can only exist in our sensations," and that outside of us it has no existence at all as a physical force, he adds:

"And so also of *light, heat odor*, and *flavor*. They all exist, as it seems to me, *only in our sensations*, and are felt, so to speak, in our consciousness. Hence *hearing, seeing, tasting* and *smelling* are only recognitions or perceptions of the sensations of sound, light, heat, odor, and flavor."

Now, the want of ordinary logical discrimination here shown is sorrowfully manifest. No one questions that hearing, seeing, smelling," etc., are entirely and solely mental acts of conscious perception and recognition, as the effects of sound, light, odor, etc., and that they exist alone in our sensations. But that is not the question at all, as the doctor might have known had he given the matter a moment's thought. Why, then, lug this undisputed principle of science into the premises as if it were any part of the controversy, unless it was for the purpose of darkening the waters of Substantialism, which are as clear as crystal upon this subject?

All sensuous impressions, of whatever character, are perceived alone through the mental powers of sentient beings, however low their grade of mentality may be, even down to Prof. Haeckel's *moneron*, which thrusts out its pseudopodia or false feet whenever it is hurt. But even the moneron, the supposed lowest of all animal organisms, would protest against the absurd logic of Dr. Jones, could it speak, and thus give its testimony that its sensations which were perceived through its low grade of mental power, are one thing as an effect, and that the cause by which such sensations were produced is quite another thing.

But even Dr. Jones, after trying to confine all these sensation-producing causes to their actual effects in our consciousness, and after trying to make them exist "only" in our mental perceptions, actually and flatly contradicts himself by admitting that they, all of them, have "*extrinsic causes*," and that these causes have external existence as some sort of forces before they can generate these sensuous impressions within us! Hear him:

"As to the real nature and *modus operandi* of these *extrinsic causes that so operate on our special senses to produce in us the sensations called sound, light, flavor, and odor*, I do not presume to know, and am somewhat in doubt as to the correctness of any of the conflicting theories!"

Well, well! Doctor, why not become a Substantialist at once? and then you can consistently "presume to know" all about it, and will have no further trouble about the correctness or incorrectness "of any of the conflicting theories." What we quote the Doctor's language for is to show that, with all his metaphysical dullness of apprehension or want of discrimination in making sound, light, heat, odor, etc., "exist only in our sensations," he is still compelled by his common sense, which occasionally comes to the rescue, to admit, just as we claim, that all these sensuous impressions have "*extrinsic causes*," namely, sound, light, heat, odor, etc., outside of our consciousness, and that these "extrinsic causes" or physical forces, have "*modus operandi*" or methods of operation by which the various senses are impressed and affected! Would it be possible, we ask the reader, for any man to blunder upon a more directly self-stultifying reply to his own oft-repeated scientific fallacy than is here shown? First to assert, in various forms of speech, that sound, light, flavor, and odor "*can exist only in our sensations*," and then to teach that these conscious sensations have an "extrinsic cause," namely, sound, light, flavor, odor, etc., by whose "*modus operandi*" our senses are addressed!

The Doctor then, as if determined to make his case as deplorably self-contradictory as possible, and indirectly to aid Substantialism to the same degree by strengthening its fundamental claims, goes on:

"The only position that I care to assume is, that these *causes*, whatever may be their nature or *mode of action*, stand in the same *relation* to the nerves of special sense that the common *sensation-producing causes* do to the nerves of common sensation; and that the *phenomena* in question can no more exist outside of our sensuous bodies than pain and pleasure can."

Thus the Doctor, after all his efforts to keep up the appearance of opposition to Substantialism, most ungraciously gives up his whole cause by an unconditional surrender. The reader can see also in this last quotation the same mixing up of the "phenomena" or conscious impressions of pain, pleasure, hearing, seeing, smelling, etc., with the "extrinsic causes" which he has in so many

ways admitted must, by their "mode of action," produce these effects. There is not a Substantialist on earth, Doctor, so badly posted that he does not believe as firmly as you do that the "phenomena" of hearing, seeing, smelling, pain, pleasure, etc., cannot "exist outside of our sensuous bodies;" and we are glad to be able to add that there is not one Substantialist of our acquaintance so weak as to be capable of jumbling promiscuously together these conscious impressions or mental phenomena with the substantial "extrinsic causes" or forces, which, by their "mode of action," produce such sensuous effects.

Surely Dr. Jones ought to be able to distinguish between the pain of a pin's prick or of the bee's sting and the substantial "extrinsic cause" which produced it. But so far from making this distinction he says emphatically, in effect, and reiterates it several times, that the *pin* or the *bee-sting* "can only exist in our sensations," because, forsooth, the *pain* which it causes can only be perceived in our mental consciousness! A Substantialist who has intelligence enough to distinguish between a nest of hornets and the pain produced by their "extrinsic" stings has already so far advanced in his scientific education as to be able to know that there is a world-wide difference between the substantial *odor*, wafted from a distant flower-garden, and the sensuous and mental impression called *smell* caused by such odorous contact with the nasal membrane. Yet Dr. Jones does really believe and tell us that these clouds of odor "can only exist in our sensations!" He has the merit of consistency in this particular, as he puts "light, heat, sound, and odor" all in the same category. But he would be still more consistent should he also include the source of those various "extrinsic causes" and proclaim to the world the important scientific discovery that a *flower garden* "can only exist in our sensations," because, forsooth, the sensation of smell, which derives its primary "extrinsic cause" from the flower garden, is a mental impression! In the same way he might just as logically insist that a tuning-fork, a beefsteak, a hot stove, and the sun itself "can only exist in our sensations," since they are all the primary sources of our mental impressions!

Truth is, a half-fledged Substantialist knows, without a moment's reflection, that since the pain of a pin-puncture requires the "mode of action" of a substantial and veritable *pin-point* to produce it, as its "extrinsic cause," as Dr. Jones concedes, it must also require substantial odor to produce the sensation of smell, substantial heat to produce the sensation of a burn, substantial light to produce the sensation of seeing, and substantial sound to produce the sensation of hearing, and that all these substantial "extrinsic causes" can produce these sensuous effects alone by their "*modus operandi*" or "mode of action."

We do not wish to make this reply so severe as totally to discourage Dr. Jones from further efforts, or to drive him from us in anger, but should such unavoidable heroic treatment of his case have this effect, and thus lose him to the cause of Substantialism, we will have to console ourself with the belief that there are hundreds of others similarly indisposed who will be effectually cured by accepting this substantial remedy. Still, we do not want a better Substantialist than Dr. Jones would make if he thoroughly understood the philosophy he is opposing, and could he be induced to apply his own unanswerable logic and his own apt illustrations to the difficulties he has imagined. Can anything be plainer, for example, than his admission that the sensations of hearing, seeing, smelling, etc., bear the same "relation" to their "extrinsic causes"—sound, light, odor, etc.—that pain bears to its "sensation producing cause"? In the name of reason, does Dr. Jones really believe that a pin-point, a bee-sting, a rattlesnake's tooth, or a red-hot poker "can only exist in our sensations," and that neither of them can exist "outside of our sensuous bodies" as substantial entities? No, positively, he believes nothing of the kind; but, on the contrary, he believes that all these "extrinsic causes" of pain must of necessity exist outside of us as substantial, objective entities, whether we feel them or not, and before they can produce the various sensuous effects of pain in our consciousness. And as he has himself established the same "relation" between pain and its "extrinsic cause," that exists between hearing and its cause, hence both classes of causes must be equally objective, substantial entities. That absolutely settles the controversy.

And the Doctor may further learn, with due reflection, that causes may be complex—that is to say, cause may exist within cause—and thus operate through a chain of connected causes for the production of one general sensuous effect. He might readily see, for example, that although the tooth of the cobra de capello produces pain, its chief pain is caused by the substantial encysted poison which the tooth helps to inject; and that while the contact of the red-hot poker might of itself produce pain, its chief painful effect would come from the substantial heat which would thereby be injected into our sensitive flesh; and that while the encysted venom is just as substantial as the tooth of the serpent which conducts it, so the heat of the red-hot iron is just as substantial as the poker itself which radiates it.

In view of all these facts, illustrations, and arguments introduced substantially by Dr. Jones himself, we cannot for the soul of us see why he should fight any longer against the Substantial Philosophy which he has thus so completely but unintentionally vindicated. Possibly by these applications of his references to pain, hearing, seeing, smelling, and other sensations, he can begin to understand why it is that the Substantialists of his acquaintance, who are readers of THE SCIENTIFIC ARENA, are such unshaken and unshakable converts to that beautiful, consistent, and harmonious system of doctrine. Hear what the Doctor says about his substantial acquaintances:

"And let me say in the outset that I have no expectation whatever that the views which I may present will be cherished in the least by any one of the converts to 'Substantialism.' I have had the pleasure of meeting a few of them, and a more positive set of fellows I never saw. To doubt the Substantial Philosophy as set forth by Dr. Wilford Hall is to close our eyes to the clearest demonstrations of truth, and to turn away from the ever present oracles of reason," etc.

We are glad to hear such a good report from Kentucky Substantialists by such a reputable and frank writer, and we venture to believe, if Dr. Jones will dispassionately review our former reply to his letter in the October ARENA in the light of the hints and important discriminations pointed out in this, that he too will join the army of his substantial neighbors, and be just as "positive" a fellow as the rest. We commend to his special consideration, however, for solving problems and meeting difficulties, the careful perusal and even study of the text-book named in these pages before he attempts to write another letter on sound or on any other of the forms of physical forces. He will there learn that no effect either physical, mechanical, metaphysical, or sensuous can be the cause of itself, but on the contrary, that every effect, in whatever department of physics or metaphysics, must always depend for its existence upon the "mode of action" of some substantial cause.

And now in conclusion, while we are upon this question of cause and effect, especially with reference to sensuous impressions in their relation to extrinsic causes, let us remark, at the suggestion of the Rev. Dr. Hamlin, sitting at our elbow, that the same law which we have been reviewing in the physical domain must also apply with equal force to the realm of vital, mental, and spiritual phenomena. It is impossible, for example, for a tree to incorporate and assimilate the inert elements around it in nature, by which to augment its size and thus to add new substance to its mass, involving as they do the most palpable mechanical effects, unless such results could be traced to an extrinsic cause in the shape of a substantial *force*. To suppose that such manifest mechanical effects could be produced without a substantial cause in the shape of an adequate force of nature, would be to fly into the face of reason. This substantial cause we appropriately term *vitality* or *life-force*.

Such a force in nature is necessarily above the purely physical force of cohesion in point of refinement in the scale of entities, since vitality has the power to coerce cohesion out of its normal physical groove into its assimilating service in the work of building up and cementing together material substance for organic structures. And thus life-force acts throughout the whole vegetable and animal kingdoms, working in co-operation and in unison with the physical force of cohesion. And at this point, how beautifully does the doctrine of the dual nature of every organism present itself. The vital force of every tree, for example, at its very start exists in perfect structural shape in its germ as the incorporeal organism of the future tree to the exact form and outline of such development, even to its twigs, buds, leaves, blossoms, and fruits, *or otherwise there would be no pattern or guide for the collection and deposition of the surrounding material elements by which such progressive organic structure could be produced and its specific character maintained*, as we have so frequently shown in the "Problem of Human Life" and in THE MICROCOSM.

In like manner *mental force*, as another real substantial entity, takes the organism when sufficiently developed and refined by creative power to raise it above the vegetable domain, and by the most palpable mechanical *modus operandi* compels the living mass, which vital force has organized into an animal form, to change its position, to move bodily hither and thither, and thus to accomplish practical mechanical results of a vastly higher order than mere vital force, or any purely physical form of force would be able to effect. This voluntary power to move living organic masses of matter, we call *mind force*. How is it possible under the reign of law for a living organism to move at will and do intelligent mechanical work, except by an *intelligent force* acting upon the physical mass as the efficient cause of its motion? It would be as absurd to suppose an animal, constituted of an organic mass, to move voluntarily hither and thither without such mental volition constituting a substantial force, as to suppose a bowlder to roll down a mountain's side without the substantial force of gravity as its extrinsic cause of motion. This substantial force, which causes and controls the movements of organic beings, we variously designate as instinct, mind, intellect, etc., as it is variously applied to beings of lower or higher degree in the scale of organic perfection; and this *mental force*, though it blends with the incorporeal vital organism in all animals, is as much above the grade of vital force, proper, in the scale of refinement and quality of work performed, as is vitality above the force of cohesion in the purely physical realm, since mind as a substantial force has the power to bring vital force under its subjection, just as vitality has the power to make cohesion subservient to its behests in the construction of organic bodies.

And lastly, *spiritual force* takes the mental power when sufficiently developed and refined, as in the human organism where it first reaches this highest of all domains of activity, and by moving the mind as the mind moves the vital body, adds to the mental the higher element of moral and rational power. These three forms of force combined, namely vital force, mental force, and spiritual force, are capable of lifting humanity above material conditions, and by the temporary schooling they give it in the corporeal form divine, thus to prepare and qualify it for a realm of perpetual activity and progressive advancement to which no organic being can possibly aspire or attain that lacks the higher form of force here named.

As the Deity is the personal embodiment of pure life, pure mind, and pure spirit, He possesses within himself these forces to infinite perfection, or otherwise He would not be Deity. And thus we have a scientific reason, added to revelation, why the organic being, who is to inherit "glory, honor and immortality" at God's right hand, must possess, even though in a finite degree, the same triune force-element and essence of which God himself, as a perfect Ego, is the infinite personification and embodiment. Thus we see also why it is that the most intelligent form of organic being below the human has no charter claim to perpetual life, lacking as it does the essential form of rational and spiritual force which alone fits the vital and mental organism for such higher plane of existence where possible progressive advancement shall bring the finite human form eternally nearer to its infinite archetype—God!

Thus, finally, we deduce by scientific ratiocination the immortality of man as essentially an incorporeal organism constituted of life, mind, and spirit. As all force is necessarily substance, according to the basic principles of the Substantial Philosophy, and therefore indestructible, and as man is the only finite being whose incorporeal organisms consists of these three deific forms of force, it rationally completes the scientific chain of analogical evidence for the ultimate immortality of the human race.

DR. SWANDER'S BOOK.

"The Substantial Philosophy."

Last month we noticed this new claimant for popular approval, and in that notice we intimated that this month's ARENA would contain a few specimen questions and answers from each of the fifteen chapters of the book, thus giving an idea of the stores of knowledge treasured up in the eight hundred questions and answers of the entire work. We select such questions as have the shorter answers, owing to the fact that we could not spare the space necessary for the more elaborate and instructive answers, many scores of which fill, each, nearly an entire page of the book.

We will only add, before introducing the reader to these specimen excerpts, that the demands for the work are coming in on its first announcement to a degree far exceeding the expectation of its publishers, thus indicating that Substantialists will not want urging to obtain and read this first formulation of their faith.

Chapter I.—The Source of Being.

Question 1. What is the chief end of the universe?

Answer. The glory of God in the revelation of his character to the rational intelligences thereof.

Q. 27. Does Substantialism, then, teach that God is the only and infinite source of all things, and that he is manifest in all things?

A. It not only holds and teaches this truth, but also sets it forth and demonstrates it in a manner and by arguments entirely different from anything hitherto known to science. It is now possible to see as never before in philosophy, that "by Him are all things," and "that which may be known of God is manifest in them."

Chapter II.—Material Substance.

Question 1. What general term does true science use in denominating the entities of creation?

Answer. *Substance.*

Q. 2. How are substances in general classified?

A. Into *corporeal* and *incorporeal* substances.

Q. 3. What are corporeal substances called?

A. Matter.

Q. 16. Is matter composed of parts?

A. A lump of matter is composed of parts, and yet each part is subject to infinite divisibility.

Chapter III.—Immaterial Substance.

Q. 8. Does Substantialism, then, teach that some things have a real entitative existence without being composed of matter?

A. It so teaches with all the assurance that ascertained facts justify, and with all the emphasis that obvious truth inspires.

Q. 25. Did the founder of Substantialism ignore everything that science had already achieved in its efforts to interpret Nature's entities and laws?

A. He did not. He rather made himself familiar with the teachings of the past in order not only to know the fundamental errors of many of its teachings, but also to enrich himself with the wheat of truth which he found in a great amount of theoretical chaff.

Chapter IV.—Cohesion.

Question 1. What is cohesion?

Answer. It is that form of force in Nature which unites like particles of matter together in a homogeneous mass.

Q. 2. Is cohesion a substance?

A. It is an immaterial substance, just as real as the material particles of matter under its control.

Chapter V.—Magnetism.

Q. 22. Is magnetic force a substance?

A. It is just as really a substance as the matter which it permeates and controls.

Q. 23. How may the substantiality of magnetic force be made to appear as a scientific fact beyond the attempt of a rational contradiction?

A. It has already been demonstrated to the faculty of reason in the unprejudiced mind by the universally admitted fact that magnetism can lift a body of matter at a distance from the magnet.

Chapter VI.—Gravity.

Q. 30. Is gravity a substance?

A. It is just as really a substance as the bodies of matter which it draws together.

Q. 36. What is the best evidence of its immateriality?

A. The fact that it passes unimpeded through all material substances, no matter what may be their properties, such as impenetrability, imporosity and imperviousness.

Chapter VII.—Electricity.

Q. 29. Can electricity travel?

A. It has demonstated its ability to move at a very rapid rate of speed.

Q. 42. At what velocity does lightning or electricity travel?

A. It has been estimated at 30,000 miles per second by the copper wire route.

Chapter VIII.—Heat.

Q. 6. Has heat an objective existence independent of such sensation?

A. It has; just as light would still have an existence even though all sensuous beings were to become blind.

Q. 7 Is heat a real substance?

A. It is just as really a substance as the water which it converts into vapor, the air which it rarifies, the clay which it hardens, the wood which it reduces to ashes, or the material elements of the building which it licks up with the cloven tongues of its conflagration.

Q. 38. Why does congealed water require more room than water in a moderate temperature and fluid state?

A. Because the particles when thus crystallized will not fit together with the same compactness as when in their fluid and abnormal condition.

Chapter IX.—Light.

Q. 1. What is light?

A. Light is that form of physical force by which the sense of sight in men and animals is addressed and affected.

Q. 2. Is light anything different and distinct from the effects or sensations produced thereby?

A. There is as much difference and distinction between the two as there is between odor and the sensation of smelling, or any other force in Nature and its phenomenal effects. Light exists external to our senses. If it had no such external existence it could not so act upon our organs of sight, or come into such contact with the retina as to bring distant objects within the compass of our observation and under the power of our recognition.

Q. 42. May not the motions of the *ether*-waves, as supposed and taught in the undulatory theory of light, cause the sensation of seeing by the tremulous action of such refined form of matter against the optic nerve, similar to the action of sound-waves in air, and their tremulous effect upon the ear-drum?

A. No; for while such an assumption is forced and far-fetched, it has not one rational analogy in Nature to justify it, as will be more fully shown when we come to treat of the nature of sound. Motion of itself is nothing but the changing position of some substance in space, and if any substance changes position, however tenuous or refined such substance may be, it can only be in consequence of a substantial force acting upon it. Hence, if such a material substance as *ether* exists, it must change its position in order to move and thus act upon the optic nerve in the form of waves or undulations; and such action must be caused by the operation of some force. Why not, then, assume this force, which is thus required to put the material *ether* into motion, to be the *light* itself, acting directly upon the sense-nerve, and thus avoid a useless circumlocution? This would be the rational view to take, since the ether, being an inert material substance, according to the undulatory theory, can no more move of itself, or without the application of an adequate force, than can a granite rock.

(*Concluded next month.*)

JOHN W. KEELY.

(*Continued from page* 120.)

for publication a complete explanation of these various changes. It is simply impossible to reproduce more than a fraction of what is freely put at one's disposal in a chat of an hour with this remarkable man, but here are the simple facts as they appear to the writer.

It is a commonly observed phenomenon that sound of a certain tone produces a response in any body having a corresponding vibrational number. Witness the responsive vibration of the piano string, when its corresponding tone is sounded several feet away, or the sympathetic vibration of one tuning fork in response to another at a distance, and

the beautiful fact of the window responding to a distant steam whistle at a particular pitch of its tone, as described by Dr. Hall in THE MICROCOSM, vol. III., p. 377. Taking these basic facts as a complete evidence of the existence of such a substantial *force* as sound, Mr. Keely set to work to secure by a combination of tones a uniform chord which he terms the "*etheric*" through which he should be able *always* to obtain that degree of force capable of mechanical effect.

If sound of any quality exerts a force capable of causing a stretched steel wire, like a piano-string, several feet distant to sway to and fro, in one perfect responsive vibration, why cannot the process be multiplied? and why may not the fact involved be developed and utilized? This was the problem. In its slow but sure solution Mr. Keely claims to have uncovered many curious and valuable facts, for instance: in the responsive vibrations superinduced by the mighty force of this etheric chord, he discovered that 42,800 vibrations per second communicated to common quartz caused its immediate disintegration, while metal will successfully withstand the enormous force of 240,000 vibrations per second. Here is the formula by which he expresses the fact he claims above, "the first etheric chord on the first octave induces 42,800 vibrations per second," or a force sufficient to disintegrate quartz.

Said Mr. Keely, "I can attach a common steel wire to a steel bar of the chord of B flat, and associate with it two more bars of the same chord, and bringing them into contact with a ton of quartz, disintegrate it in fifteen seconds."

Curious thought, is it not, that this man is a *bug* of the "hum" species? Yet this is the charge reiterated frequently in public print, and not only is he denounced as a "crank," but all he claims and all he exhibits is declared to be a delusion and a fraud by those who do not know the man or cannot understand his work.

But what *object* to be a crank? What *motive* to give his life to the perpetration of a fraud so stupendous as to secure the everlasting execration of his name, remembered only to be detested?

A poor lad, reared in obscurity and privation, in early childhood drawn to these unique researches, and having caught a glimpse of the possibilities involved, he toiled on, concentrating every energy, devoting every resource, deprived of every enjoyment, often destitute of the comforts that his skill, turned into other channels, would quickly and abundantly have provided, for SIXTEEN YEARS he *kept on* ALONE *and unaided.*

Love of notoriety? Odd way to enjoy it, cloistered for years alone with an inspiration! Greed of gain? Yet struggling with want when he might have enjoyed abundance! Since the formation of a company to aid in the development of his invention, consuming a fortune yet accounting for every dollar in labor or materials, and turning into the treasury $50,000 of his own (the proceeds of the sale of a personal interest), with the quiet remark, "It will be needed. You can repay it when I have completed the invention." Such facts should go a long way in refuting the cry of "fraud," "notoriety," "greed," and "crank."

"But he has been so long about it and always completing it within sixty days, yet never completed."

Well, all honor to him for his exhaustless tenacity; and if he, to whom the completion and final demonstration of such vast claims would bring so much of honor, wealth and fame, can afford to wait, why should the "fraud" shouting public become so impatient at the delay of a "bug" to "hum?"

In personal appearance Mr. Keely is a splendid specimen of the *genus homo.* Tall, straight, broad-shouldered, and muscular. In manner he is courteous, frank and genial, cordial and generous with friends, keen and cautious with enemies, his presence is always magnetic, and so surely as his discoveries are the most stupendous ever given to man to accomplish, his memory will live while men cherish with pride the names of great benefactors.

If, after carefully comparing the various solutions of sound-problems as set forth in the substantial theory with those of the current doctrine of acoustics, the reader shall, candidly and without prejudice, decide that the wave-theory presents the more reasonable view of acoustical science, we cheerfully submit, believing that the truth upon the subject, in whatever direction it may lie, will ultimately prevail.

A. WILFORD HALL.

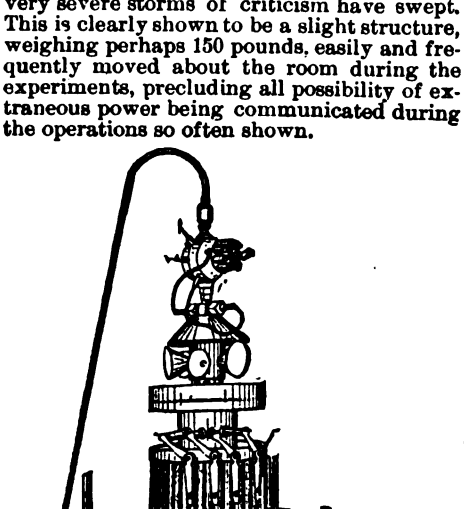
New York, 23 Park Row, Jan. 1, 1887.

THE MOTOR ILLUSTRATED.

BY THE ASSOCIATE EDITOR.

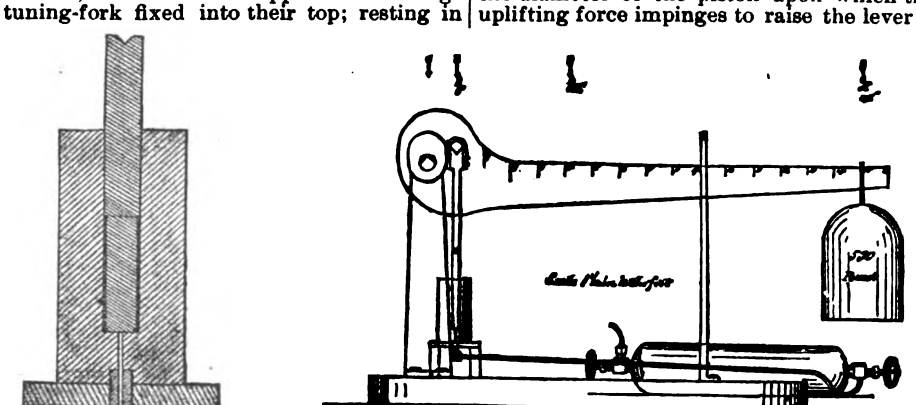
The many readers of THE ARENA who have manifested such a keen interest in the Keeley Motor, will be gratified with the revelation the accompanying cuts will make to an observant eye of the great mystery the very mention of Mr. Keely's name always suggests. We can assure any one disposed to doubt their own eyes, that these cuts convey an accurate idea of the mechanism at present employed in the development of the enterprise. We feel quite confident, however, that the seeing will do about as much toward explaining the problem as the hearing has done, and not much more. The illustrations may nevertheless serve to show that as Mr. Keely claims to be dealing with an original force entirely new to mechanics, his methods and machines are at least consistent in presenting an appearance as new and novel as the power they are said to accommodate. A glance at the "engine" is sufficient to show how completely the mind has become adjusted to other and totaly different forms as suggested by that term; but in this case the eye is trustworthy and the thought must accommodate itself to "the new form in the old place."

In an effort to explain we will begin with the "Liberator," which is presented to us as the source of the power, and over which very severe storms of criticism have swept. This is clearly shown to be a slight structure, weighing perhaps 150 pounds, easily and frequently moved about the room during the experiments, precluding all possibility of extraneous power being communicated during the operations so often shown.



THE LIBERATOR.

The reader will readily recognize the small "receiver" with a valve in each end, and a small copper pipe (1-32 in. bore) leading to the extreme top piece of the structure. Next above this "receiver" is shown the base of the device, consisting of a plain surface of wood, upon which rests the iron ring with two tuning-forks fixed upright in its surface; in addition to the two forks are three upright devices, which in turn support each a large tuning-fork fixed into their top; resting in these three elevated forks by means of projecting bolts, is the main piece of the whole device, this being at once the largest and heaviest part Underneath this, and fastened to it by a bolt passing through its center, may be seen the large Chladni plate of steel. Beneath this plate, and resting upon the wooden base, is shown a curious device consisting of numerous steel pins radiating from a common center. The tuning-forks, steel pins, and Chladni plate are all agitated by bowing or striking, to produce the power. The main part of the "Liberator," as shown above, is not a single section but several pieces. That part seen to consist of a row of perpendicular tubes, is simply a collar of brass resonant tubes, set over the iron body. Above this is seen another smaller but similar device, except the brass resonators are set in horizontally. Above this again is seen the outer rim (about 2 1-2 inches wide) of another design, also full of resonators, while the next story is seen to resemble three fun-



THE LEVER.

nel-like projections, surmounted by a good likeness of a lamp-shade, and crowning all is the "turret," from which the connection is made to the "receiver" by a copper pipe. The two short pipes near the top are said to be for the "positive" and "negative" flow. In the above, the reader has an excellent likeness and a fair description of the claimed origin of the great force shown by Mr. Keely.

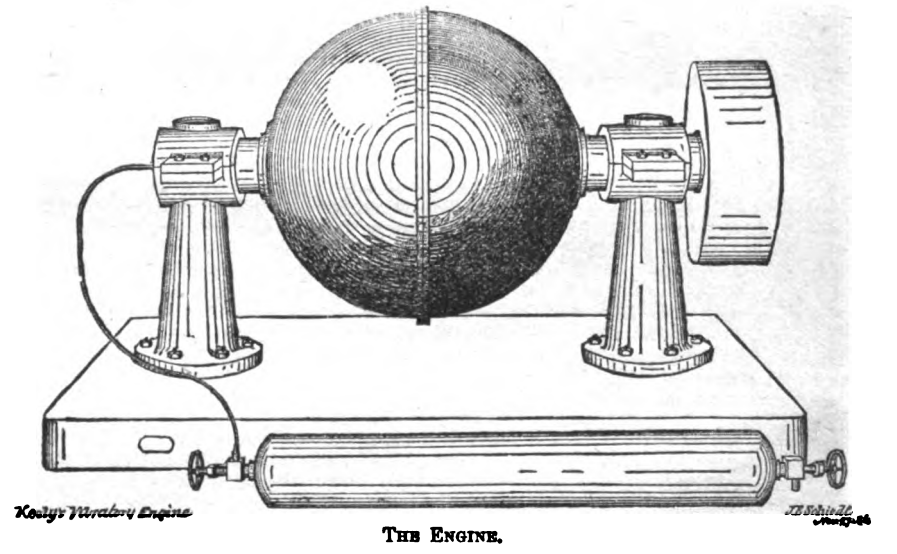
The second cut is of the weighted lever by which Mr. Keely is able to show in simple measure the enormous force he produces.

The respective arms of the lever are about sixteen to one; that is to say, the length of the longer arm is forty-eight inches, and the shorter arm is three inches from the fulcrum: the diameter of the piston upon which the uplifting force impinges to raise the lever is seven-eighths of an inch; and its area in cross sections is, accordingly, six-tenths of an inch.

This being the case, and adding the weight of the lever, it follows that when a weight of five hundred and fifty pounds is suspended on the end of the longer arm, it requires a force of fifteen thousand seven hundred and fifty-one pounds per square inch and impinging on the lower end of the piston to raise the lever.

The accompanying sectional drawing, signed by J. E. Schiedt, correctly represents the construction of the piston and the cylinder in which it works.—*Extract from report of Messrs. Linville and Le Van.*

The third cut is quite as interesting as the first, as it presents to the eye an idea of Mr. Keely's method of applying his new force to practical uses; and I doubt not that whatever question the reader may hold about a *new* force, it will readily be conceded that Mr. Keely employs a new *harness.*



THE ENGINE.

This is the engine. It runs! I have seen it running with a velocity that shook the building and seemed to threaten itself with destruction, such was its tremendous speed. And this speed was secured entirely by the introduction into its hollow interior of this same mysterious force with which the weighted lever is lifted, the cannon is fired, etc. (For a detailed account of what representatives of THE ARENA have personally witnessed of the operations of this force, the reader is referred to the July, September, and November issues.) The whole sphere revolves and carries with it the large pulley or band-wheel shown on the end of the shaft, and by this means the power may be distributed in

the usual way. This shell, while hollow, is not empty but contains, securely fastened to the stationary trunnion, a complicated system of cog-gearing which is said to relate only to the *reversing* device, by which it is made to run with equal facility in either direction, as determined only by its initial motion. The mystery of an exhaust for this unique construction is solved by the fact that it is *not air-tight*, and any gas, air, steam, or other force employed to drive it, is at liberty to diffuse itself imperceptibly into the air after it has performed its work.

We have now placed before our readers the leading parts of the mechanism that greet the eye of a visitor to Mr. Keely's laboratory, together with such a statement of the details as may serve to make the illustrations intelligible, and here we might leave the matter to the unaided discussion of the interested But we are aware of the state of the public mind touching the whole enterprise, and believe also that we understand some of the reasons that have led to if not merited the distrust with which it is generally regarded.

Let us now canvass some of this ground:

This invention comes before the world with no ordinary claims, and of course can be substantiated by no common proof. For years the public have been hearing tales that put to blush the "Arabian Nights."

As a preliminary to any acceptance of this new discovery we were bidden to set aside forever all that science and mechanics have shown to be fundamental since the knowledge of man began to wrest valuable service from the coy forces of nature. The axiom, "*Ex nihilo nihil fit*," was seemingly ruled out by a stroke of Mr. Keely's wand or bow.

The mighty problem of perpetual motion was quietly admitted to have been successfully solved, and treated as an unimportant corrollary. We were told that the sleepless forces of cohesion and gravity slunk away abashed in the presence of a modern Jupiter who had tardily assumed the throne of his power at the bidding of this remarkable inventor. With these stupendous claims supported by such unsatisfactory proof as "vague rumor" alone afforded, it is no wonder the road to public confidence has been long and difficult.

One obstacle that has thus far effectually prevented public confidence is the failure to give a *complete* exhibition or permit a full examination, and since the company went into the exhibition business of its own volition, the public has justly condemned the attempts upon the simple ground of what it has *failed* to *show*. Moreover the disjointed and contradictory accounts that reach the public as a result of these partial exhibitions to the few have been better calculated to create doubt than beget confidence.

Is the power previously stored ready for use at the will of the exhibitor, and in what part of the structure is it concealed? are the questions of earnest and tenacious discussion. It has been said by expert examiners that the "construction and organization is such that it is *incapable* of containing or concealing *any* stored power."

Now, as an aid to the cautious investigator, we will here show that this cannot be so, since *Mr. Keely claims to secrete and store his force in this "liberator" between the time it is generated or "liberated"* by the bowing of the tuning-forks and the commencement of the work the force is shown to perform. That is, after assembling the various parts and properly adjusting them, Mr. Keely proceeds to agitate the tuning-forks for a minute, after which he exclaims: "It is vitalized, it is charged," etc., and of course from that instant until it is liberated to perform work this force *is* "contained or concealed" in this "liberator." Thus "any power" *can* be stored in *this* part of the mechanism. Has it ever been shown that the power which *must* be "contained" in this liberator before any effects are produced is a *new force? I fully believe it has;* but, unfortunately, not in a manner to at once and effectually answer *all* objections, as might readily have been done. Thus, at the examination of the various parts of this liberator on Oct. 22, by Messrs. Linville and Le Van, in my presence, how effectually might the *conviction* of these eminent engineers have been welded into an *incontrovertible fact*, had their examination extended to the receivers and every part involved in the experiments so often made, and had such examination been immediately followed by a series of performances such as are commonly shown.

Such a test made, with the identical parts examined, would have given their report a force it cannot possess so long as the examination is thus incomplete; for however strong may be the conviction of any individual, doubt will remain while there is room for it in the public mind.

In whose interest these various exhibitions have been given may be seen by the fact that while Mr. Keely has been patiently and quietly working out his idea, and years before *he* was ready to bring it before the public, his financial managers deluged the market with 100,000 shares of stock representing a par value of $5,000,000, *without one dollar's worth of actual property behind it*, only the promise of Mr. Keely that *when* he should have produced a patentable device and secured patents, they were to be the property of the company.

A man once met a boy hurrying along with a gun. "What are you after?" asked the man. "Rabbits," said the boy. "Are you having any luck?" "First-rate." "How many have you?" "When I get the one I am after and two more I'll have three," replied the boy as he disappeared into the bush. Imagine that man making extensive preparations and inviting his friends to a rabbit stew upon the strength of the boy's enthusiasm! Why the management allow the invention to be delayed and the inventor denounced by industriously circulated reports that "it is all complete," is clearly shown by the fact that so soon as the market value of the stock reaches ten or twelve per cent. there is a great unloading, and a prominent officer of the company is one of the most active dealers, "selling for a friend," of course. But the supply of friends is something phenomenal. Such manipulation of the stock by parties in interest has tended to arouse first the suspicion and then the contempt of financial and business men. But responsibility for this state of affairs is exactly placed by the fact that in 1881 Mr. Keely desired to secure and *lock up for five years* over half the entire stock, and the proposition was promptly rejected by the parties into whose hands the management had fallen.

Mr. Keely states that for nearly sixteen years he worked on alone before he brought his enterprise to the attention of others, and then only when compelled to do so by a lack of means to press on. Could he have gone on in his own quiet way until his work was done, or had the parties who undertook to furnish the needed funds been content to wait, and keep out of the milk-and-water line, the community would have been better pleased and the inventor better treated.

But however manifold the obstacles that were created by a premature introduction of the enterprise to the public, or have since arisen through these attempts to stimulate public interest and confidence by such partial and unsatisfactory methods as exhibiting one part to one man or set of men, and another section to other men upon a different occasion, until the community, in the absence of any consecutive or reliable statement of the affair came to regard it as a veritable delusion, the fact remains that Mr. Keely is able to demonstrate the existence of a stupendous power perfectly obedient to his will which, however unwilling men may be to accept as a new discovery, has never yet been satisfactorily accounted for by the supposition of any old and well recognized force. I can give no better statement of my own confidence in the complete validity and perfect integrity of Mr. Keely's enterprise than is afforded by the following letter of the prominent engineers, Messrs. Linville and Le Van, of Philadelphia:

As the result of our observations upon several occasions of experiments conducted by Mr. Keely in the generation of his so-termed "etheric force," and having examined in detail his structure designated a "liberator" having immediately after such examination seen its several parts assembled and put together and connected with his "receiver," and it having been conclusively shown that such structures contained nothing but atmospheric air at normal pressure, we have seen a force generated or liberated, exerting an expansive energy of upward of 20,000 pounds per square inch, without other instrumentality in its production than the agitation of two or more tuning forks.

There was no possible connection between the power-generating structures and any extraneous source of power. There was no appreciable thermal changes either at the instant development of the power, or upon its being instantaneously exhausted into the room.

Compelled as we are to eliminate as factors in the development of this force all known agents such as heat, electricity, chemical combustion, etc., the conclusion forced upon us is that the power is developed in the manner stated by Mr. Keely, viz., that the result is the disintegration of the air contained in his receivers by vibration, and the liberation of a highly attenuated vapor or ether. That Mr. Keely is dealing with compressed air or other "stored power," as has been alleged, is preposterous.

We have seen at different times the tests made by Mr. Keely of the utilization of this force as a motive power, and in view of our observations in this line, our belief is that the obstacles still remaining in the way of his practical success in running engines will be overcome by him.

Very respectfully yours,

W. Barnet Le Van,
J. H. Linville.

Philadelphia, October 25, 1886.

Mr. J. H. Linville was for many years President of the Keystone Bridge Company, and is the inventor and patentee of many important features in iron bridge construction. The majority of the iron bridges in use by the Pennsylvania Railroad were erected by the Keystone Bridge Company under the superintendence of Mr. Linville. He was for many years associated with the Messrs. Carnegie, of Pittsburg, in the Union Mills and other enterprises. Mr. Linville is recognized as one of the most eminent engineers in the State of Pennsylvania.

Mr. W. Barnet Le Van has for many years been a contractor for machinery, including steam engines, boilers, electrical plants, etc., has long been a conspicuous member of the Franklin Institute and a contributor to its journal, is a member of the American Association of Engineers, and is regarded as authority in all branches of steam engineering, and is frequently called as an expert in patent litigation involving questions pertaining to steam and electrical engineering.—*Phil. Press.*

The most reliable reply that the writer can make to the eager question, "When will this be completed?" is to print Mr. Keely's reply to the same query—"I think by next July."

AMERICAN INSTITUTE OF CHRISTIAN PHILOSOPHY.

THIS already influential and highly useful organization is, as we are glad to learn, in a very prosperous condition, financially and otherwise. It meets monthly as a society of philosophical and scientific investigators, the chief object of such meetings being to hear an original paper from some one of the members previously designated, and the subject of whose paper has also been previously agreed upon.

The subjects of these papers are chosen with reference to the spirit of the times; at the same time, such themes are selected as shall be in harmony with the aim and general scope of the institution itself. Papers thus presented and read are freely discussed by members present in the spirit of courtesy and kindness, with the sole view of eliciting the truth as it may be apprehended from the various standpoints of the members present, after which the paper appears in the due course of publication in the pages of *Christian Thought*, the official magazine and organ of the institute, of which the Rev. Dr. Deems (also President of the Institute) is the editor.

At the request of the President the editor of THE SCIENTIFIC ARENA has consented to read a paper before the institute at its meeting in this city on the evening of the third of February *proximo*, on the subject of the Substantial Philosophy. It is the desire of President Deems, as well as the aim of Dr. Hall, so to present the fundamental principles of Substantialism that no one present shall hereafter fail to know just what is meant by the Substantial Philosophy. This paper will appear in the last three numbers of the present volume of THE ARENA (March, April, and May), divided into equal installments, thus winding up the first year of the organ of Substantialism with the fullest and most elaborate statement of its principles yet published.

The meetings of the Institute of Christian Philosophy take place at No. 4 Winthrop Place, New York.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

THE BIENNIAL REPORT of the Alabama Insane Hospital. P. Bryce, M. D., L.L. D., Supt. Pamphlet 6x9.

"A COMMON-SENSE VIEW OF LIFE, DEATH, AND IMMORTALITY," by I. S. Drake, M. D., Richmont, Ind. Pamphlet about 6x8.

SUNDAY AFTERNOON BIBLE TALKS, by A. J. Ingersoll, M. D., Corning, N. Y. Pamphlet 4 1-2x7.

Publishers' Department.

The Zetetic Phoolosophy.

BRODHEAD, Wis., Dec. 13, 1886.

Dr. Hall:

DEAR SIR,—Having been many years interested in astronomy, and having recently read your articles in THE SCIENTIFIC ARENA, headed "Is the Earth a Globe?" I beg permission to tender you ten thousand thanks for the masterly manner in which you have crushed the very life out of that zetetic monstrosity—so completely that not a man of intellect can possibly give candid attention to your arguments and still believe in the flat notion. Having spent so many years in computing solar and lunar eclipses myself, I was hoping that you would call attention to the difference in the *magnitude* of total solar eclipses, as *now witnessed*, as to the *extent of the shadow on earth*, in comparison with the extent of the shadow which that little zetetic moon would produce on earth when it (about four miles above the earth) gets between the earth and that little zetetic sun about 700 miles away—the size of *its shadow*. The actual size of the shadow is thus given by Astronomer Ferguson: "About 180 English miles broad"—in its *total* phase. But you have done so well that we have not the heart to say, Why did you not do more? Those articles are worth ten times the price of THE ARENA.

WM. SHELDON.

Good Cheer.

CEDAR RAPIDS, Iowa, Dec. 8, 1886.

HUDSON & CO.,—I have been reading THE ARENA with very much interest. Have read all six numbers. The more I read it, the better I like it; it seems to be so fresh, and packed with truth.

I feel as if I could not do without THE ARENA, and I shall be pleased to have its monthly calls at my study.

Yours fraternally,

REV. J. E. STAUFFACHER.

A HAPPY NEW YEAR to each one of the twenty-five thousand readers of THE ARENA! May THE ARENA's contribution to your happiness each month of this New Year be as substantial as the philosophy it brings to your aid in the defense of the truth.

And may the entrance of His Word bring light to all waiting eyes, until He comes and we are permitted to see "not as through a glass darkly, but face to face."

THE ARENA has got its new clothes, including a brand-new bonnet, and of course nothing would do but it must wear them for the first time while making its extensive round of New Year's calls. Really, now, we feel quite pleased with the young man's appearance; but should any of our gentle friends object to such a sturdy youth wearing a bonnet, just remove it before he sits with the rest of the company, and the family resemblance will at once be seen. Seriously, now, the thoughts of our editor and valued contributors, as well as the generous labors of the many friends of THE ARENA, seemed to merit the best appearance in the way of dress possible with our limited price. But clothes, even paper (collars), cost something, and we trust that our improved looks will result in thousands of 50 cent welcomes. Henceforth THE ARENA will dress in this style. Meanwhile postage-stamps may appear with a Watteau pleat, or postal notes, and express money orders may be cut bias and all be in pleasing fashion, only let them appear frequently.

ALWAYS read the Publishers' Department of THE ARENA. This is our only way of communicating with our thousands of friends, for we cannot *write* to each. And here often will be found the explanation or answer sought.

WRITTEN acknowledgments or receipts we cannot give. The receipt of the premium or THE ARENA, or both, will be a sufficient acknowledgment. But don't wait over *ten days* if you fail to receive what you order, before sending us a card *duplicating the order*, for our convenience in looking it up.

PARTIES not receiving their ARENA by the tenth of the month, should notify us *at once*. Send no extra stamps, for we do not take pay twice for the same thing, and we will promptly send a duplicate number or a written explanation of the delay.

ALL subscriptions begin with Nos. *one* or *seven* of the current volume. Those not specified are entered to commence with No. 1. Nearly every one orders from the first number; but we say this for the instruction of the few.

READERS of any of the publications mentioned in this journal, who shall order them through us at the regular rate, will receive THE SCIENTIFIC ARENA one year free

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4. The same set bound in full Turkey morocco, superior paper, gilt edges, entirely new, and of magnificent get-up and finish, $50 cash; or, as a premium on an order for $65 worth of our books. Original cost, $160, or $10 per volume.

The above-named books will be sent by express, safely packed, on receipt of the price as above. Persons desiring a set of either binding for cash, or as a premium for our books, but who are not prepared to send for them at once, can have a set reserved for a time by so requesting.

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MESSRS. HALL & CO.,—I have received the $50 worth of your books and the beautiful set of 16 volumes of Appleton's New American Encyclopedia as a premium. I am exceedingly pleased both with the purchase of the books and with the set of Appleton. I have long desired this Encyclopedia in my library as an almost indispensable help in my ministry, but never found myself prepared to possess it till I chanced to see your remarkable offer. The books came in prime condition notwithstanding the distance.

Let me suggest that those ordering books with a view of securing the Encyclopedia as a premium should not fail to include a liberal supply of the "Problem of Human Life," and of the five bound volumes of *The Microcosm*, to be transmitted to posterity as heirlooms. Their providential appearance marks the grandest epoch in science and philosophy the world has ever witnessed. To be an appreciative possessor of these volumes will be a distinction of which any man may well be proud in the coming ages. In those ages no name will stand higher in science than that of the author of these works. Substantially yours,

RUFUS E. MOSS, Pastor of the Christian Church.

CLEARWATER, Kansas.

MESSRS. HALL & CO.,—* * * * * * * The books came all right. I am much pleased with them, and would not take $50 for the set of Encyclopedia alone. With sincere thanks, I remain yours, etc.,

D. T. BOGARDUS.

DARLINGTON, S. C.

MESSRS. HALL & CO.,—I have just received the fifty copies of "Walks and Words of Jesus," and the sixteen volumes of the Encyclopedia. I am more than satisfied with the books, and feel well paid for my labor. I would not take $50 for the Encyclopedia alone. You have my thanks for your kindness.

REV. A. MCA. PITTMAN.

HYDETOWN, Pa.

MESSRS. HALL & CO.,—The $50 worth of your valuable books have arrived. The sixteen leather-bound volumes of the Encyclopedia also came in good order, and I would not take $60 for the set. I told my people about your great offer in *The Microcosm*, and they at once urged me to go to work and secure the Encyclopedia for my library. They subscribed for your books and paid me in advance, so I could send the $50. Many thanks to the people on the Hydetown charge for their liberality. I feel sure if my brethren in the Erie Conference, as well as in others, knew of your offer, they would soon be at work on their various charges to secure this important accession to their library. Accept my sincere thanks for your kindness.

S. DIMMICK, Pastor M. E. C.

"DEAR DR. HALL,—The elegant half morocco set of 'Appleton's Encyclopedia' you sent me is a *gem*. I can buy books at low rates, but *I* could not have gone into the open market and bought this set for $60. Wife and I are actually proud of it, and have giv n it the chief place in our little library. How you can sell such valuable works at your astonishingly low prices, and not 'go over the hill to the poor-farm,' is a good question for any debating club to wrestle with.

"Yours for some more books at the same rates,

"H. B. HUDSON,

559 Quincy St., Brooklyn, N. Y."

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A writer in the fifth volume of the *Microcosm* remarks:

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Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph.D., LL.D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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

PRESIDENT OF WESTFIELD COLLEGE, WESTFIELD, ILL.

BY THE ASSOCIATE EDITOR.

THE subject of this sketch was born in Decatur Township, Clearfield County, Pa., December 10th, 1832. His paternal great-grandfather, Nicholas Kephart, came to America from Switzerland in 1788. His maternal great-grandfather, George Goss, came from Germany prior to the Revolutionary War, was in the Wyoming Massacre, in which two of his sons were killed, and from which he, his wife and only remaining boy (Abraham), then a lad of fourteen, and the maternal grandfather of Dr. Kephart, escaped by secreting themselves in the laurel. Soon after this both father and son enlisted in General Washington's army, in which the father was killed. The son survived the war, and near the close of the eighteenth century settled in Clearfield County, Pa.

Nicholas Kephart settled first in Berks County, Pa., and afterward in Centre County. His son Henry, the grandfather of the subject of this sketch, married Catharine Smith, a maiden of purely English descent, while Abraham Goss, the maternal grandfather, married Elizabeth Eimerhizer, whose father was Dutch, but whose mother was purely Irish.

To these parents were born, with other children, respectively, Henry Kephart, Jr., and Sarah Goss, who were united in marriage March 26th, 1826, to whom were born, in all, thirteen children, seven sons and six daughters, Dr. Kephart being the first son and fourth child. (It will be seen from the above that he is of Swiss, German, English, and Irish extraction; hence, if mixture of blood constitutes a genuine "Yankee," he surely is one.)

His father died in May last, in the eighty-fifth year of his age, at Shinnyville, Iowa. He was a local preacher in the church of the United Brethren in Christ for more than fifty years, distinguished for his upright, consistent Christian life, and died loved, esteemed, and confided in by all who knew him. His mother still survives, and is in the seventy-ninth year of her age. Catharine Kephart, the grandmother of Dr. Kephart, died in 1857, and at her death she left living eleven children, ninety-six grandchildren, and sixty-three great-grandchildren.

Of Dr. Kephart's brothers and sisters, nine are still living. One of them is Bishop Kephart, of Toledo, Iowa, and another Prof. Kephart, of Western College, Iowa.

At the time of his birth (1832) Clearfield County was a vast wilderness on the western slope of the Alleghany Mountains. There, in the year 1826, his parents erected a small log cabin, and with not a cent of money, but with an ax, a mattock, a rifle, and the most simple and spare household

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outfit, but with brave and loving hearts, they commenced the herculean task of clearing out and paying for a farm. Flour, fruit, and all the luxuries of life were scarce, but venison, bear-meat, berries, nuts and hard toil were plenty. The husband felled the trees, and, often aided by the wife, rolled the logs into heaps and burned them to make way for a crop of wheat; while the wife cultivated the garden spot, sheared the sheep, "skutched" the flax, and spun both wool and flax into yarn, and wove it into "homespun," out of which she made garments for herself, her children and her husband. Scarcly had the subject of our notice attained the age of seven years when he was taught to "wind the bobbins" for his mother. There he would sit, day in and day out through the long winter, behind the "old quill-wheel, winding quills," while the good mother sat behind the "old loom," weaving into cloth the yarn brought in by the residents of the surrounding neighborhood. The doctor says that the first piece of money he ever had as his own was a "ten-cent piece," given to him by his mother as his reward for filling the bobbins for her one whole winter; and he says he has never felt half so rich since as he did when he first could call that dime his own.

When he was nine years old he attended his first school. It was kept in a little dingy log cabin; the seats were made of slabs and the writing desks were rough boards, laid on wooden pins driven into the wall. To reach this school he had to walk, with his older sisters, a distance of two miles, through the wilderness; consequently, there were many days during the winter (for the school only kept during the three winter months), that he could not go. At the age of fourteen he was capable of taking charge of and driving a span of horses, and being the oldest boy in the family, his time during school months was necessarily devoted to teaming across the mountain and in the lumber forests. Consequently, so meager had been his schooling, that, although apt to learn and a great lover of books, he attained his twenty-third year before he had ever "looked into" a text-book on geography or grammar to study them. However, by the aid of the "pine-knot" light, he had read with care the few books in his father's cabin, which were—the Bible, the English Reader, "Pilgrim's Progress," Baxter's "Saints' Rest," Fleetwood's "Life of Christ," and Flavel's "Redemption," with a few other books that he borrowed, among which were Weem's "Life of Washington" and "Life of Franklin." He also attended, during the summer, the country Sabbath-school, and, by committing verses of Scripture to memory, purchased a New Testament and several other small books.

In 1855 he resolved to educate himself, and by special permission of the directors, he attended the public school (which was then presided over by a competent teacher), and studied arithmetic, geography, and English grammar, making encouraging progress. He had already become an expert raftman—a good pilot on the Clearfield Creek and Susquehanna River—and the following spring (1856) delivered, by special contract, two rafts to Marietta, Pa., by doing which he netted $75 in three weeks. Returning to his native county, he hired, as head sawyer, to run a steam sawmill, for which he received $26 per month and boarding. This he continued until the first of August, when, in company with his brother (now bishop), he entered Dickenson Seminary, Williamsport, Pa., where he continued three months, and then returned home, taught school the following winter, "rafted" in the following spring, and then entered Mount Pleasant College, Westmoreland County, Pa., May, 1857. From here he went to Otterbirn University, Ohio, in September, 1857, where he continued (with the exception of staying out occasionally to earn some money by teaching, or serving as a supply some field of labor), until January, 1861, when, because of the impending national crisis, and the consequent financial stringency, he was compelled to quit college without having completed the classical course, but having more than completed the scientific course. Throughout his course as a student, he was distinguished as an incessant worker, a close thinker, a clear reasoner—excelling in the mathematics and sciences.

In 1851 he was converted, and joined the church of his parents—the United Brethren in Christ. In 1857 he received Quarterly Conference license to preach the Gospel; was received into the Allegheny Conference, at Altoona, Pa., in January, 1859; and at the same place was ordained as an elder in January, 1862.

In January, 1861, having retired from college, he was assigned by his conference, to a

charge in Mechanicsburg, Indiana Co., Pa., which he served with marked ability and success, and where, on the 28th day of November, he was united in marriage to Miss Mary Elizabeth Sowers, daughter of Michael and Susannah Sowers. In 1862, he was assigned to a charge in Juniata Co., Pa., where he labored with his characteristic zeal and success until in June, 1863, when, owing to the invasion of Pennsylvania, he yielded to a sense of duty to his country, enlisted a number of men, repaired to Camp Couch, Harrisburg, where, on the organization of the 21st Regiment of Pennsylvania Cavalry, he was by the field and line officers unanimously chosen chaplain of the regiment, and duly commissioned as such by Governor Curtin. In this position he served with marked fidelity until the close of the war, remaining all the time right with his regiment, passing through all the battles in front of Richmond and Petersburg from Cold Harbor till the close, and although he was never wounded his horse was, and at the battle of Sailor's Creek, April 6, 1865, the man next to him was shot dead off his horse; and during that great campaign which ultimated in the surrender of General Lee, he was for fourteen consecutive days and nights that he never had his boots off once. He was especially diligent in seeing after the sick and wounded of his regiment, and whenever the men were paid, they brought and intrusted to him, all the money they desired to send home. In this way hundreds of thousands of dollars passed through his hands, not a dollar of which failed to reach its destination. In October, 1864, he carried, at one time, $65,000 to City Point and expressed it North. As a mark of their appreciation the men of his regiment presented him with a suit of clothes, a twenty-seven-dollar Bible, and a sixty-five-dollar set of horse equipments.

The war ended, he returned home and taught a select school in Mechanicsburg, Indiana County, Pa., four months, when in September, 1867, he became pastor of the U. B. Church in Hummelstown, Pa. Here, at the end of two years, and as a result of overwork, his health failed, and he resigned his charge and removed to Jefferson, Greene County, Iowa, when he was soon called to the principalship of the public schools of that thriving young county seat. At the end of two years he was made county superintendent of schools, and at the end of two years more he was called to the chair of mathematics and natural science in Western College, Iowa, where he served with marked ability. While here, in 1872, Otterbirn University, recognizing his distinguished ability as an educator, conferred on him the degree of A. M. Throughout these nine years of work in the educational field of Iowa, Dr. Kephart had labored with great efficiency and success. His abilities were apparent to all acquainted with his work—especially as one who had the happy faculty of securing the good will of his pupils, and thereby preserving the most complete discipline, without burdening them with oppressive or chafing rules. The only rules he insists upon are "Do right;" "Be ladies and gentlemen."

In 1876, the chalk dust of the recitation room having brought on catarrh, he resigned his position in Western College, and accepted the actuaryship of the U. B. Mutual Aid Society of Lebanon, Pa., and the editorship of that journal. Removing to that city, he entered this new field with his characteristic energy, and it was soon evident that he was not long to remain a novice in the sphere of life insurance. He canvassed the entire field and many of his productions, in the shape of editorials in the *U. B. Aid Journal*, statistical and illustrative tables, and the "Agents Manual" attracts wide attention among insurance experts.

In 1881 he won a prize of $5000 for writing the best essay on "The Evils of the Use of Tobacco by Christians."

In 1883, through the influence of Prof. E. H. Ridenour, a former pupil of his, he was offered, and induced to accept, the Chair of Mental and Moral Science in San Joaquin Valley College at Woodbridge, California, and in December of that year he removed to the Pacific Coast. Here he labored with marked success for nearly two years, and when, owing to the failure of the health of Mrs. Kephart, it was rumored that he thought of returning east, the entire school drew up and signed a petition praying him, if possible, to remain. But the very evident fact that nothing but a return to the east would save his wife's life he, with many regrets at the necessity of leaving a clime and a people he had learned to love so dearly, in July, 1885, returned to "the States." In June, 1884, Western College, which he had so faithfully served for five years, in recognition of his abilities conferred on him the degree of D. D., and in May, 1885, the General Conference of his Church appointed him one of a commission of twenty-seven to revise the Constitution and Confession of Faith of that denomination.

While on his return from California, an urgent call from Westfield College, to accept its presidency, met him. This, after careful deliberation, and only through a sense of duty to the Church of his choice (for he never desired to stand at the head of a college, much prefering only a Chair, and thereby avoiding the perplexities and burdens of superintendency), he finally accepted, proceeded at once to Westfield, and entered on his work August 1, 1885. He is now in the second term of the second year of his work at that place, and the very marked increased prosperity of the college indicates that his energetic, unceasing labors in its behalf are not in vain. The halls of the college are now well filled with students who are a diligent, exemplary class of young ladies and gentlemen, and the friends of the institution, who but recently almost despaired of its survival, are now inspired with bright hopes for its future prosperity.

To Dr. Kephart and wife have been born two children—a son and a daughter. The son is twenty-four years old. He completed the classical course in Lebanon Valley College in his sixteenth year, after which he spent one year in Boston University, taking special studies in biology, French, and German; three years in Cornell University, pursuing a course in history and political science (in connection with which he was cataloguer in the university library), and fifteen months in Florence, Italy, in the library of Prof. Fisk. He is now the librarian of Yale College. The daughter is in her sixteenth year, and is a student in the college of which her father is president.

In 1877 Dr. Kephart became a reader of the "Problem of Human Life" and an enthusiastic admirer of Dr. Hall, and a believer in the Substantial Philosophy. From the issue of its first number he was a contributor to THE MICROCOSM, in the columns of which he most ably discussed "Free Will," "The Foreknowledge of God," "Motion and Force," "Life," "Christianity and Science," and kindred topics. He is a clear, forcible reasoner, an interesting, able speaker, a profound thinker, and a genial companion, delighting in witticisms, innocent jokes, and laughable stories. He is recognized among all his acquaintances as an honest, conscientious, upright *Christian* MAN.

For the encouragement of others, attention is called to the fact that Dr. Kephart, *after he had attained to his majority*, earned every dollar needed with which to educate himself.

CHRISTIANITY ON THE PLANET OF MARS.

BY ELD. THOS. MUNNELL.

BUT to gain the highest results from an attempt to reach inferior intelligences, mere words, law, and holy precepts, without a practical demonstration of the same in daily life, such as the best of men have never exhibited, would utterly fail. Religion concreted and incorporated into one grand life, such as that of Jesus Christ, would seem to be necessary. Hence the reasonableness or unreasonableness of the doctrine of incarnation, when viewed at a distance, should be considered. We affirm nothing as to the *mode of existence* in the Godhead as a basis for our belief, nor do we allow the absurdity of any current speculation to deter us from accepting the doctrine of "God with us" in its fullest meaning. The idea of "three in one," however, or one composed of three, is not an absurdity. In man's constitution is found a trinity—body, soul, and spirit. In his body alone are the osseous, muscular, circulatory, and nervous systems—four in one. It need not be affirmed that the relation between the Father, Son, and Holy Spirit resembles either of the above arrangements; but they relieve not only trinity, but quadrinity, from the charge of absurdity. White light contains seven distinct colors, neither of which in the least resembles the composite white. We can easily believe that two substances may chemically unite and form a *tertium quid*; but when theology asserts that both the human and divine found complete expression in Jesus of Nazareth, Rationalism is amazed at our credulity. Matter and mind may unite in one: philosophy may assert that no black object, on account of the complete absorption of all the rays of light, has ever yet been seen, or assert any other scientific paradox, and there is no complaint; but the moment we affirm the divinity of Christ, doubt and rejection of the proposition become the insignia of superior erudition. Whether the saying, "I and my Father are one," indicates the same kind of oneness as the prayer for the disciples, "that they all might be one," or oneness in any other sense, or under any other form, it must be admitted that God may be with the Marsians in some very consistent and practical way, whether they understand the mystery of incarnation or not. Suppose it were simply announced on that world that "in the beginning was the Logos, the Logos was with God, and the Logos was God; that he became flesh and dwelt among them;" what impossibility is lodged in the assertion? Is it that God could not in some way assume the form of man without abandoning his proper individuality as God? Belief in the divinity of Christ in the fullest sense, in no way hinders our belief in the possibility of God's being manifested in the flesh in more worlds than one, and at the same time. Here, again, we may utterly fail in illustration; but suppose the sun should kindle a fire on a thousand dark worlds at once, just like himself as to quality of light and heat, would not each one fairly represent the sun and be able to say: "I came forth from him;" "I and the sun are one;" "He that hath seen me, hath seen the sun;" "The sun has no element not found in me;" "I am the light of the world." The language of the Scriptures may be so understood without derogating at all from the lofty claims of Him in whom dwelt all the fullness of the Godhead substantially. An inspired man receives and reflects the light and life of God; but Jesus has "life in himself;" and his appearance on the planet Mars in this character, is not only a very thinkable circumstance, but may be the best possible method of conveying to them a practical knowledge of God.

Some regard the incarnation of Christ as a method of reaching men, as scarcely consistent with Divine dignity; but had any one of us a desire to communicate with a world of insects in behalf of some possible interest of theirs, sufficient to call forth our sympathies, how could such communication be effected with the use of our present vocabulary? How, without reducing ourselves, or some one of ourselves, to their condition and nature, and become an insect in order to speak to insects? How, without adopting their language, modes of expression, entering into their sympathies, and winning their affections? When the six hundred Moravians, in the days of Count Zinzendorf, set out as missionaries to conquer the heathen world for Christ, two of their number went to the Island of St. Thomas to preach to the slaves there; but, finding that the condition of society forbid all access to them, they voluntarily sold themselves for slaves, that they might teach them and bear the message of life. This is the nearest approach in the annals of time to the humiliation and love of Jesus Christ, and mightily indorses the necessity of having become flesh to reach us, and that we might feel that he was "touched with the feeling of our infirmity."

If the inhabitants of that world resemble us in moral constitution, sin renders them unhappy. It seems reasonable, also, that like a thorn in the flesh, it must be extracted to alleviate the pain. In this world, pain is our friend; it is God's monitor of increasing pain and ultimate ruin, if the cause be not removed; and the principle does not seem strange at that instant. The slightest febrile excitement, the almost imperceptible nausea, and such like delicate intimations of the approach of some hostile influence into the system, at first only suggest the expulsion of the foe; but if neglected, the modest monitors begin to raise alarms and tumults, and never cease their warnings till death dispenses with their services. One might say that thorns up there produce no pain, and that sin meets no punishment; but it is as unthinkable as that three and three, with them, do not make six; that they have no law of gravitation, or that they make no distinction between right and wrong.

If sin remains in their souls for a decade, a century, or a millennium, our philosophers fail to see how the attendant pain can have a shorter term. The presence of sin and pain seem on principle to be coetaneous; and if so, it is useless to argue the question of endless punishment, as it all turns upon the question of forgiveness of the sin and its removal from the soul. Some think it safe enough to ignore the necessity of justification through Christ, and weigh anchor for the shoreless sea in uncertain hope; but to say the best of this, it is unsafe, and it will be better for the Marsians not to risk it. Moreover, if moral conditions become unalterable there, as well as here, he that is filthy at the end of his probationary state, will be filthy still. Neglected education incurs an ignorant old age. Slothfulness sowed no seed in its season, and the crop is forever lost; the practiced scoundrel, whose "eyes are full of adultery, and that cannot cease from sin," amid all the good influences of civilization and religion, will scarcely surrender sin in the next world, nor escape its penalty—all of which suggests the policy of disengaging sin in this life, and before the Gorgon head of death has stereotyped it forever in the soul.

It is not unreasonable to suppose that rationalists on that world insist upon the harmlessness of sin, and the uselessness of alarm on account of it, nor to suppose that their theologians resist them with some such argument as this: "Suppose some mighty Spirit had power and disposition to break the centrifugal force of our world, and send it hurriedly, pole over pole, to the sun, or snap the centripetal chord and let it fly to the other side of the dog-star—it is nothing but a sin against physical things, and yet utter physical disaster results. Or sever the jugular veins of the body—it is only a sin, and can be perpetrated in a moment. A soul breaks away from God, into darkness, coldness, and disaster irreparable, by nothing but a sin that may be committed in an hour. Nor is the duration of such consequences to be measured by the time occupied in sinning. As malaria, the sword, or an explosion may, in a moment, damage what ages cannot repair, sin once accepted and cherished may so disrupt the texture of the moral nature, that eternity may not be able to mend the breach. As even a homeopathic dose of virus taken up by the absorbents into the circulation develops convulsions and death, the smallest sin, if entertained and loved, becomes the seed of inevitable ruin to the soul.

Unless two and two make four here, and forty there; unless all the angles of a triangle are equal to two right angles here, and five there; unless justice, mercy, and truth are commendable here, and indifferent there; and every other mathematical and moral principle is subverted as soon as transported to another world—there can be no fairness in rejecting the above reasoning of our neighbor theologian. The skeptic is defeated and the preacher triumphant, as to the nature of sin. Moreover, should that world ever dash off into depths of space, where comets tarry in their unknown aphelions, it would possess no inherent power of returning to its orbit. Gravitation cannot bring it back. A broken law can never redeem an offender. A miracle only could restore it to its place. God might move the whole solar system right after it, until its own orbit would overtake it, and establish its former relations. And should our foreign evangelist reason that, when man became "a wandering star for whom was reserved the blackness of darkness forever," it required the Sun of righteousness, with the angels and the whole system of Divine influences, to move after him to overtake him in his helplessness, and bring him back to his forgiving God, it would be useless for friend or foe to deny the force of his logic.

While every fundamental principle of the Christian religion, viewed at such a visual distance, would be equally justified at the bar of sound philosophy and common sense, our limits forbid a progress into other specifications beyond the following, which illustrates the inconsistency of skepticism in rejecting Divine revelation as an aid to the soul. The rationalist is Paul's "natural man, who receiveth not the things of the Spirit;" denies revelation, and depends wholly upon the sensuous inlets to the mind for all he knows of the spiritual universe. The things of the Spirit he "cannot know," because he rejects the source of such knowledge. The ear cannot detect color, nor the eye sound. No more can our five senses discern that which is only discerned by revelation. And why should not the soul need Divine assistance in the discharge of its highest functions, as well as the body and the intellect? No man depends upon his own muscular force for every physical effect. He subsidizes the muscles of the more massive animals, the water-fall, the wind, steam, gunpowder, nitro-glycerine, and other natural agencies, to supplement his natural weakness. In locomotion, we accept the steamship, rail-cars, and would like to navigate the air. To aid the senses, we accept the ear-trumpet, magnifying-glasses, and many other supplements to their weakness. The intellect may harness the lightning, and in a moment flash its thought around the world; but the soul, depending upon the bodily senses, slow and sluggish, must go afoot. The intellect may invent a spectroscope, and erect every ray of light from the most distant world into as many telegraph-lines, revealing with unerring certainty its physical constitution and characteristics, and yet faith is denied to the soul to bring a knowledge of that world with which *it* is most concerned. As well might you deny an astronomer all knowledge of the sun until he visit it. But as the body and the mind both subsidize other abilities to strengthen and lengthen their reach beyond what is natural to themselves, there is no reason why the soul should not be allowed to "receive the things of the Spirit;" and, erecting faith as its telescope, accept every ray of light from the throne of God, that tells it of things not seen. The light of science brings no redemption to the sinful soul. The telespectroscope tells us much of light from distant worlds, but knows nothing of "the light of the knowledge of the glory of God." This is revealed only by the Spirit, to supplement the weakness of the soul.

But does God take care of beings so insignificant as the men of Mars? Are the hairs of their heads all numbered? David said, "Lord, what is man, that thou art mindful of him?" There being no telescopes for twenty-six hundred years after his death, he could count about one thousand stars only. Had he known of the one hundred million now known to be in our universe, and of the six thousand other universes that lie in space at inconceivable distances from us, and from each other; and had the fact then been revealed, as it is now, that two-thirds of those nebular-looking universes are already organized into solid worlds, and the other third in a gaseous state constituting so many laboratories for world-building, with all their physical laws and all their tenantry of land and sea—he would have put the above question with an emphasis inconceivable at that time. Is it reasonable that the Architect of all these should say to man, "I will never leave thee, nor forsake thee?" Do their sparrows not fall without the Father? or is he too much engaged in universe-building, laying off infinite space in centers, circumferences, and orbits, and arranging centripetals, centrifugals, eclipses, and periods, to notice such an entity as man? To this question, which to many hearts is no stranger, nor very welcome, the following replies may be made:

1. The Almighty bestows care on the whole animal creation, that is of far less consequence than man. "How much better is a man than a sheep!" "Ye are of more value than many sparrows." Think of the animalcula, myriads of which can frolic in a drop of water for a lifetime. All these "receive their meat from God," who supplies "the wants of every living thing." He took time to order them into existence, made their frames, laid every tiny muscle to its place, established their circulation and pulsation. If these infinitesimals populate the planet Mars, and God cares for them, he surely would not consider it lost time to care for those who are only "a little lower than the angels," spiritually, and are at least halfway from nihility to infinity, even in their physical proportions.

2. The greatest minds among men are those that can manage the largest transactions in business, and at the same time attend to all the minutest details thereof. Infinite power reaches to infinity in both directions, and expresses itself as mightily in the generation and preservation of the minutest existence, as in conferring luminosity upon the morning-star. Fear not, then, little flock. "It is the Father's good pleasure to give you the kingdom." You shall judge the world. You shall judge angels.

3. But the chief consideration is found in the infinite love of God for immortal souls, made originally in his own image, and then renewed in knowledge after the image of him that created them. The value of the spirit is not to be estimated by the avoirdupois of the house it lives in. No physical in-

tegers can weigh, measure, or value it. Nor can its temporary alliance with matter discount its value as a spirit, which can take up the wings of the morning and fly to the uttermost parts of the east, to Sirius or Orion, and bring back intelligence almost divine, while the body had never been able to leave its heavy home. Add to this its constant growth in grace and in likeness to the Divine image, its justification and adoption into the family of God, its having come already "to Mount Zion, to the city of the living God, the heavenly Jerusalem, and to the innumerable company of angels;" and we can see why "the Father of our spirits" "is not ashamed to be called their God." Hence, "He has prepared for them a city." "Blessed are they that do His commandments, for they shall have a right to the tree of life, and shall enter in through the gates into the city."

Here we leave our subject and our readers, uncertain whether our excursion will prove as beneficial to any other as it has to the writer. Some things look well enough at home, but very ludicrous abroad, when seen under other circumstances. We have taken ten of the most fundamental principles of the Christian religion, and have set them off far enough to be judged of without any embarrassing proximity of the evidences, and find them all to proclaim their divinity there, no less than here. We return with a fuller conviction than ever, that Jesus is the Christ; and are persuaded that it would be no less difficult to change the principles of his religion than to change the principles of mathematics or the laws that govern all physical things; and hence our "hope of eternal life, which God, who cannot lie, promised before the world began."

A LIMIT TO THE HEIGHT OF THE ATMOSPHERE.—No. 3.

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

(*Conclusion.*)

Now let us endeavor to deduce the height of the atmosphere, and thus comply with the third and last proposition. We cannot expect to get at the height exactly, but we certainly can approximate it very closely. If the earth was devoid of an atmosphere, we should be involved in total darkness from the instant of sunset till the instant of sunrise.

The transition, however, from day to night and from night to day occupies an interval which varies with the latitude and the declination of the sun. This intermediate stage is called twilight. Morning twilight is called *aurora*, and evening twilight *crepusculum*; the cause of both is the same. Twilight is due to the reflection and refraction of the sun's light by that portion of the atmosphere which is still illuminated by the sun's rays after he has set to us, or a similiar portion on which he shines before he rises in the morning. At the equator twilight lasts one hour and twelve minutes, or 1-10 of semi-circumference, which is equal to eighteen degs. When the sun has descended so far as not to illuminate any of the atmosphere which lies above the horizon, twilight is at an end. "It* is assumed when the sun has reached this position, in which no portion of air that lies above the horizon is directly illuminated, faint stars will become visible over the western horizon, and thus that the end of evening twilight is definitely marked by the appearance of such stars In like manner morning twilight is astronomically defined as beginning when faint stars situated in the eastern horizon begin to disappear." Therefore as long as the sun is not more than eighteen degs. below the horizon, its light is reflected by the air, the clouds and vapors suspended in it, in sufficient quantity to render even distant objects visible.

If the earth's atmosphere were more extensive than it is, the twilight would of course be longer, since the sun would not cease to illuminate the higher portions of the atmosphere until more than 18 deg. below the horizon; and if the atmosphere were less extensive, the reverse of this would be the case.

Knowing, then, the depression of the sun (18 deg. mean) requisite for the cessation of twilight, the approximate extent of height of the atmosphere has been calculated. In the calculation, the curvature of the incident and reflected ray due to refraction must be taken into account. Without this correction, the result would be 49·3 miles; with it, however, about forty-five miles in height. *

Sir J. Herschel† states that "a secondary twilight may be traced even beyond the height mentioned, consequent on a re-reflection of rays dispersed through the atmosphere in the primary one. The phenomenon seen in the clear atmosphere of the Nubian desert, described by travelers as the 'after glow,' would [he says] seem to rise from this cause."

We must bear in mind one fact, and that is that the atmosphere must have a certain density before light will affect it so as to send a sensible amount of reflected light to the eye of the observer through the intervening body of air.

The following table shows the density of the atmosphere above the earth at various heights:‡

Height above the sea in miles.	Height of the Barometer in inches.	Density of the air, sea level = 1.	Pressure in pounds to the square inch.
0	30	1	15
3·4	15	½	7·5
6·8	7·5	¼	3·75
10·2	3·75	⅛	1·875
13·6	1·87	1/16	0·9375
44·2	0·0036	1/8192	0·0018
47·6	0·0018	1/16384	0·0009
51·	0·0009	1/32768	0·0004

At the height of 13·6 miles, the air would be rarer than hydrogen. At the height of fifty miles, the mercury would be elevated about one-thousandth of an inch, and the air would be less than one-thirty thousandth of its density at the sea level, and, according to Prof. Norton, at this height the limit of the atmosphere is practically reached.

Prof. Norton says that "the intense cold of the upper limits of the atmosphere tends to diminish the expansion of the air, by diminishing the repulsion between its molecules, so that it is probable that the height does not exceed forty-five miles;" and he claims that this result is confirmed by the phenomena of refraction of the heavenly bodies. The speculation as to the distance a supposed molecule could travel without encountering another molecule at a height of 200 or 300 miles (321·8 to 482·7 km.), as given by Daniel, is shown by Prof. Norton to be erroneous, as the intense cold of the upper limits of the atmosphere would tend to diminish the expansion of the air by diminishing the repulsion between the molecules. Daniel does not seem to have taken this factor into account. As I have stated before, the minute that cohesive force and gravity get the best of the heat present in the air, that minute we arrive at the limit to the expansion of the air; and if we knew this point, as I have deduced the limit where the centrifugal force caused by the earth's rotation gets the best of gravity, we could easily assign to the atmosphere its true average height.

I say average, for the upper surface of the atmosphere must be like the surface of the ocean, always in wave motion, as the heat in the atmosphere fluctuates up and down.

It is a simple matter of calculation to show that if the atmosphere were everywhere of the same density as at the level of the sea, its height would be 5·2 miles; for the height of the atmosphere required to balance the column of mercury in the barometer would be 11,000×28·922 inches (742 mm.), or 27,400 feet (8·352 km.), where 11,000 represents the density of mercury compared with air.

The pressure of air may therefore be reckoned as equal to a column 5·2 miles (8·369 km.) high, having throughout a density equal to that of the air at sea level.

I have calculated the weight of the atmosphere, and find it to be 5,866,973,781,969,539·2936 tons, and have also calculated what its height should be if it had a uniform density, as that at sea level, and I have done this by an entirely new method.

Experiment has shown that 1·604 ounces (45·467 grms.) of solid oxygen occupies 2·82 cu. in. (46·25 c. c.), therefore one ton will occupy 32,587 cu. ft. (688·31 cu. dec). It has also been found that 687·3 vols of gaseous oxygen are condensed into one in the solid form.

From this data, with a little labor, I have found that if the atmosphere consisted alone of oxygen gas, the height it would have at 32 deg. F. (0 deg. C.) and at density of sea level would be 4·53 miles (7·29 km.), instead of 5 miles (8·05 km.), as deduced above. As, however, four-fifths of the air is nitrogen, and a somewhat larger volume of nitrogen must be compressed into one to form the solid, the difference—0·67 of a mile—would be made up to 5·2 miles, which proves the correctness of the two calculations.

The next step is to find out from this data the height of the atmosphere in its expanded condition. This I have attempted to do also by a new method, which I will proceed to describe.

Taking the average temperature of the air as 60 deg. F. (15·55 deg. C.), and the temperature of space as —60 deg. F. (—51·11 deg. C.), as calculated by Fourier, we can call the average temperature throughout the atmosphere from the earth to its height one-half, or —33·33 deg. C. (—27·98 deg. F.). There will therefore be 33·33 Centigrade heat units to disappear as mechanical work doing expansion.

Now the next step is to find out the true value of a heat unit when all of its energy is used in expanding the air, and none of it in raising the temperature. We know that a gas expands 1-273 of its volume for each rise in temperature of 1 deg. C. (or 1-491 for each rise in temperature of 1 deg. F.); but in this case the heat unit not only has to do the work of overcoming cohesive force, and thus expanding the air, but of raising the temperature at the same time. This result is not, therefore, what is required.

We can, however, from analogy deduce its value. When water at 100 deg. C. (212 deg. F.) is converted into steam of 100 deg. C. (212 deg. F.), its increase of volume, as stated before, is 1,695. This expansion is accomplished by 536·5 heat units, and from this we deduce the expansive value of a heat unit as equal to 3·15. Now, as we have 33·33 heat units, their total value would be 104. Applying this deduction to the number of cubic miles of atmosphere of equal density, which is 949,882,378·683 cubic miles. I have deduced the height of the atmosphere to be 49.83 miles, or, in round numbers, fifty miles (80·45 km.). This result not only agrees with the deductions made by Prof. Norton, but agrees with the deductions made from the phenomena of twilight, which fixes the height at forty-five miles (72·4 km.). There is undoubtedly five miles of atmosphere of too small a density to reflect light, and this added to the forty-five miles makes fifty miles (80·45 km.) as the probable height of the atmosphere.

* Norton's Astronomy p. 156.

* See Johnson's Cyc., Twilight; S. Alexander.

† Outlines of Astronomy.

‡ See Nat. Phil., S. A. Norton, p. 187.

As I have cited cases where astronomers have stated that meteorites have been observed at the height of over 100 miles (160·9 km.), it may be well before closing this paper to allude briefly to such results.

It must be admitted at the start that great difficulty arises when we try to calculate the height of meteorites, owing to their limited duration and the fact that they seldom leave a persistent streak of light; again, it is necessary that two observers must not only see the same meteor from different stations, but at the same time. All these considerations cast some distrust on the various heights to the atmosphere which have been assigned from such phenomena. It is perfectly evident that no meteorites have been seen as high as 210 miles, when we take the molecular theory of the constitution of matter into consideration; for Daniel* tells us that at such a height there are only 1,000 molecules in a cubic centimeter, and that each molecule can travel through a uniform atmosphere of that density sixty million miles without entering into collision. And Daniel furthes tells us that the supposed ether, according to Clerk Maxwell, has the same density as the air at that height, or $\frac{1}{10000000000000000000}$ that of water. This being the case, a meteorite would not have to strike the atmosphere to be rendered incandescent, for its travel through the ether would accomplish this result.

It is not even reasonable to assume that a medium of one hundred-millionth of an atmosphere, or the density the air would have at about ninety miles (144·81 km.) above the earth, could offer sufficient frictional resistance to render a meteorite incandescent; for by calculation it is easy to show that not even one per cent. of the space is occupied by the oxygen and hydrogen molecules, in fact only sixteen ten-billionths of the space is so occupied; the rest must be empty.

Even at the height of sixty-eight miles (109·42 km.), where the density would be one-millionth, it is not reasonable to assume sufficient frictional resistance, for the molecules at this height only occupy one hundred and sixty-one hundred-millionths of the space; that is to say, in a cubic foot of such air the oxygen and nitrogen would only occupy one hundred and sixty-one hundred-millionths of the space; the rest would be vacant so far as the constituents of the air are concerned.

At fifty miles (80·45 km.) in height we find that five hundred and seventy-three ten millionths of the space† is occupied by the constituents of the air, and the density is about 1-28000 of that of the sea level. I do not think it is reasonable to assume that a medium less dense would be able to offer sufficient frictional resistance to a meteorite passing through it so as to heat the same to incandescence. For these reasons, and others that I have mentioned, I do not consider the various heights assigned to meteors by astronomers as reliable.

It must be understood that inasmuch as I do not believe in the molecular theory of the constitution of matter, but do believe that matter is perfectly homogeneous throughout, it naturally follows on this theory that at a height of fifty miles (80·45 km.) the air is still homeogeneous, occupying the whole of the space; it being simply expanded, dilated, or thinned out, every portion being expanded just to the extent that the heat present has overcome the cohesive and gravital attractive forces.

To close this paper, I would state that I have established the fact *that if the atmosphere is limited* in height, the height must be below 22,329·1156 miles (35,928·82 km.): also that *the height of the atmosphere is limited*, and *that its probable height is fifty miles above the earth.*

* Prin. of Phys., pp. 224 and 208.

† The number of molecules in 1 cu. c., according to Sir Wm. Thomson is 6,000,000,000,000,000,000,000. In air of $\frac{1}{28000}$ density at 50 miles there would be 214,300,000,000,000,000. Molecules in cu. inch = 3,505,519,800,000,000,000. Diam. of molecule = $\frac{8}{10000000}$ mm. Volume of a molecule = 0.00000000000000000028808 cu. mm. ∴ 0.0000573 cu inch is the space occupied by all the molecules = $\frac{573}{10000000}$ cu. in.

NOT CHARGED WITH HERESY.

BY REV. T. M. WALKER.

It will, without doubt, be regretted by many of the friends of THE ARENA, that the article of Dr. Swander, "Charged with Heresy," found a place in its pages. This article may be taken as evidence that the writer is either too dull to see a point, or is so far under the influence of prejudice that he will not see; or else jumps at conclusions without due investigation. The Andover trial is not on the trial of heresy, but on the charge of breach of trust, which is certainly a very different thing. Andover Theological Seminary was built and endowed by men who held a certain theological system. They determined that nothing should be taught in this institution that did not conform to that system. They hedged this purpose about as thoroughly as written documents could do it; even to the requirement that each Professor should, as often as once in five years, in the most solemn manner, give in his adhesion to this system. Whether this system is true or not, or whether these men were wise in what they did, is not the question. But had they the right to do this thing? That they had this right, no one, not even Dr. Swander, will deny. The charge simply is that these professors are holding professorships in this institution and drawing their salaries from the money contributed by these men while they are teaching doctrines subversive of this system. If such charges are brought against these professors ought they not to be tried? And if found guilty ought they not to be expelled, even if Andover never has another professor or student to the end of time? Would not this be better than that the expressed will of the dead in regard to the use of money that they had contributed be trampled under foot? If these men will go out and build and endow an institution of their own no one will object to their teaching therein anything that their fancy or their convictions might dictate, whether it might be the baldest Antinomeanism, or Swedenborgianism, or Universalism, or Mormonism, or Ingersollism, and they would be defended in their right by all classes and creeds. This, then, is not a trial for "heresy" as Dr. Swander would have us believe. Such a trial may or may not be hereafter instituted by the association of which they are members. And would *this* be wrong? Has not every family the right to preserve its own unity and purity according to its own view of these things? This everlasting twaddle about heresy-hunting is most disreputable, as if an organized community has not the right to rid itself of traitors to its cause and its principles—it matters not what these principles may be—good, bad, or indifferent; and it shows a want of common courtesy for outsiders to interfere or even criticise.

If Dr. Swander were to employ a man to come into his family and teach his children, giving satisfactory evidence that his views and principles were in harmony with the Doctor's, and afterward some of his children would charge this man with teaching them Mormon doctrine and Mormon practice, it would, I think, not be too much to say that the doctor would hardly wait for a formal trial but would eject him from the house without ceremony, and think any one impudent that even criticised him for what he did, and yet he would not have a word to say if that man taught his doctrine in his own family or in a Mormon community. Or if a minister should be received into a Universalist Association and be installed pastor of a Universalist Church, and afterward preach in that church the doctrine of eternal damnation, every lover of honesty would say that he ought to be expelled from that church and that association in no gentle manner. And not because of his heresy, but because of his breach of trust he ought to be held in contempt by all honorable men.

From cant on "Progressive Thought" and universal charity, as well as from any other pious cant, "Good Lord, deliver us!"

CHRISTIANITY versus MYTHOLOGY.

BY PROF. G. R. HAND.

An inspired apostle says: "For we have not followed cunningly devised fables, when we made known to you the power and coming of our Lord Jesus Christ, but were eye-witnesses of his majesty."—2 Pet. i. 16.

I. Analysis and Scope of the Theme.

(*a.*) In the above quoted sentence, are two kinds of religion placed in antithesis, which it is the purpose of this paper briefly to examine antithetically.

(*b.*) The one of these religions is maintained and enjoined, the other is ignored.

(*c.*) The statements are reiterated in view of his dissolution which he knew was approaching, and of which he says: "Knowing that shortly I must put off this my tabernacle." (14).

(*d.*) He calls this his "decease," (15), showing that the tabernacle put off at death, is the body, "even as our Lord Jesus Christ hath showed me."

(*e.*) This "showing" is found (John xxi. 18) where Jesus reminds Peter that when young he girded himself and went where he pleased; but informed him that when older he should stretch forth, or extend, his hands and another should gird him and lead or carry him against his will, referring to the kind of death he should die.

(*f.*) This stretching out is understood to refer to a Roman custom, in which those to be crucified were made to put their necks into a yoke, and extend their hands to the extremities of the yoke, to be tied fast, and then to be led or carried through the city.

(*g.*) Substantialism is clearly recognized here, where an immaterial entity, the spirit, is dwelling in a material body, as in a tent or tabernacle, which is to be put off at death.

(*h.*) This written and permanent reminder is addressed to those of whom the apostle says: "Though ye know them, and be established in the present truth" (12).

II.—The Ignored Religion.

In the "cunningly devised fables" of our lesson, the word for "fables" in the original, means myths, or imaginary deities or things, and from which we have our word mythology, the teaching concerning the myths or imaginary deities of the Greeks, and comprising their systems of religion.

The most persistent efforts to find out God, or "the cause of all things," through nature, had been maintained by the Greek philosophers, within the six hundred years from Thales to Christ. In their philosophic researches after Theism, these philosophers stumbled upon Polytheism and Pantheism (Acts xvii. 22), and finally acknowledged agnosticism (Acts xvii. 23), leaving behind them the monumental inscription: "To the Unknown God," as a witness in coming ages, of the disastrous failure to find out God, without the aid of his revealed word.

The cunningly devised fables of mythology, clothed in fantastic drapery, the myths evolved in the explorations of Grecian philosophy.

Clothed in the majesty of atmospheric meteorology, and panoplied with scathing lightning, and awe-inspiring thunder-bolts, their superior deity, Jupiter was honored with a throne on Mount Olympus. If a man was struck by lightning as we would say very cunningly it was taught that Jupiter killed that man. The name of Jupiter, the greatest of their gods, is perpetuated in the largest planet of our Solar system.

Then the Muses, "the sacred nine," were assigned poetic realms on Mt. Parnassus and Mt. Helicon. Thither the poet, mounting his flying horse, Pegasus, steered his aerial flight, in quest of fresh draughts of inspiration. Astronomy perpetuates the name of the poet's flying horse, in that large constellation in which, by conspicuous stars, may be traced "The Square of Pegasus."

But Young America, ignoring Pegasus, besieges Jupiter in his mountain home, adroitly spikes his thunder-cannon, and safely leads his lightning down to earth; and lassoed lightning leaps along the living lines of light and thought.

Down in ocean's depths was assigned the dominion of Neptune, whose calm, watery world was sometimes invaded by Eolius, the god of the winds. Then the cunningly-devised fables wove a warlike mantle for the belligerent scene. As Eolius, unbidden, riding upon the wings of the wind, disturbs the placid surface of Neptune's dominions, and raises the serried ranks of crested waves, a war is said to be inaugurated between the god of the winds and the god of the waters. The long ranges of crested waves, like ranks of soldiers, are pointed to as evidence that insulted Neptune has "his back up," and resents the intrusion.

Then old Boreas, the special god of the north wind, sometimes came down in his fury and made things lively.

The Euroclydon (Acts xxvii. 14) seems to have been a Boreal wind, as it rose against the south wind on this occasion, and usually came down the coast of Asia Minor. Notus was the south wind, and here Boreas and Notus seem to have been in opposition. But Euroclydon was supposed to be from a more easterly direction, etymologically, as Eurus was the east wind.

But Young America comes to the front again and fathoms the depths of Neptune's domain, and lays the submarine cable. And now the lassoed lightning, wrested from Jupiter's control, bears telegrams through aerial and submarine realms, undisturbed by Eolius or Neptune.

But mythology had its oracles, where the gods were said to speak to those who consulted them. Fables cunningly devised shrouded these oracles in mystery and supernatural awe. The responses of the oracles were studiously ambiguous, so that it might mean this or that, or the opposite at pleasure.

III.—THE REVEALED RELIGION.

Passing the negative we now come to the affirmative declaration, that the apostles had revealed or made known: "The power and coming of our Lord Jesus Christ."

The evidence of his "power" (*dunamin*) had been manifested in his miracles, power over diseases, over the winds and waves, over gravitation, over material elements, over death and the unseen world, and his ability to confer miraculous powers upon his apostles.

His "coming" (*parousian*), more literally presence or appearance, had been assured, during his personal ministry of three-and-a-half years on earth, and the presence of the Holy Spirit, according to his promise, sent down from heaven, after his ascension and coronation. In "the present truth," above quoted, (12) the word "present" is from an adjective form of this same "*parousian*," here rendered, "coming," in the common version. The truth had come, and was present.

While the oracles of mythology were studiously and purposely ambiguous, the oracles of God are as conspicuously unambiguous. God spoke to the fathers by prophets, and has spoken to us by his Son. See Heb. i. 1-4. The message "to the fathers" is in the Old Testament, that "to us" is in the New.

In our lesson the apostle refers to the oracle uttered on the Mount of Transfiguration. (17.)

On the mount, in garments of light and radiant glory, Jesus appears to three of the apostles, in the presence of Moses and Elijah, when God speaks from heaven, and transfers the authority from Moses, the lawgiver, to Jesus, the new lawgiver, in the memorable oracle: "This is my beloved Son, in whom I am well pleased: hear ye him." Matt. xvii. 5.

Submit this oracle to the most crucial tests of significance, and, unlike the oracles of mythology, it comes out of the fiery ordeal without the smell of fire upon the skirts of its unmistakably unambiguous oracular decision.

Try the proposition in the first clause: "This is My Son." If ambiguity lurks in this clause it will be found in some of the words. The subject of the proposition, "this," cannot be ambiguous. It cannot mean Peter and James and John, for they are the persons addressed in answer to Peter's proposition. It cannot mean Moses and Elijah, for when the apostles looked, they saw none but Jesus present. It cannot mean God, for he is the speaker, and "this," is used in the third person. That it does mean Jesus, is as plain and clear as the significant light then radiating from his face, as he stood in their presence.

Next take "is," the copula of the predicate. This truthful little word never prevaricates, except by implication when in bad company. This word is used to predicate something of the subject, and may predicate quality, action, class, etc. Here it predicates class, in positive affirmation with no room for ambiguity.

Now try the predicate "son," a relationship entirely unambiguous, predicated of the subject, and for which the substitution of any other relationship in the sentence is excluded.

Finally, interview the pronoun "my," which indicates the person to whom the relation of "son" is sustained. It cannot mean Peter, or James, or John, for then it should be in the second person, as they are the persons addressed. It cannot mean Moses, or Elijah, for then it would be in the third person. But "my" is in the first person, and represents the speaker; and as God is the speaker on this occasion, it shows that God is the person to whom Jesus sustains the relationship of son. In like manner, try all the words of the sentence, and arrive at the conclusion that God's oracles are unambiguous. The antithesis in this feature, then, is abundantly sustained.

IV.—WHEN MADE KNOWN.

Can we locate the time when this triumphant "Power and coming of the Lord Jesus Christ" was first "made known" to the world? Do I hear some one suggest that, as Peter, in our lesson, refers to the transfiguration, they must have commenced telling it, as soon as they came down from the mount? Then read a little farther, and stand corrected. "And as they came down from the mountain, Jesus charged them, saying, Tell the vision to no man, till the Son of Man be risen again from the dead." Matt. xvii. 9.

So their lips are sealed for a time.

You read again, after the resurrection, Jesus said to them, "all power [authority] is given to me in heaven and in earth. Go ye, therefore." Matt. xxviii. 18. You say, of course they begin now. No, they are again restrained. Read again: "And ye are witnesses of these things. And behold I send the promise of the Father upon you; but tarry ye in the city of Jerusalem until ye be endued with power from on high." Luke xxiv. 48, 49.

Should you desire to know when this "power from on high" may be expected, read again: "But ye shall receive power, after that the Holy Ghost is come upon you, and ye shall be witnesses unto me." Acts i. 8. This restrains them from beginning till after the ascension, and descent of the Holy Spirit from heaven.

You ask again when the Holy Spirit came. Read the next chapter and you find the Holy Spirit came according to divine promise and apostolic expectation, on the first Pentecost after the resurrection. And the apostles received the promised power, and then and there "made known the power and coming of our Lord Jesus Christ." Acts ii. 1—36.

The culmination of this announcement of the glorification of Christ is in the thirty-sixth verse, and reads: "Therefore let all the house of Israel know assuredly that God hath made that same Jesus, whom ye have crucified, both Lord and Christ."

Now the announcement is made, the triumph "made known," and Christianity, established upon a sure basis, commences its career of glorious achievements in conquering the powers of darkness, and leading the race of man into a higher civilization than cunningly-devised fables could ever inaugurate.

SAN DIEGO, CAL.

THE REFORMED CHURCH QUARTERLY AND THE OBJECTIVE IN CHRISTIANITY.

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

REV. THOMAS G. APPLE, D. D., LL. D., of Lancaster, Pa., is a gentlemen, a scholar and a Christian for whom the writer is proud to cherish sentiments of unfeigned love and respect. His views on questions of Christian philosophy are received and considered with deferential regard by those who for more than a quarter of a century have watched the gradual unfolding of his symmetrical manhood, and the outgivings of his modest yet mighty pen. He is now generally regarded as the fairest and most moderate representative of the Mercersburg Philosophy. For some years, or since Dr. J. Williamson Nevin passed into the superannuated list of intellectual giants, Dr. Apple has been looked upon by many as bearing something like an oracular relation to the Mercersburg School of thought. The truth of this remark is further confirmed by the fact that he is President of the college, a Professor of Theology in the seminary, and editor of the *Reformed Church Quarterly* in which the fundamental principles of that philosophy are allowed to be taught, and through which they are advocated before the world.

The October number of the aforenamed *Quarterly* was opened with a very clear and able editorial from the Doctor's instructive pen. We allude to the article in this connection because we regard it as affording a proper occasion to express the views and criticisms about to shape themselves in the paragraphs of this paper. The article is valuable, not only for its own intrinsic excellence, but also for what it may fairly be supposed to represent of the teachings of that particular school of philosophy which called the *Quarterly* into being, and which has sustained it for nearly forty years in some of the most interesting and important theological conflicts ever waged in this country in behalf of fundamental truth. Of course the contributors for the *Quarterly* are individually responsible for the sentiments which they may respectively advance and advocate in its pages—and some

of them proclaim views not in harmony with the teachings of Mercersburg Philosophy; yet it would not be reasonable to presume that the consistent and conscientious editor of a great religious and literary magazine would use its pages and his own pen to promulgate principles at variance with the cardinal tenets of philosophy in whose interests the magazine was started, and to whose support and defense the Editor was thoughtfully selected and appointed. It may then be fairly inferred that whatever excellent things Dr. Apple may say in the *Reformed Church Quarterly* is largely, if not unqualifiedly exponential of the Mercersburg School of Philosophy.

The very able editorial referred to in the foregoing paragraph is a discussion of "The Objective in Christianity." The first part is devoted to a brief review of the old conflict in the Middle Ages between realism and nominalism. The learned Doctor very correctly holds that the truth lies in a qualified realism. This is also generally admitted to be the position of Mercersburg Philosophy, so far as that question is involved in its teachings. Dr. Apple's editorial may therefore be regarded as a fair and faithful presentation of the doctrine as held by the Mercersburg School. He does not call it the real in Christianity, although there is no good reason why it should not be thus denominated. Realism is in contrast with nominalism, while the objective is in antithesis to the subjective. While the two forces are "constantly and mutually interactive" in solving the problem of human destiny, the objective is real and independent of human apprehension and experience, even as sound—an objective form of force in nature—does not depend upon the sensation of hearing. The editor understands the use of terms, and is to be congratulated upon his calling of his excellent paper by the right name—"The Objective in Christianity."

Well, what does the doctor mean by the real or objective in Christianity? A few quotations from his article will make his meaning obvious, and also tend to show what the Mercersburg School of Philosophy means in the employment of such and similar language. Hear him on pages 426–431: "Humanity in its development in the sphere of time, in the order of the natural, phenomenal world, is joined with an invisible world that is eternal. The spiritual world underlies and supports the natural world at all points. Though man himself is finite, the infinite flows into and through him. Though he lives in time the eternal sounds through him. Humanity as a whole is intoned from the spiritual realm, and every individual human life strikes its roots within the same. In various ways a sense of his relationship on the part of man to a spiritual realm that stands in the sphere of the absolute, reveals itself in his consciousness and in his unfolding life. Every line of thought which his intelligence pursues leads off into the infinite and absolute. It is not only in pure metaphysics that this question in regard to the absolute is raised, it overshadows *every* science. . . . For it must be conceded that there are depths in the human soul that consciousness in its ordinary exercise does not penetrate. Consequently there is more in the life of man than he himself knows—than he can bring into forms of conscious thought. . . . Now, just as human life is of this twofold character, so Christianity is both objective and subjective, general and individual. It is a life in its individual subjects, constituting each one of its subjects a new creature, but it is also a general constitution. . . . What we mean by the *Objective in Christianity* is just this organic constitution, the generic factor of Christianity as distinguished from subjective individual Christian experience."

Now the foregoing passages are not only a truthful representation of Mercersburg Philosophy, but also the utterance of a great truth without reference to any particular school of philosophic thought. We say great truth, not only because of the excellency which the truth always possesses, but also because of the practical effect its teachings are having upon the theology of the age. It is already bringing forth fruit in its season. It is echoed from the classic walls of Andover, and enjoyed by thousands who know nothing about it as an element in philosophy. Such apprehension of the truth is, under God, beginning to save this country from the delusion of humanitarian gush, from subjective sensationalism of the sickliest sort, and from the consequent damnation of downright infidelity.

But, in order to greater clearness, it may again be asked: What is meant by the "objective" in Christianity? Does it mean the material—that which may be seen through the eyes, or handled with the hands, or tasted with the mouth? Does it mean those entities incorporated in the Christian economy which may be weighed by balances, computed by figures, or analyzed by chemical test? Does it mean the literal bread and wine and water of the sacraments? Does it mean the material paper of the book, and the vellum of the ancient manuscripts which are supposed to enshrine the mind of God? Does it mean the outward organization, the written constitutions, the Gothic domes and cathedral spires of Christendom? Oh, no! say the Mercersburg theologians. While the substantially objective in Christianity must of constitutional necessity take outward form, it lies back of all manifestation and phenomena thereof. According to the language of its liturgy, "it is a new order of *life* and *power* in the world, extending with real unbroken succession from the day of Pentecost onward continually to the end of time." Mercensburg Philosophy therefore teaches that in what it calls the "spiritual realm" there is objectivity, entativity, life and power, and that these underlie and uphold all things material and phenomenal connected therewith. In a word, Mercensburg Philosophy teaches Substantialism at one end of God's graduated order of beings and *shows its inconsistency by failing to recognize and teach it at the other.*

The same number of the *Review*, which was enriched by Dr. Apple's most excellent article, contained also a paper from the pen of another Mercensburg philosopher, in which, on page 504, he exposes his half-disguised purpose by breathing out such harmless epithets as "charlatan," "crank" and "sciolist" upon those who contend for recognition of the objectivity of being outside of the "spiritual realm." For this, after all, is just what Dr. Hall teaches to be the case in every department of the universe. Why this peevish petulance on the part of the Professor in writing about the "scope of science"? Why his half-disguised thrust at the founder of the Substantial Philosophy? Is it possible that he got behind the door and made mouths at the gun because the gunsmith had recently whipped him with the ramrod? The professor's paper, which in the main is full of excellent thought, contains some amusing things. Take the following in its connections:

"There is, however, another species of science, falsely so-called, which, although more respectable as to its paternity, from the scientific standpoint, is equally vicious in its methods, and mischievous in its tendency. It is that which goes upon the assumption that all objects of thought must be of the same order, that the data of science must be obtained in the same way, and that the results of investigation and induction in the sphere of nature must include the sum of all knowable things. Proceeding upon this assumption, the investigator goes to work armed with the scalpel, the microscope, the crucible, and the balances to unravel the mysteries of the universe. He finds that living matter does not differ in weight and chemical constitution; he can discover no substance or agent in the one that is not present in the other; he sees only different properties of the same kind of substance, and these properties, he says, are produced by the particular condition to which the substance is subjected. He concludes, therefore, that what we call life is only the result of chemical action, a property of matter; and protoplasm is only a molecular machine. . . . He can find no new agent; he sees only a chemical change in the structure of the nervous matter, and finds that this is accompanied by a peculiar experience on the part of a living being, which we call feeling or consciousness. He infers, accordingly, that consciousness is a property of living matter in certain conditions. In the same way, he resolves thought into the decomposition of brain substance, and with the reflex action of the nervous system. Thus he constructs a chain, the links of which are matter, life, consciousness, thought, and will; and when he is done, he tells you that he sees in matter 'the promise and potency' of all the manifestations of the universe. I have said that this kind of science is more respectable, as to its paternity, than the other, and so it is; for many of those who are responsible for such a conclusion in the name of science have done excellent work in their respective fields of labor, and have made for themselves brilliant reputations."

Now, does not Prof. S. know that this dangerous heresy in science as outlined in the foregoing quotation, and out of which the leading materialists of the world have "made for themselves brilliant reputations," is just the very heresy which that "sciolist," Dr. Hall, has analyzed and answered in the "Problem of Human Life"? Does he not know that the effectual work thus done received the encomiums of the Christian press and pulpits of this country, wherever the "scope" of scientific vision was not limited to the rut of unscientific and pharisaic narrowness? Note the Professor's language: This kind of science is "more respectable" than the other, *i. e.*, the infidelity, atheism, and materialism which deny the existence of a personal God, and the only substantial basis for a rational hope of immortality is "more respectable" than the truth which met and overthrew it. The damnable stuff taught by Tyndall, Haeckel, Bastian and Mills "more respectable" than the manifest teachings of Almighty God, which in these last days have been spoken to the world by that god-man whom the professor denominates a "sciolist." Great heavens! What a "scope of science!" "*More respectable?*" Indeed! Then Caiphas was more respectable than Jesus Christ. Then was the Sanhedrin more respectable than Paul. More respectable? Yes; upon the assumption that when rogues are in the majority crime is made honorable. When the "scope of science" is too wide to exclude popular error, or too narrow to include unpopular truth, the scholastic atheist is looked upon as "more respectable" than the man who has taken from him all his armor wherein he trusted. Such science may make for its advocates a "brilliant reputation" for a little while, but wait until the clouds roll by, and the pearly portals open to give down the approval of Almighty God.

Wait? We need not wait another moment. The approval is already being given. It is expressed even in the *Reformed Quarterly Review*. Dr. Apple sees the truth in a wider "scope of science." He is just as much of a Substantialist in theology and kindred branches of science as is Dr. Hall in the several branches of physics. His opening paper in the October *Review* is brimful of the Substantial Philosophy. The editor says that "the question of the absolute overshadows *every* science." In every science

the absolute, the real, the immaterial, and the objective must be held in their proper relation to each other. If Christianity involves objective realities back of all which belongs to it as merely phenomenal or experimental, why should the learned world lock its jaws in a fit of cold, convulsive silence, or take to calling ugly names when the same general truth is applied to the science of optics and acoustics as shown in Dr. Hall's writings, and as formulated in chapters IX. and X. of the writer's book entitled "The Substantial Philosophy"? The open-minded are coming to take this view of the matter. Let the good work go on until the "scope of science" shall be sufficiently widened and deepened to make room for something better than the "more respectable" infidels who are now ornamenting themselves with the "brilliant reputations" of "unscientific atheists."

FREMONT, O.

THE ANNULAR THEORY.—No. 1.

BY PROF. I. N. VAIL.

I have been asked many times, by parties interested in my former communications, why I have not written more on my favorite theme. I felt that it was necessary that my readers should have time to digest what I had written on this subject. I believe I may now enter once more into this amazingly fertile field, to the advantage of thinking men. Let me now ask the reader whether there is, in the whole realm of physical science, to be found one philosophic objection to the claim that the earth rolled through space for countless ages, with a system of Saturn-like rings? How could the earth ever pass through the sun-state and not hold in suspension, as a mighty aqueous or vaporous atmosphere, the oceans now on its surface? Every man possessing common intelligence knows it as a self-evident fact, that in that age of primitive fire and swaddling flames, the waters that belonged to the earth (every drop of them) were held in suspension on high. But what else does he know? He knows that the earth, molten as it was, *rotated*, and that the atmosphere, whatever its extent, rotated with it. He knows, also, that the rotating force caused the matter composing the atmosphere to move from the poles toward the equator, and to heap up there more than at any other point. The great difficulty lies in the fact that investigators have altogether neglected to take these conditions into consideration.

Let us now imagine a molten sphere, with its necessary and inevitable attendant of aqueous vapor, on the outskirts of the mass. Let it not rotate. In this case it is plain that, other things being favorable, the mass will be a fiery center with a vast cloud shell, or vaporous canopy *all around* it. It is also plain that so long as it does not rotate it would continue in this form while under the reign of fire. If, then, the heat be withdrawn, we see the vapors condense and fall. Now it so happens that all writers upon this question, both geologists and astronomers, have, so far as I am able to find, never advanced farther than this; and herein lies the fallacy of all their conclusions, as I will presently show.

Admitting, as all must do, that the vapors of a non-rotating globe will fall to its surface immediately as the mass cools down, what would be the result if the mass was a *rotating* body? Is there a philosopher that would say that the result would be the same? In order to understand plainly what the result would be, let us imagine our motionless sphere of molten matter to begin to rotate. In this case, any one can see, it would no longer be a sphere. The vapors at the equator would *rise* higher than elsewhere. The repelling heat force operates to make a perfect sphere so long as it is a molten world; but here is another force, and every pound of it operates to break up that spherical form. The rotating or centrifugal force finds the vapors in equilibrio, and immediately operates to carry them away from the center. The centripetal or attractive force is partly overcome by heat force, and the rotatory force is left at liberty to fashion the form of the mass, and if no attraction operated, the vapors would be carried entirely away.

Again, it is plain that if no heat force were acting, the radial and central forces would give an oblatoidal form to the mass, but as heat force is superadded to the radial force, it must lift the equatorial vapors higher and higher until they all accumulate over the equator. The vapors would move in the direction toward which the greatest force would carry them, and that direction is in the equatorial plane. But after these vapors are located here, they possess a moving energy, or rotating force, which they did not possess when heat force only was acting. Hence it is manifest that as they now possess an energy which the cooling of the mass does not reduce, they cannot fall to the surface of the sphere until that energy is overcome. Vapors, then, that would fall immediately to the earth on the removal of repelling or suspending heat, when it did not rotate, would not so fall on the rotating earth. What, then, can be the meaning of the declaration of eminent astronomers and geologists when they announce, in unqualified terms, that the primeval waters returned to the earth when it cooled down, forming the primitive ocean? Not one of them, so far as I am aware, has ever hinted at the fact, that the vapors had a rotating momentum to be overcome after the heat was withdrawn, before they could possibly fall to the earth. I could quote voluminary from these eminent authorities, to show that such a fact was never entertained, but I need but quote that eminent astronomer, Norman Lockyer, as an illustration: "When the earth was molten, the atmosphere must have been very different. We had, let us imagine, close to the glowing crust, a dense vapor, composed of the compounds of the materials of the crust, which were volatile only at a high temperature; the vapor of chloride of sodium, or common salt, would be present in large quantities: above this, a zone of carbonic acid gas; above this again, a zone of aqueous vapor in the form of steam. As the cooling went on, the lowest zone, composed of vapor of salt, and other chlorides, would be *condensed on the crust*. Then it would be the turn of the steam to condense, and form water; this would fall on the layer of salt, and dissolving, it would form the ocean and seas." ("Elements of Astronomy," p. 111.) Thus is left on the student's mind the impression that the vapors had nothing to do but to condense and fall to the earth. But it is plain that they had something else to do. The canopy of "chlorides" had a revolving momentum that *prolonged* their stay in the firmament after they had condensed. The zone of carbonic acid also had its independent momentum, and that momentum was greater than that of the chlorides, because being further from the earth it had greater velocity, and the aqueous vapors being, according to this view, the most remote, like the rim of a great wheel, had the greatest velocity, and consequently the greatest revolving force. Having, then, the greatest revolving momentum to be overcome and which could not be overcome by the simple withdrawal of the heat, must have remained as a revolving zone until that momentum *was overcome by something else.*

When, then, the vapors, of whatever materials, were suspended on high as a great vaporous atmosphere, there were two known forces operating in the main to force the vapors from the poles toward the equator—the heat force suspending them, and the rotary force carrying them forward in the equatorial plane, at the same time it drew them, as it were, from below upward into that plane. Every one can certainly see that these two forces must have established an aggregate of conditions which neither one of them alone could establish. Hence it follows as an inevitable result, that when the heat force retired, this aggregate of conditions could not possibly be annulled, while the rotary force remained. Let us admit, then, this aggregate to have been established in the case of the igneous earth, and the condition was simply this: The primitive vapors *were suspended by these two active forces in the earth's equatorial planet.* Now, there came a time when one of these forces ceased to act. The other force the centrifugal remains so long as the sphere rotates. Again, it is plain that the repelling, or suspending heat, would have less influence upon the *uppermost* vapors than upon the *innermost.* According to well-known mechanical law, however, these uppermost vapors would be more largely under the influence of the rotating force than the innermost. The hub of a wheel has but little rotating momentum, while the rim has a great deal. The inevitable consequence is, that when the earth cools down the innermost matter in the igneous envelope, meant the earth's surface, being almost entirely under the heat influence alone, would immediately fall as that heat withdrew, while the suspended matter further off, almost entirely under the final influence of centrifugal energy, and but slightly, comparatively, under the power of heat would remain on high! It is evident, then, that when the innermost vapors fell to the earth, they *left an equatorial ring revolving on high!*

It is not my purpose now to give the transitions by which under the beck of inexorable law this ring was subdivided into a complex system of concentric rings. It is enough for my present purpose to show that the conclusion that the ocean of the earth fell to its surface as the igneous era closed, is necessarily erroneous. It is enough to show by this conclusion that annular formation is an *inevitable result* of the evolution of a planet from the sun-state. That annular law is a LAW, as universal as the law of gravitation. Then the assumption of Lockyer, "*that all the planets were once white hot,*" necessarily leads him to the conclusion that all the planets have had annular systems. Hence, the foundation claim of the annular theory is, that a ring-system is a necessary appendage to all planets during some period of their career. I have used but one line of argument to prove that the earth once had such a system, while I can produce at least ten equally strong. I will endeavor to point out some of the momentous conclusions flowing from this hypothesis.

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THE WORK IN STORE FOR SUBSTANTIALISM.

SHALL IT HAVE A COLLEGE?

BY THE EDITOR.

TEN years ago, when we were putting the finishing touches upon the "Problem of Human Life," we had very vague and incomplete ideas as to the scope and future possibilities of the work then being inaugurated. We felt, however, an unwavering conviction that the foundation principles of Substantialism, then shaping, were destined ultimately to revolutionize modern science as relates to the nature and character of the physical forces: and as all other branches of natural philosophy have their foundation principles laid in the natural forces, we saw, as clearly as we ever saw anything in the future, a general overturn inevitably to take place in most of the scientific theories of the present time. This may look like egotism on the part of the writer, but we trust the reader will pardon it in view of the progress already accomplished in the revolutionary work which was then in its very incipiency.

When the announcement was made in 1878, that every force of nature was a substantial but immaterial entity, and that every phenomena-producing or sensation-producing cause in physical philosophy, was as really an objective existence as is a rock or a tree, and that these force-entities extended even to *sound* itself as the substantial cause of the effect in our sensation called hearing, it came like a thunder-clap from a clear sky upon those professors of physics who chanced then to see the book. So unreasonable, not to say preposterous, did this new departure in physical science seem to those who had all their lives been rooted and grounded in the mode-of-motion doctrines of acoustics, that there were scores of teachers at once ready to come to the rescue of the venerable wave-theory and to break a lance with the scientific upstart who had dared to publish a formidable book making such a ridiculous announcement as that *sound* was a substantial entity.

This feeling of opposition was by no means lessened when they saw it further announced that not only was sound claimed to be a substantial force, but also that light, heat, electricity, gravity, cohesion, and even magnetism were veritable immaterial entities radiating by different laws of conduction and diffusion from their respective sources. These professors of physical philosophy were not only provoked even to laughter at such untenable departures from the notions of their scientific forefathers, but many of them, as the record of THE MICROCOSM shows, were provoked to anger and even bitterness, because, in addition to the assumption that sound was a substantial entity, the reckless innovator had daringly assaulted the wave-theory itself as set forth in all the text-books in our colleges, claiming it to be a jumble of self-contradictions and incongruous impossibilities.

To these excited professors the insolence of the new author was only paralleled by his ignorance, while both combined did not equal the stupidity of the house that had ventured to publish such a senseless book. The professors thus excited, had been, no doubt, just at the time this new revelation struck them, teaching their classes the very adsurdities and scientific impossibilities we had so severely exposed in the "Problem." Such a coincidence, occurring just as the book chanced to be placed in their hands, possibly by one of the very students they had unintentionally been misleading (we know of one case exactly in point from personal knowledge), conspired provokingly to mistime the two events in such manner as to cause an inharmonious mental discord in which visions of damaged reputation for want of scientific astuteness were at once aroused, in having taught such manifest errors, unless by some means the force of the new philosophy could be broken. It was not unnatural, therefore, under such circumstances, that the coincidences referred to should tend to precipitate and crystallize the half-formed decision made at first sight, that the book was necessarily all wrong, from beginning to end, and that the author was, therefore, not only a sciolist of startling proportions, but an ignoramus of the first magnitude.

Consequently, in their haste to be put squarely upon the record against the new departure, they skipped to the fatal conclusion that it was not necessary even to read such an absurd work through, much less to study it, before knocking the pretentious nonsense into smithereens with the nibs of their steel pens, thereby furnishing the timely antidote for the scientific poison imbibed by the students who had unfortunately chanced to read the book. The result in every case was that superficial and trivial objections were raised against the arguments of the work which had been fully met in other portions of the monograph, and which would have been seen and felt to utter confusion by the would-be defender of the old theory had moderation at the start proved the better part of ambitious valor.

While the foregoing describes fairly and truly the course pursued by the majority of professors of physics into whose hands the "Problem" chanced to fall soon after its publication, it by no means describes the result with all. Many professors were approached by the new departure under more favorable circumstances for mental receptivity, besides being more fairly disposed naturally, being even ready and anxious for new scientific light from whatever source it might come. These teachers were in the fortunate frame of mind to suppose it possible that there might be some things in heaven and earth not yet dreamt of in their philosophies, and that even as great a scientific crank as the author of the new departure on sound was reported to be, might accidentally have stumbled upon something new and true, as well as worth reading, in this department of physical research.

Such professors, therefore, took up the subject and examined the questions discussed in altogether a different spirit from those first described, the result being that many of them gladly received the word, and making all due allowance for incidental errors, became converts to the basic principles of the Substantial Philosophy, accepting the doctrine as a system of coherent and harmonious scientific truth; and during the past six or eight years, without varying in any direction except to become stronger in the faith, these same early converts have boldly and unwaveringly on all occasions defended the cause of Substantialism as the system of physical philosophy which shall in time, as many of them believe, take the lead in natural science and form the basis of the educational curriculum in every college in the world.

We have the incontrovertible proof of the state of facts here intimated in thousands of letters received during the last few years, in which college professors, ministers, doctors, lawyers, teachers, and students of science have written us expressing the most ineradicable conviction of the truth of the general principles upon which Substantialism is based, and at the same time avowing an assurance equally unshaken that the revolution in physical philosophy thus begun shall go forward with accelerating speed till no institution of learning, however slow to accept innovations, will teach science except on the general basis as set forth in the Substantial Philosophy.

These thousands of new adherents to the Substantial Cause, which began in so humble and obscure a way less than a decade of years ago, have already increased in numbers (and are now increasing with greater acceleration than ever before), till it is believed by those who are in a position to know, that tens of thousands of the more intelligent thinkers of this country are already in-

vincible believers in, and defenders of, the cardinal principles of Substantialism as originally proclaimed in the "Problem of Human Life," as maintained for five years in THE MICROCOSM, and as now set forth and defended in THE SCIENTIFIC ARENA, the permanent organ of that revolutionary system of doctrine, and of which it is our proud and honored privilege to be the editor. And we may add here, that the popular price of that organ under the wise and able management of its proprietor, Mr. Hudson, constitutes a rational assurance, and most happy omen, for a still increasing acceleration to the cause of Substantialism in the near future far surpassing anything heretofore dreamed of by its adherents.

The patent fact that this journal is now taken and read in every civilized country on earth, and even by missionaries in most of the heathen lands, with the additional fact that its subscription list is augmenting with an increased rapidity commensurate with its age, holds out encouragement to its friends of a brightening day for Substantialism soon approaching, compared to which its past prosperity would be as moonlight contrasted with the glare of a noonday sun.

Let any man of intelligent reflection be informed that a journal, advocating such principles as here set forth, can be had for the nominal subscription price required for this, and it takes no forecast of a seer to predict the consequence; and thus we have one of the reasons, at least, for such unparalleled weekly increase of circulation in a monthly magazine, even toward the very close of its first volume.

But it takes something even more cogent than its comparatively trifling price to account for results so phenomenal, since no man whose time is valued as a factor in his existence, would care to read a paper, if given to him free of charge, that did not touch a "mass chord," as Keeley expresses it, in his intellectual being, and cause it to vibrate sympathetically with the contents of the paper itself. Such, we are glad to say, are the general effects which the subject matter of THE ARENA produces upon its readers, notwithstanding certain things it may occasionally contain which unavoidably may not please all. This, however, is inevitable in all impartial journalism.

Substantialists, therefore, who are using their influence to extend the circulation of their organ, can look forward with gratifying anticipation to a period when in coming years no pent-up United States shall contract its powers, but to the time when the English-speaking British Empire shall be one of its chief fields of circulation, while Germany, France, Italy, and the other civilized nations of the world, speaking the modern languages, will feel it a proud privilege to issue translated reprints of this very organ of the Substantial Philosophy.

Six years ago, when the battle was at its height in defense of the new departure against undulatory science and mode-of-motion philosophy in general, and when professors of physics who were then, one after another, newly discovering the "Problem of Human Life," thought it but a play-spell of half a day to annihilate the "scientific crank of New York," as its author was familiarly termed, the cause which now so proudly stands erect in these columns could hardly succeed then in extorting a single word of sympathetic encouragement from the friends of the respectable institutions of the country. But already has the new departure gained such footing with thoughtful scientists that not only has all public opposition to its onward march ceased, but the founder of that departure is at this very writing invited to lay the principles of the Substantial Philosophy, in the shape of an elaborate paper, before one of the most dignified and respectable philosophical societies of the country, in order that its nearly one thousand members may know of a truth what is meant by Substantialism. This paper, published in the organ of said society and scattered to the four winds of the philosophical heavens, to be read by thinkers in all the civilized countries of the world, will, we trust, tend to place the new philosophy in a light before those hitherto unacquainted with its principles that will add a new and powerful impetus to its already accelerating progress.

Take this ominous sign of the times, in connection with the recent issue of the Rev. Dr. Swander's great book, entitled the "Substantial Philosophy," now rapidly circulating; then take the complete formulation and publication of the "Text-Book on Sound" rapidly introducing into schools; and take finally the forth-coming formidable scientific book by Henry A. Mott, Ph. D., LL. D., in advocacy of the same great philosophical principles, and the reader will catch a glimpse of the grounds on which all true Substantialists may feel jubilant at the prospects before them.

Already the subway is tunneled for laying the wires which will lead directly from the office of THE ARENA at 23 Park Row, to the *College of Substantialism*, which is no doubt soon to be established in some eligible locality as the necessary and legitimate outgrowth of the most fundamental and far-reaching of all the systems of philosophy the world has yet known. Even now the harvest for such an institution is ripe for the right man or woman with means to thrust in the golden sickle, and at once gather the richest sheaves of honor and renown ever reaped since colleges were first instituted.

Who will be that wealthy man or woman who shall first lay claim and establish his or her right, in fee-simple, to the imperishable honor of founding this college upon a basis of perpetual usefulness to mankind, and thus, by having the name of such founder engraved upon the granite lintels of its doors and windows, go down to all coming generations as a benefactor to the race of men?

A few thousand dollars thus set apart as an endowment fund, even as a fraction of a moderate fortune, would carve and erect a monument to the donor more lasting and emblematic of honors well earned, than any marble monolith ever consecrated to hero or king.

In the coming ages, as students and investigators of science shall apply the principles of Substantialism to the easy solution of every mystery which human ingenuity can discover, and to the unfoldment of every problem which the persistent and tireless research of man shall encounter, the name of that man or woman whose bounty shall build the initial home for that philosophy will be uttered with grateful blessings, even while the name of a Rothschild shall be forgotten. Whose, then, shall be that honored name?

A HOLE THROUGH THE EARTH!

REPLY TO GEORGE DUNN, ESQ.

BY PRESIDENT R. L. ABERNETHY.

IT is asked, "If a hole could be made through the earth, and a cannon ball dropped in, where would it go; and where would it stop?"

The answer of the editor of THE ARENA cannot be correct. His conclusion is based upon the experiment of falling bodies above the earth's surface, which cannot be true beneath its surface.

Acceleration of falling bodies is owing to the fact that the entire mass of matter which attracts the body is below. When, however, the ball would enter the opening in the earth, it would instanty be attracted by every particle of matter in its rear, and its motion would certainly become less and less, as the number of particles fell to the rear, and by the time it reached the center, it would be equally attracted in all possible directions, and its motion must cease.

If we admit that accelerated motion depends upon anything else except the increased attraction which arises from the near proximity of a falling body toward the earth, we necessarily put an additional force in matter which our scientists have never cognized.

The attraction of the steel increases as it approximates the magnet, though it be held beneath the magnet; and were it not for the earth's attraction, its motion would increase as it moves upward toward the magnet.

But lest I fall into the hands of the editor of the THE ARENA and be dropped into the opening through the globe, I will call a halt, expecting, by the editor's permission, in a short time to give the readers of THE ARENA a new theory on light, which I ask the scientists to ventilate.

RUTHERFORD COLLEGE, N. C.

REMARKS BY THE EDITOR.

President Abernethy would no doubt be willing to admit himself in error, provided it could be shown clearly that he was mistaken in the assigned cause of the acceleration in velocity of a falling body. That it is not in consequence of the nearer proximity of the earth to the body thus approaching it, as assumed by President Abernethy, we can show in a sentence or two. If the accelerated velocity of a falling stone were caused by the nearer proximity of the earth, it is clear that the earth ought to attract the stone with greater force, just in proportion to such increased velocity. But so far from this being true, it is a well-known fact that a body taken up miles above the earth in a balloon, is not perceptibly lighter, weighed by the

most delicate spring-balance, than it is on the earth's surface. In fact, the decrease of gravital attraction is so trifling, if at all, for the first few miles, it cannot be observed. Hence, if acceleration depends on increasing attraction with near approach to the earth, as its cause, there would be no perceptible acceleration in the fall of a stone on striking the earth, even from the highest altitude yet attained by the aeronaut. But it is a fact that a falling bullet from a balloon four miles high, would reach a velocity of more than 1,100 feet during the last second of its travel, while it would only fall sixteen feet during the first second. According to President Abernethy, the earth ought, therefore, to exert about seventy times as much attractive force on that bullet near the surface of the earth, as four miles above it.

Now the truth is, the actual cause of accelerated velocity in a falling body has never been given to the world till it first appeared in THE MICROCOSM; and had President Abernethy been familiar with the revolutionary scientific teachings of that magazine on the question of acceleration in falling bodies he would never have committed such a manifest error as comparing the attraction of the earth to that of a magnet.

The true cause of acceleration lies in the hitherto unrecognized fact of *stored-up force.* Let us explain what we mean by this new factor in mechanical terminology. We mean that the velocity of sixteen feet fall of the stone (taking this as the unit) during the first second, is so much force stored up in the stone, and therefore if gravity should cease entirely to act on that stone at the end of this first second it would continue falling at a velocity of thirty-two feet a second thereafter, and without any acceleration whatever, *as that was its actual velocity at the end of its first second.*

What, now, does gravity do? It simply acts on this stone during the next second precisely as it did during the first, that is, it takes it a distance of sixteen feet which added to the acquired velocity of thirty-two feet make forty-eight feet of fall for the second second. Then again, at the end of this second second a new acquired velocity of thirty-two feet is added to the old stored-up thirty-two feet, making the total stored-up velocity sixty-four feet. Gravity then again takes hold of the stone *de novo*, carrying it another sixteen feet during the third second, which added to the acquired sixty-four feet a second, which it maintains on account of the stored-up force previously exerted, bring the aggregate travel of the stone up to eighty feet during the third second or a velocity of one hundred and two feet at the end of the third second, and so on for any number of feet till the velocity of gravity itself shall be partly overtaken by that of the falling stone, if such a thing is possible.

If this explanation of accelerated velocity in falling bodies by means of stored-up mechanical force, has ever been hinted at before we explaiend it in THE MICROCOSM, we should be glad for some one to point it out.

For the benefit of the reader who may not have access to the back volumes of THE MICROCOSM, we conclude our remarks upon President Abernethy's views by a brief extract from our review of Prof. Tait on Force, as printed in the fifth volume of THE MICROCOSM, at page 5:

"As an illustration, take the falling stone. Gravity exerts a certain amount of force upon it during the first inch of fall. Now if gravity should cease at the end of the inch, the stone would keep on falling, but without acceleration, by virtue of its *momentum*, as it is usually termed, which really signifies nothing more nor less than the gravital *force* which is stored up in the stone by that first inch of downward pull. Gravity, however, does not stop at this first inch of pull, but adds just as much more gravital force during the second inch; these two quantities of force combined, and now both stored up in the stone, increase the stone's velocity, or accelerate its motion, and the same continues on, because new portions of gravital force are continually being added to the stone to produce this acceleration, or continual increase of velocity. What more appropriate language, in the name of reason, could be used than to call this constant addition of force (that produces acceleration), "accelerating force"? Had a child raised this pointless and pitiable objection, we might have had patience with it.

"The true explanation of *momentum*, here for the first time hinted, and which, by the way, has thus been incidentally utilized, will prove in the future to be of importance to science, inasmuch as it straightens out another tangle of Prof. Tait's confused reasoning in connection with this uncalled-for denial of 'accelerating force.' He says: 'Some people are in the habit of confounding force with momentum.' Such a blunder he calls a 'monstrosity.' No careful reasoner, however, could do so except in the original and beautiful manner just presented, namely, as *stored-up force*, and this no previous writer has done. In a recent editorial we showed that the property of *elasticity*, instead of being a *force*, as nearly everybody believes, was simply the condition or quality of a body by which mechanical force, or energy, could be *stored up* within it for the purpose of restoring the body to its original form after distortion. This was just as true, as well as new, in science as the point we have here made, that the momentum of a body can be nothing else than the stored-up force which gave to it the original impetus. If we mistake not, this must strike every careful thinker in physics as a most important scientific discrimination. To illustrate: The force, or energy, of the exploding powder does not by any means cease acting on the ball as it emerges from the mouth of the cannon, or otherwise the ball would then stop; but it continues on with the ball, stored up in it to the end of its journey, as proved when it strikes a tree at a distance. What but stored-up force, or mechanical energy, could knock that tree to splinters? But this stored-up force, by common consent, receives the name of *momentum*. In fact, momentum, hitherto unexplained, is thus made clear. Suppose, as a further illustration, that during every ten feet of the ball's travel, after leaving the gun, it should receive another and equal impetus of force from exploding powder, each adding another velocity, and each new addition of force being stored up in the ball like the first, thus augmenting its momentum, does a great professor of physics need to be told that such accumulating force, which produces the accelerating velocity of the ball, may properly be called 'accelerating force'? Why, then, we ask again, this purposeless scientific scolding at well-understood terms, without even pretending to substitute others more appropriate?"

DR. SWANDER'S BOOK.

"THE SUBSTANTIAL PHILOSOPHY."

Last month we began to copy specimens of the questions and answers of the various chapters making up this important work, but were interrupted at the ninth chapter by a crush of other matters that had to be printed. We now conclude the specimens, which will show the drift of the book—EDITOR.

CHAPTER X.—THE NATURE OF SOUND.*

QUESTION 1. What is sound?

ANSWER. Primarily, sound is that form of physical force by which the sense of hearing in men and animals is addressed and affected.

Q. 2. Has sound any other meaning?

A. Yes; by a *trope* which we call *metonymy* the effect is often put for the cause, and thus sound signifies the *sensation* itself in our consciousness, which we call *hearing*, and by which we distinguish tones or recognize their various peculiarities.

Q. 3. What are these chief peculiarities of sound?

A. They are intensity, pitch, duration, and quality, the latter expressed under the general term *timbre*.

Q. 4. What is meant by the pitch of sound?

A. It is that peculiarity of tone by which we recognize sounds as high or low, sharp or grave.

Q. 17. Is all force necessarily substantial?

A. Yes. Nothing in Nature can directly cause a phenomenon, or produce a positive effect upon our sensuous observation, unless it is a substantial entity or objective thing. Every force of Nature, therefore, must be a substantial entity, as it is the direct or immediate cause of sensation, or of observed phenomena.

Q. 29. If air-waves, or atmospheric condensations and rarefactions, do not constitute sound, how are we to account for the fact that no sound is heard from a ringing bell in an exhausted receiver?

A. Substantial sound-force requires a conducting medium as much as substantial electric force. The air being the ordinary conductor of sound, it follows that the sound of a perfectly insulated bell in an exhausted receiver has no medium of conduction to the outside air, and hence cannot be heard. But let the bell rest on the wooden bed of the receiver, and it can be heard about as well in the vacuum as with the receiver full of air, since the wood now becomes the sound-conductor to the outside air, and through it to the ear.

Q. 80. Does the same law of sound-conduction, according to the substantial theory, prevail in solids, liquids, and gases?

A. Precisely the same, namely, the cohesive arrangement of the particles of the various material substances serving as sound-conducting mediums, and the correlation of cohesive force and sound-force in relation to these various arrangements of such material particles. Just as electric-force or light-force will travel better through some bodies than through others by the co-operation or opposition of the regnant force of cohesion, and without any reference whatever to the elasticity, density, mobility, or compressibility of such material bodies, so will sound-force travel through air, the various gases, water, wood, iron, glass, etc., by the same correlation or co-operation with cohesive force, and the various different ways in which that force has arranged and now maintains the material particles of various bodies to facilitate or impede such sound conduction.

Q. 89. What is the general conclusion to

* As this chapter constitutes the text-book on sound, which the readers of THE ARENA have been so long expecting, we give a little more space to its questions and answers than to those of other chapters.

be drawn from this catechetical investigation of the nature and phenomena of sound?

A. From the various incongruities of the current theory and necessarily attaching to it, as developed in these questions and answers, notwithstanding the wisdom of ages and the ripest scholarship in science the world has ever known have been applied to its formulation and defense, it follows rationally that such a theory cannot be true. While the harmonious consistency and the internal evidence of correctness which attach to the substantial theory, as here set forth at its very first formulation into a text-book, would seem to indicate to a logical, scientific, and unbiased mind that such a system of acoustical science cannot be false.

CHAPTER XI.—LIFE.

QUESTION 1. What is Life?

ANSWER. This question is one of the most difficult ever propounded to the wisdom of the world—a question to which no satisfactory answer can be given without a recognition of the existence of immaterial substance in being. It stands next to the question: What is God? Man's encouragement to find it out by searching lies in the fact that life is not necessarily infinite. An attempted investigation into its nature is therefore not necessarily a piece of presumption on the part of finite man. Such searching after the nature of life and the origin of its existence becomes presumptuous folly only when man attempts it without acknowledging the eternal existence of a Personal One—the Fountain and Giver of all life.

Q. 12. Is each living individual a distinct and separate creation?

A. God is the creator of each and every individual in the domain of finite life, but after creating the first parents of each distinctive species, by a creative act of his sovereign will through the creative word of his omnipotent power, in the creative transmission directly of his own substantial life, he now carries forward his creative work through the agency of progenitors. Hence, living beings are now created mediately. This process of propagating the species results from the fact that the life first imparted to the parental head of the species involved the possibility of and tendency toward organic multiplication into numerous individuals.

Q. 29. What does the Substantial Philosophy teach with reference to organisms?

A. That all organisms have a dual nature, and that the two are inter-related and vitally united when both are in their normal condition.

Q. 30. What is the highest form of such dual organism?

A. Man.

CHAPTER XII.—DEATH.

Q. 5. What definition does Substantialism give of death?

A. If, as already seen, life is the highest form of force in the universe, death must be defined in such terms as to represent it in some way antithetic thereto. The withdrawal of life force for want of favorable conditions, or for want of ability to remain in any given substance, leaves such substance under the negative power of death. The withdrawal of life results in death.

Q. 38. Is humanity then totally depraved?

A. In a qualified sense, man is totally depraved.

Q. 39. How should the term "total depravity" be qualified?

A. So as to express merely its coextensiveness with human nature in its present abnormal condition.

Q. 40. Then man, by the actualization of his possibility to sin, did not cease to be human?

A. Man by sinning became neither a brute nor a devil as to the essence of his being. The substance of his nature has neither been destroyed nor transformed into something else. He is human still—though defaced and deformed, he retains the Divine image. For this reason his Maker loves him still.

Q. 41. If man is still human, and in a qualified sense still retains the Divine image, why does he die. What had sin to do with the bringing of death into the world?

A. As already seen, it had nothing to do with bringing death to the vegetable and animal kingdoms—death was an ordained physical necessity for them.

Q. 42. But how does sin stand related to the perplexing problem of death in the higher or rational order of being?

A. It is here and in this sense that *by sin came death.* That is what theologians call "spiritual death."

Q. 43. What has science to do with theology and the question of spiritual death?

A. Until recently it has had too little to do with the great problems involved therein, just as theologians have had too little to do in an earnest way with true science, and it will be better for theology when it becomes less dogmatic and more consistently scientific in the work which the author of a twofold revelation has given to the scientific theologian and the Christian scientist to do.

CHAPTER XIII.—DEATH'S ANTIDOTE.

QUESTION 1. What is an antidote?

ANSWER. An antidote is an applied counterforce—a remedy—that which neutralizes the evil or poisonous power of something else at work in organic existence—that which eliminates another force from any particular field of organic action, and relegates it to its fountain source.

Q. 4. Is sin then a disease that calls for a remedy in the form of an antidote in order that death, its more fully developed form, may be averted, and the patient ultimately restored to spiritual health?

A. Sin is that abnormal force in humanity which throws the spiritual side or quantity of human nature and in a certain consequential sense the entire being of its human subject—into a diseased condition. The greatest philosopher that ever blessed the world with a revelation of truth upon this subject declared the medical character of his mission among men by announcing the implied and tremendous fact which underlies his own self-evident proposition: "They that be whole need not a physician, but they that *are sick.*"

Q. 8. But does not science transcend its own proper limits when it attempts to study the deep things of God?

A. It does not. If a correct knowledge of the forces and facts of Nature assists us in a more proper interpretation of the higher facts and forces of Christianity, it is both our proper privilege and imperative duty as Christian scientists, to avail ourselves of all the help thus placed within our reach; especially so since Christianity is the proper corrective, continuation and crowning complement of Nature, rather than a disjointed section of the universe out of all connection and correspondence with the world's present order of things.

Q. 12. But is it not irreverent for Science to attempt an entrance where angels either fear or fail to enter?

A. Christian science is more likely to become devout than otherwise at the manger cradle of Immanuel. Besides, if science, after it has availed itself of an attainable knowledge of all the knowable facts and forces which the God of Nature and Revelation has placed at its appropriation and command, does not attempt to pass the court of the Gentiles and enter with reverential attitude the holy place, it will prove itself a contemptible coward before the eyes of angels, God and men.

CHAPTER XIV.—RESURRECTION OF THE DEAD.

QUESTION 1. Does the question of the resurrection of the dead come in any sense within the proper province of science?

ANSWER. It does. As seen in Chapter XI., biological science treats of being in the domain of *life.* If now, by the exercise of some force, or some perverse force-element antagonistic to life, as seen in Chapter XII., living beings are overtaken with an alleged catastrophe, seemingly destructive of all there is of life and for life, science is in duty bound to continue its work to the full extent of its ability to institute and complete a thorough investigation of the case.

Q. 2. What, then, is the first duty of science in its investigations of the conflict in which death has seemingly triumphed over life?

A. To inquire carefully as to just what is necessarily involved in the idea which the term "death" is made to express.

Q. 3. What has already been shown in the "Problem of Human Life," and in this book—a formulation of truths based thereupon—as to the sense in which alone death is predicable of any form of being?

A. It has been shown, as never before, from the unique standpoint of the Substantial Philosophy, that there is no death, except in the sense of change from one form or condition of existence to some other form or state of being.

Q. 4. What has the Substantial Philosophy, as formulated in the foregoing chapters of this book, re-established upon a new and more rational basis?

A. The indestructibility of all matter, and the conservability of all the substantial force-elements of the universe.

Q. 9. What then have we a right to expect from science touching the resurrection of the personal dead?

A. We have a right to expect science to show whether they are in a conserved condition in which they may be reached, and from which they may be raised, provided there be a resurrection power to reach and raise them.

Q. 10. Has science responded to this rational expectation on our part?

A. The Substantial Philosophy with its recently discovered facts, and its rational view of the substantiality and consequent conservability of all forces, has demonstrated from all the known analogies and prophecies of Nature that the personal dead are not dead in a sense that would render a state of conscious existence impossible, or their resurrection therefrom improbable.

Q. 37. Then Substantialism as applied to Christianity is not at variance with the Gospel of Christ and the blessed hopes which its promises kindle in the hearts of Christian men?

A. God forbid; yea, Substantialism establishes the hope of immortality; it tends to show how the law of the spirit of *life* in Christ Jesus makes human individuals free from the law of sin and death; it justifies the reasonable expectations of the human soul; it encourages the noblest yearnings of the home-sick heart; it catches every promise of Revelation, and then from a truly scientific standpoint it shows that the dignity and destiny of God's children require that they should rise from the intermediate state of the dead and shout their triumph through the skies.

CHAPTER XV.—OUR FUTURE STATE AND PLACE.

Q. 2. What now still lies before us in the full problem and comprehensive volume of human life?"

A. Our future *state* and *place* after the resurrection from the dead.

Q. 3. In considering our future state, what is it that first of all enforces its claims upon our attention?

A. *Immortality*, which "oversweeps all pains, all tears, all time, all fears—and peals like the eternal thunders of the deep into my ears this truth: Thou livest forever."

Q. 4. Then man is immortal?

A. Either man is immortal or the whole creation has no higher mission than to mock God's noblest creature and man's noblest yearnings.

Q. 16. Will our transition from this to the future state produce any change in the *relation* now existing between the material and the immaterial substances in the constitution of our individual persons?

A. It will indeed. The former order of things in this particular will pass away, or be reversed. Notwithstanding the superiority of mind over matter, the immaterial here is largely conditioned by the material. Hereafter the spirit will be emancipated—not *from*, but from *under* matter, which state of subordination is at least largely abnormal and the result of sin. When the spirit is thus emancipated, the body, no less than itself, will be a beneficiary of the change, and the entire disenthralled person will arise to a state in which it will be unconditioned, except by its own finite limitations and the impassable and bridgeless chasm between itself and the sphere of the infinite.

Q. 17. But will not the finite saints be permitted to enter into the very presence of the infinite God?

A. The pure in heart shall stand in the immediate presence of God's person, admire the beauties of his face and all the glories of the place, but such approach even into the presence chamber of the King immortal does not imply that the saints will ever transcend the realm of the finite any more than the humming bird passes into the realm of the human by being admitted into the palatial residence of the prince?

Q. 25. What then is our duty to God and to ourselves?

A. It is our chief duty as well as our high privilege to study God's Word and works in the light which they shed upon each other and which they commingling shed upon the great central problems of human life, here and hereafter. This can now be done to greater advantage than ever before, since the investigation may be made from the standpoint of the Substantial Philosophy founded by A. Wilford Hall, and partially formulated by the author of this book. Blessed are they that heed the suggestions of this volume, for the time is at hand for men to see the invisible things of God in every domain of finite being. Guided by the foregoing helps and hints, the devout student of Nature and Revelation may quicken his steps in the direction of a more perfect knowledge of him whom to know aright is life eternal, and whom to love supremely is the highest duty of man. Thus walking in the path of duty, and thus possessed of this eternal life, even now,

> "Before we reach the heavenly fields,
> Or walk the golden streets,"

we shall be able partially to overcome all false forces at war with the proper dignity and well-being of our nature, pass through our transition period in triumph to the skies, enter upon the higher realm of human existence, join the gathering, swelling throng of former friends to range, in mutual happiness, the flowery fields of heaven and pluck ripe clusters from the vines of God.

THE VALUE OF REPEATING ARGUMENTS.

BY THE EDITOR.

IT is very unpleasant to us in conducting the editorial discussions in the organ of Substantialism, to repeat elaborate arguments which we may have made with the greatest possible care during the five volumes of THE MICROCOSM before THE ARENA was commenced. But unpleasant as it is to us, it is to some extent essential to new readers, for otherwise many laws and principles involved in the Substantial Philosophy, of which we have treated elaborately in those volumes, and cleared up every mystery connected therewith, would be wholly hidden to new readers, leaving room for innumerable objections and difficulties to arise in their minds which would be as clear as meridian sunshine could they only see what has been written in those nearly 1800 octavo pages. Would that we were rich, that we might send free as a circulating library, to be read and loaned, a copy of those five volumes to every subscriber to this *Journal*. We should then have to repeat nothing, except for the benefit of those not subscribers who might chance occasionally to pick up and read a stray copy of this little magazine.

Under the circumstances named we will do the best we can to make the fundamental principles of Substantialism clear to all, whether they may have enjoyed the reading of the previous volumes of THE MICROCOSM or not, while at the same time we shall try not to reiterate more than is absolutely essential to make our work intelligible and not lose sight of the continual advancement in knowledge necessary to true journalism. Let every reader, therefore, consider himself a co-worker with the editorial staff of THE SCIENTIFIC ARENA and not hesitate to communicate freely and fraternally upon all subjects of legitimate inquiry.

DR. GOOD ON DR. SWANDER'S NEW BOOK.

ANOTHER ACCESSION TO SUBSTANTIALISM.

BY THE OFFICE EDITOR.

REV. J. H. GOOD, D. D., of Tiffin, Ohio, Professor of Theology in the Heidleberg Seminary of the Reformed Church, has given some impartial attention to the contents of Dr. Swander's great book, "The Substantial Philosophy," and as we expected, is almost persuaded to announce himself as an avowed Substantialist. In an article of nearly two columns of the *Christian World*, published at Dayton, Ohio, he takes issue with the author on several points, but says many things favorable to the work as a whole. Among other good things he makes the following truthful comments upon the startling volume and the philosophy of which it treats: "Dr. Swander, who is enthusiastic in respect to the truth and future acceptance of this Substantial Philosophy, saw that it was desirable that a compendium of the whole system, so far as yet established, should be issued in one volume. Regarded in itself it is a noble and praiseworthy effort. It takes the name *Substantial Philosophy*, because it holds and undertakes to prove scientifically that matter is not the only substance in the universe, but that above, beyond, and behind matter there are *substances* which are real entities.

"The starting point in the development of this theory was made in respect to sound, whether this be a substance or a mode of motion. The latter has been the theory of the schools for many years. It is very plausible, at first view, and has strong scientific facts in its favor, yet Dr. Swander claims that it has been overthrown, root and branch, by countless arguments. Each one can find them here, and judge for himself. The controversy about the substantiality of sound does not at first seem to be one of great importance. Acoustics will be mainly the same, on the basis of either theory. But the proof that sound is a substance led to the same doctrine in regard to light, heat, magnetism, electricity, etc.

"It would require a very long article to go into a critical examination of all the parts of this system. This is properly the business of the Reviews, and we hope the *scientists* in our church will investigate fully the question whether *sound* (which is made the very citadel of this theory) is a *substance or not*. It is a strictly scientific question, and should be re-examined in the light of Dr. Hall's arguments. Scientific theories have sometimes proved to be erroneous. In astronomy the earth was long regarded as the center of the universe. But when the Copernican system was demonstrated to be true it gave a wonderful impulse to the onward progress of astronomy. Are Hall and Swander the Copernici to lead us into the true arcanum of nature and spirit? If not, let their arguments be fairly refuted.

* * * "*We are persuaded that Dr. Hall is right* in the position that sound, heat, electricity, and light are *substances*, and not mere modes of motion. * * * As a tentative or working theory, this is an admirable thought, especially when we regard the vast range to which it may be made applicable."

Here, then, is another great man joining the swelling ranks of Substantialists. But we are not surprised at this. We had already received intimations of what was confidently expected. Dr. Swander, in his recent visit to New York, told us that Dr. Good was as honest as he was scholarly; and that at the right time he would "speak out fearlessly" upon the subject. How grand the fulfillment of such an anticipation! While not convinced upon every point which Substantialism involves, he has spoken "fearlessly" upon those points where cool conviction prompted his manly utterances. He says that *he* is "*persuaded that sound, heat, and light, are substances*, and not mere modes of motion," as current theories teach; and he insists that the question should be investigated. He also expresses the hope that the scientists in the Reformed Church will go forward in the discharge of their duty in this matter. All honor to Dr. Good for his outspoken sentiments concerning an unpopular truth! Dr. Swander was not mistaken in his man. It seems that already thirty years ago, when the author of "The Substantial Philosophy" was under the instruction of Prof. Good, as a pupil in mathematics at Heid. College, the student sized up the Doctor as to his moral proportions; and of late, after the lapse of more than a quarter of a century, he felt perfectly calm in the remark that Dr. Good was "as honest as he was scholarly." Dr. Good is "persuaded that sound is a substance," and has the manliness to say so. Next.

THE LOSS OF TONE IN VIOLINS.

42 N. Richmond St., Edinburgh, Scotland.
Dr. Wilford Hall:

DEAR SIR,—I have read in the Glasgow *Christian News* some comments on your theory of sound, and learn that you hold sound to be an entity; and I take the liberty of writing to you to ask if you are aware that a violin if played continuously for a great number of hours becomes played out and does not produce nearly so much sound as it did at first? This is so apparent that players have to give their violins a rest for a week periodically, and sometimes the leader in an orchestra has to change his instrument during the course of a night's play. It is no doubt a fact that all violins improve with play to a certain point, and some have been found that have never given evidence of be-

ing played out. but I have no doubt *that point* could be reached if they had more play continuously. I think this rather confirms your theory; and, although I think it probable that you know this and can explain it much better than I can, I thought you would be none the worse of having your attention called to it.

I am yours very truly,
THOMAS CHISHOLM.

REMARKS BY THE EDITOR.

There is no question as to the correctness of Mr. Chisholm's information, and it is equally certain that the fact stated is directly opposed to the present theory, that sound consists of air-waves driven off by the vibrating instrument. While the fact stated is opposed to the wave-theory of sound, it can be most readily explained according to the principles of Substantialism, on the supposition that sound, like every other sensation-producing cause in nature, is a substantial force, though it is immaterial. Let us see if we cannot give good and sufficient reasons for this general conclusion.

In a number of recent editorials in THE MICROCOSM and SCIENTIFIC ARENA, we discussed the very principles and laws involved in the facts as stated by Mr. Chisholm, namely, that the quantity of sound-force emitted by any sounding instrument depended entirely upon the sonorous property of the instrument, and that it was in no way related to the amount of atmospheric disturbance caused by the vibrating body, and sent forth in the shape of supposed aerial pulses, or so-called "condensations and rarefactions." As a matter of course, if our argument upon this was conclusive—that the quantity of sound emanating from different instruments was demonstrably out of all proportion to the so-called air-waves or pulses generated by the vibratory motion—then the wave-theory dies instantly from the effects of this single blow, and the substantial theory of sound as certainly takes its place. Let us here, for the benefit of new readers, repeat one of those invincible arguments which we publicly and repeatedly invited Prof. Mayer of Stevens' Institute, Prof. Rood of Columbia College, Prof. Tyndall of the Royal Institution of Great Britain, and Prof. Stokes of Cambridge University, to answer and set aside, in the columns of our journal, if they felt competent to do so. Of course, no reply was ventured, for the best of all reasons, that no reply was possible: and it is clear that all these professors, to whom copies of the magazine were sent, know in their souls that this single argument annihilates the theory of acoustics as now taught all over the world. Here is the substance of the argument referred to:

A certain species of locust, common to most parts of the United States, in stridulating at about the pitch of A. (440 vibrations to the second), and with nothing but its tiny body to vibrate, can easily be heard a mile in all directions, while a tuning-fork held in the fingers, or a string stretched over rigid supports ten times larger in surface than the locust, and producing, when heavily bowed, more than ten times as much vibratory action or condensing effect on the air, *cannot be heard more than about six or eight feet away!* Why is this, if sound consists of air-pulses or atmospheric condensations and rarefactions? Of course, if there is the least foundation for the wave-theory in true science, the loudness or intensity of sound should be in exact proportion to the width of swing of the air-particles caused by the vibrating instrument. Prof. Tyndall says:

"We have already learned that what is *loudness* in our sensation is, *outside of us*, nothing more than *width of swing* or *amplitude* of the vibrating *air-particles*."—Lectures on Sound, p. 48.

In describing the action of the tuning-fork, and the manner in which its sound is produced, he says:

"How are we to picture to ourselves the *condition of the air* through which this *musical sound* is passing? 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 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."—Lectures on Sound, p. 62.

Of course this is the standard teaching of current science upon the present theory of sound, and if all sounds are loud in proportion to "width of swing or amplitude of the vibrating air-particles," and if the tuning-fork produces its sound by sending off condensations and rarefactions of the air, it is plain that the stridulating locust makes its sound in the same way. Yet look at the enormous incongruity that exists! We have stood within a foot of one of these locusts when stridulating at its best, and we assert most positively that its vibratory tremor, which was barely visible, *was not one-tenth that of a tuning-fork or stretched wire of the same pitch.* Yet here stand the incontrovertible figures against which the wave-theory is helplessly impaled, that this small vibration of the insect transmits the sound-force 800 times farther than the ten-times greater vibratory action and condensing effect of the tuning-fork, while it actually generates 80,000,000 times more volume of tone! What, now, with this crushing fact before us, becomes of the standard theory of acoustics as expounded by Prof. Tyndall as well as by all modern authorities, that "loudness in our sensations, *is, outside of us, nothing more than the width of swing or amplitude of the vibrating air-particles!*"

Having thus completely broken down the wave-theory of sound with a single statement of facts, which have hitherto escaped the notice of all writers on acoustical science until they were presented in THE MICROCOSM (Vol. IV., pages 318, 381; Vol. V., page 38), we are now prepared for a restatement of our fundamental law as laid down at page 233, Vol. V., of THE MICROCOSM, as follows:

"That sound, instead of being the mechanical effect produced upon the air by the vibrating instrument, and conveyed through it in pulses or atmospheric waves, is a real substantial, but immaterial force, and depends for its intensity or quantity upon the sonorous character of the sounding instrument itself vastly more than upon its mechanical motion, just as the amount of substantial electricity issued from a dynamo-machine depends chiefly upon the electrical quality of the magnetic apparatus, and secondarily upon the mechanical rotation given it."

As an additional and simple illustration of the law here set forth, and as an absolute confirmation of the same, place the stem of a sounding fork firmly against a piece of dry pine *wood* having four or five times the fork's surface, and instantly the volume of sound is augmented several hundred-fold; but place the stem of the fork against a piece of *iron* of the same size, and no perceptible increase of sound takes place. Why is this? Not because the same vibration does not take place in the iron as in the wood by the fork's motion, and not because the same increased action upon the air does not occur in the one case as in the other, for they are precisely the same. It is simply because the *sonorous property* of the wood, caused by the arrangement of its particles under the substantial force of cohesion, is hundreds of times greater than that of the iron. just as the body of the locust, by its peculiar arrangement of particles under cohesive force, possesses millions of times more sonorous property than does the steel fork.

Now, in explanation of Mr. Chisholm's problem, it follows that if any derangement of the material particles of a sounding instrument, or if any essential disturbance of the force holding the particles together shall occur in such instrument by excessive use, its sonorous property might readily be changed so as to produce less sound-force and less effect upon the auditory nerve. Surely there is not the slightest evidence that any less vibratory effect on the air either in the strings or in the body of a violin, ever occurs from long use, but exactly the contrary is manifest; while this new law of physical science, and the startling facts upon which it is based, completely demonstrate that it is the sonorous quality of a sounding instrument alone which determines the volume of its sound, and that the atmospheric effects in the shape of air-waves have nothing whatever to do with such sound intensity.

We have thus taken special pains to elaborate this crucial argument as a death-blow to the present theory of sound because the mass of the readers of this *Journal* have not yet seen the accumulation of facts and arguments upon which the fundamental overturn of modern physics was made to hinge. Next month we will present some of the special reasons why the prominent discussion of the sound question was intimately related to the revolutionary reform in physical science which the Substantial Philosophy so successfully inaugurated. In that discussion will be revealed probably for the first time to most of our new readers the origin of Substantialism, which has proved to the minds of some of the best scientific thinkers of this country its just title to the claims of a new philosophy.

A CAUTION.

We desire to put our readers on their guard against an enterprise in Cincinnati, Ohio, advertising extensively throughout the country under the lofty name of "The Foreign Art

and Loan Exchange, Cincinnati, O., U. S. A."

They advertise a work of Art to be issued quarterly at $1.00 each number, or $4.00 for the year. And as an incentive to the uninitiated a remarkable display of generosity is exhibited in an offer to divide "75 per cent. of the profits among subscribers" in the shape of loans at 4 per cent, the principal of which "need not become due or payable so long as the interest is kept paid." Well, this would be perfectly legitimate were not the idea deftly carried that each subscriber should receive a loan by such display lines as these:

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and

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"WHAT LOAN CAN YOU GET?

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"Send $1.00 for three months' subscription, or $4.00 for a full year's subscription, as you may prefer. With the first number will be sent a SEALED envelope containing a Loan Certificate for whatever amount will be loaned you on above terms," etc., etc.

Now if the above statements taken from their bulletin, several of which reached this office, do not carry a clear impression that *each subscriber* will receive a loan, we mistake the proper use of language, and when these statements are associated with such as this found in the explanation of their methods in Europe: "Thus *each* subscriber, in addition to receiving the finest of art publications at a very low price, was represented in each dividend so long as he remained a subscriber," etc., the intent is beyond question.

And notwithstanding a little simple arithmetic would show any one the impossibility of making "each subscriber" a loan in excess of his subscription *out of the profits*, and also that once on the bulletin the term "selected patrons" indicates the beneficiaries, still the scheme is so well adapted to deceive that we caution the public to look well into it before investing.

Their method of procedure is this: Upon receipt of a subscription, a form assigning the subscriber to a class, designating the amount of loan he shall receive, is forwarded him, together with a blank, to be filled out and returned within a specified time, or the right to a loan is forfeited; said blank calling for a description of the *amount*, location, *value*, etc., of "REAL ESTATE" possessed by the subscriber, upon which the loan is to be made.

How nicely that little scheme weeds out the "each subscriber," etc., etc., etc. Out of the 60,000 ministers in this country who might become subscribers, how many own real estate this side of heaven? And a dozen corner lots in the new Jerusalem count for nothing beside a quarter of an acre of swamp ground in Patagonia with this astute concern.

We wrote them weeks ago, calling their attention to some of these angles in their straight line, and politely asked for an explanation. But they seem to be too busy to explain, and believing that our thousands of readers all over the world were entitled to an explanation, we state tnese facts for their benefit, as also a hint for our exchanges.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

"THE PENNY WEEKLY," of Chicago, Ill., comes to our table with a remarkably fresh, crisp appearance, full of news and good cheer. No one need be without the news when he can obtain a clean weekly paper for one cent.

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THE February number of "DEMOREST'S MONTHLY" is fully up to the standard of that excellent periodical; $2.00 per year, 20 cents single copy.

"THE PROBLEM OF RELIGIOUS PROGRESS," by Daniel Dorchester, D. D. 5 1-2 x 7 1-2. 600 pages. $2.00 Phillips & Hunt. Any one interested to know how religion looks when clad in its Sunday-go-to-meeting figures will find this book an interesting study. Doubtless the best showing that can be made toward demonstrating a religious progress is here set forth. Yet a cautious student of the *Scripture* along with the *signs of the times*, even as set forth in Dr. Dorchester's book, will note a clear distinction between *Christ* and *Religion*, though it pass for Protestantism to which such prominence is given in the book before us. There seems to be drawn a comparison between the worst phases of society in a past age, and the most hopeful conditions of the present time, with the natural result of great progress as the conclusion. And many of the conclusions arrived at are clearly possible only from the standpoint of the *liberalism* that sees much that is good in every thing, and seeks for a satisfactory description of the Devil in Emerson's definition of a weed, "a plant (principle) whose good properties are not understood."

Dr. Dorchester seems quite conclusively to show that present methods, sufficiently continued, will produce a converted world; at least it will not be the fault of his cheerful mathematics if that is not the result. What relation "to the Christian subjugation of the world" does the claim that "685,000,000 people are under Christian government" sustain in the light of the well established statistics that "in Berlin not *two per cent.* of the inhabitants pay any attention to the services of the church," and in London less than twelve per cent. attend church, while in Boston itself ten years ago "fifty-five per cent. of the people *never entered church* except to attend a funeral."

A writer in the *Missionary Review*, in an able paper entitled, "A Century of Protestant Missions," presents these undisputed figures: Converts in all Protestant missions during the century, less than 3,000,000, even counting *families* and *dependents* of all adult converts; while the increase in the heathen population during the same time was over 250,000,000, or *seventy* times the number of converts! Protestant missions started into the race 800.000,000 behind, and during 100 years of vigorous labor finds that for every soul won to Christ *seventy* heathen have succeeded to his place by natural increase, and consequently is now over 1,000,000,000 behind. How long must present methods continue to convert the world? But all students of mathematical legerdemain will find "examples for practice" in the *Problem of Religious Progress.*

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(SUCCESSOR TO THE MICROCOSM, FOUNDED 1881.)

A MONTHLY JOURNAL

Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph. D., LL. D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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CAPT. R. KELSO CARTER, C. E.

BY THE EDITOR.

SCOTCH-ENGLISH Presbyterians on the father's side, and Presbyterian, North Irish, joined with English Quaker on the mother's side, sufficiently attest the fact that the subject of this sketch was born in the pale of rigid orthodoxy. His paternal grandfather was born near Portland, Maine, but the rest of his grandparents and his parents were natives of Baltimore, in which city he himself was born in 1849. His father, A. M. Carter, Esq., has stood for more than forty years in the very front rank of solid religious work in his native city, and from him and his devoted mother Capt. Carter received the most patient training and tender care. From his earliest recollection he has never known what it was to doubt the truth of the Word of God, even when he had no practical knowledge of a personal salvation. To illustrate the faculty of original thought which was born in him, his mother relates that once, when about five years old, he was reciting the answers from Brown's catechism, and on reaching the one, "Are my thoughts, words, and deeds all sinful?" after repeating the answer, "Yes, I do nothing but sin," the child said, impetuously, "Ma, me does do something else;" a remark which caused much amusement at the time, and which seems to show that he was born with a strong logical turn of mind, and with a decided leaning toward the doctrines of Methodism.

As a boy he was bright and quick, although always inclined to do everything in the way that involved the least personal effort; and at the age of only thirteen he entered the Baltimore City College. After remaining there two years, his father sent him to the Pennsylvania Military Academy, then situated at West Chester. In a few months Colonel Hyatt moved the academy to Chester, and there Captain Carter graduated with honors in 1867, with the degree of Civil Engineer. One year was spent as a post-graduate; and then, although only eighteen years of age, he was offered by Colonel Hyatt the equivalent of nearly one thousand dollars to remain in the P. M. A. as permanent instructor. Accepting this offer, for several years he taught the various elementary branches, besides acting as the drill-master of the academy until 1872, when he was called to the Chair of Chemistry and Natural Philosophy, and appointed Adjutant of the Academy, with a commission as Captain from the State of Pennsylvania.

From boyhood our subject was very ambitious in manly sports, and although working against serious physical disadvantages, as he was not naturally strong, by dint of hard work and perseverance he became the best base-ball pitcher and the most powerful and active gymnast ever known in the college. (The P. M. A. is a college, with full univer-

CAPT. R. KELSO CARTER, C. E.

sity powers, and only uses the term academy because of its close resemblance to the United States Military Academy at West Point.) About the time he was called to the Chair of Chemistry a violent cold settled into what threatened to be throat consumption; and while taking powerful medicines for this affection he allowed himself to overexercise in the gymnasium, with the result of a sudden injury to his heart. The trouble was valvular and organic, and became rapidly worse. At the close of the year Capt. Carter resigned his position and went to California, where, in company with his cousin, he engaged for upward of three years in the sheep business, living in camp, cooking, washing, herding sheep, shearing them, riding day and night, and submitting to all the rough and varied experiences of a stock ranch. Here his health was built up, and he looked perfectly well; but the heart trouble remained, and he never could trespass beyond a certain line without serious injury.

About the beginning of the Centennial year he was suddenly telegraphed for to take his old chair at Chester, and left the Pacific coast in three days and resumed his duties as instructor. But the in-door life soon told on him, and his health failed. A trip to Europe in 1878 seemed to afford some benefit, but in the summer of 1879 he suddenly broke down, his heart becoming so bad that he could not sit up longer than an hour or two. During the months of July, August and September he passed through the great crisis of his life.

During his first year at the P. M. A., when sixteen years old, he was converted during a blessed revival season, and united with the Presbyterian church. During the fourteen years that followed he was always active in religious work in the cadet prayer-meetings, and also did much service as a speaker on gospel temperance, and in 1878-9 we find him heartily assisting in the Moody inquiry meetings in Baltimore. But all this time he was far from being satisfied with his religious experience. When he was prostrated by the heart disease, as already related, he reviewed his past life, and finally made a solemn and irrevocable consecration of his whole being, time, talents, possessions and plans to God, submitting himself absolutely to the will of his Creator in every way. At this time he was lead to study the Bible on the subject of healing through faith, and the result was that in September, 1879, he went to Boston, although from every human standpoint utterly unable to travel; saw Dr. Charles Cullis, and was prayed with according to the directions in James v. 14, 15. He returned at once to Chester, and astounded everybody by walking a mile from the depot and by entering at once upon his duties, from which he has missed only one day from sickness since. A full account of this remarkable experience is published by Dr. Cullis at Beacon Hill Place, Boston. (Fifteen cents.)

A few months after his wonderful recovery, Capt. Carter was married to a niece of Col. Hyatt, and just about this time, by a strange concurrence of outside circumstances, was impelled to unite with the Methodist Church. Here his gifts were at once recognized, and in a short time he was made a local preacher, and given the most abundant opportunities for work. From this time on his career has been an exceedingly busy one, constantly marked by a vigorous warfare for what he believes to be the truth, totally regardless of moss-covered tradition. He was soon called to the Chair of Civil Engineering and Higher Mathematics, which position he now occupies.

In 1881 the "Problem of Human Life" came under his notice, and he immediately wrote us, and receiving a copy of the first number of THE MICROCOSM, became one of its very first supporters. Capt. Carter was well fitted to write on acoustics, being an accomplished musician, performing brilliantly on the piano and flute. His piano compositions, published by John Dougherty of Chester, show a rare power of melody, and a brilliancy of execution that may engage very high abilities.

He never could lay his hand to anything without developing his originality; and so in a short time, at our request, he presented his first experiment and contributions for THE MICROCOSM against the wave-theory of sound. He conclusively demonstrated, as we had set forth in the "Problem of Human Life," that

the loudness of sound does not decrease as the square of the distance at all, nor anything remotely approximating it; *one* pitch pipe equaling *four* in loudness when the relative distances were as *one to thirty*, instead of *one to two*, as taught by all textbooks on sound. Amongst all his other experiments, this one stands pre-eminent as having been absolutely unchallenged for now nearly six years. But others rapidly followed, and the Captain extended his experiment through the whole range of resonant tubes and organ pipes, unison tuning-forks, interference of fork waves, the chladni plates, etc. Besides these original experiments, he took up our famous discovery involving the almost inconceivably slow motion of a tuning-fork's prong when sounding, and ran our first crude calculation down to a point that showed the motion of the prong, while still sounding audibly, to be *less than one inch in two years;* a fact which drove such a nail in the coffin-lid of the wave-theory, that even Profs. Stevens and Mayer, although they went diligently to work on it, have so far not dared to attempt its public extraction. He also took up our origininal locust argument, and applied it to a bell rung under water, and in other ways gave the wave-theorists logical hot-shot that could not be returned. About this time he favored the readers of THE MICROCOSM with the clearest and most detailed exposure of the famous tricks of the spiritualists, Slade and Foster, that has ever appeared.

Of late Capt. Carter has become so overwhelmed with religious work that he has not found much time for scientific experiments. Besides his regular college duties, he edits a monthly paper called the *Kingdom*, which is devoted to such subjects as "Full Salvation," "Divine Healing," "The Second Advent," and "The Deep Things of God." It is published at Chester, Pa., by the *Kingdom* Pub. Co. His summer vacations are spent largely in the camp meetings in various parts of the country, where he is in great demand as an eloquent and most convincing speaker. He stands out boldly as the most unshrinking champion of the doctrine of Christian Holiness; and in the line of faith healing he is looked upon as an acknowledged leader. An ably written article from his pen on this subject will soon appear in the *Century Magazine*. Several years ago Capt. Carter issued a book entitled "The Atonement for Sin and Sickness" (to be obtained at Chester), which is universally acknowledged to be the most scholarly, logical, and exhaustive work that has yet appeared on the subject.

In preaching he is logical to a hair, and clear to an uncommon degree, as we were deeply impressed when we heard him a year ago at Dr. Bottome's church in this city. He is an uncompromising Substantialist, believing in the entitative nature of all force, including life, mind, soul, and spirit; and in all his preaching and writing he constantly appeals to and uses science as in complete harmony with religion. His illustrations are unique and excite attention everywhere from their freshness and force; while he is absolutely unsparing in dealing with error and sin. His musical genius has been utilized for religious work in the writing of hymns suited to his fine melody and composition; and in conjunction with this, he has used an old talent, that of writing poetry. For many years he appeared quite frequently in the religious press as the author of poems of real merit; and this gift now serves him well, as a glance through a hymn-book edited by him and Prof. John R. Sweeney will clearly demonstrate. The latter gentleman has been associated with Capt. Carter, at the P. M. A. for more than twenty years. The book mentioned—"Songs of Perfect Love"—may be obtained, *as may all the Captain's publications*, from the *Kingdom* Publishing Co., Chester, Pa. A single hymn, written by him, which has swelled up from the throats of thousands during the past summer, is here quoted from this hymn book:

AT THE CROSS.

O Jesus, Lord! thy dying love
Hath pierced my contrite heart;
Now take my life, and let me prove
How dear to me thou art.

Amid the night of sin and death
Thy light hath reached my soul;
To me thy loving voice now saith,
"Thy faith hath made thee whole."

I kiss thy feet, I clasp thy hand,
I touch thy wounded side;
Oh, let me here forever stand,
Where thou wast crucified.

My Lord, my Light, my Strength, my All!
I count my gain but loss;
Forever let thy love inthrall,
And keep me at the cross.

This hymn expresses the devotional sentiment of Capt. Carter's life. He lives, and moves, and thinks, and works, FOR CHRIST. With the ability of Henry Drummond to put religion in a scientific dress, he utterly repudiates the nonsense of materialistic evolution, and as his able introduction to Prof. Vail's great book on the Earth's Annular System shows, he finds a perfect harmony between God's two great volumes, Nature and Scripture; holding to the fundamental axiom that discord is impossible between the works and the revelations of the Lord God Almighty.

Much as we have prized Capt. Carter's contributions to our publications, we prize his personal acquaintance and genial friendship even more if possible. Some of our pleasantest hours, in the midst of our arduous and incessant editorial labors during the past six years, have been spent in discussing knotty scientific questions with the Captain, as he has occasionally dropped over from the Military Academy, to while away an afternoon and evening at the headquarters of Substantialism at 23 Park Row. We should be suppressing a part of the truth did we not confess our sad regrets in missing the pen of Capt. Carter, from the columns of THE SCIENTIFIC ARENA, as so familiar to the readers of the five volumes of MICROCOSM. And we may be allowed to express the hope that the Captain may find it consistent with his other duties, in the near future, to allow our readers, as of old, to enjoy the pleasure and profit of his versatile pen.

PHILOSOPHICAL CONFUSION.

BY J. WEBER, ESQ.

The Germans, who have furnished the world with a long list of eminent philosophers and scientific writers, among whom we find such illustrious names as Kant, De Wette, Leibnitz, Fichte, Hegel, Lotze, Liebmann, Plauck, Drossbach, Ritter, Schaller, Schelling, Schopenhauer, Schleiermacher, and last, but by no means least, Haeckel and Helmholtz, have an adage which says, "*Wo gelehrter, wo verkehrter.*"

This adage translated into English would read: *The more learned, the more perverted.* In its spirit this German adage is not very flattering to scientific education. It is somewhat akin to our English adage, "Where ignorance is bliss, 'tis folly to be wise."

When we carefully examine what passes for science and philosophy as taught in most schools, and in the greatest universities in the world, this German adage needs no apology for its origin, but expresses a great truth with an intensive force. If, *e. g.*, the undulatory theory of sound as advocated by the greatest acousticians in the world, viz., Helmholtz, Tyndall and Mayer, and taught in nearly all the schools in the world, be a fair sample of scientific education, one loses all confidence in science.

This theory comes to us with scores of contradictions, inconsistencies, absurdities, and impossibilities. And yet we are assured that it is firmly fixed and established on scientific principles and mathematical calculations. If this be science, one naturally comes to the conclusion, the less a body knows, the wiser he is. And no doubt the wave-theory of sound is a fair specimen of much that is called science. It is no less absurd than the all-pervading *ether-wave* theory of light, with its trillions of jelly-wave pulsations upon the retina of the eye each second.

Take the plainest terms in the philosophical vocabulary and look at the definition given by the great savants. Take the term *matter*. Before you consult these Solons to learn what they have to say about it, you will have a tolerably fair and correct conception of it. Common sense will tell you that matter includes all those substances in nature which have a certain determinate and ascertainable density and specific gravity; or, all substances which can be subjected to chemical analysis or mechanical tests. That the term includes all the solids, liquids, and gases. But when you look at the definitions as given by the great philosophers and scientists, you will soon become bewildered and confused by their contradictions, disharmony and want of perspicacity. You will soon be in doubt and uncertainty what constitutes matter, or whether or not it exists at all. There will be about as many philosophical *richtungen* (tendencies) as there are philosophers, each one giving his own definition of matter, and each one differing a little, and sometimes a good deal, from all the rest. They may, however, all be lumped into three great classes—Materialists, Spiritualists, and Nihilists.

The materialists teach that matter is all there is of substances in the universe; that the invisible and impalpable forces of nature, including the physical, vital, mental, and spiritual, are only the results, or phenomena of molecular motion in matter. They tell us that matter has various modes of motions producing these phenomena, which the ignorant and uneducated call life, mind, soul, and spirit. The name of this class of philosophers is Legion. It is the largest in number, and perhaps has the ablest and most distinguished leaders. The *richtung* (tendency) of this system necessarily leads to atheism. For if matter is all there is of substance, and the physical, vital, mental, and spiritual forces are simply the result and phenomena of molecular motion in matter, and are not substantial entities, then all these forces will cease to exist so soon as the material molecules will come to rest. These materialistic philosophers use the terms matter and substance interchangeably, as though they were synonyms; and the atheistic bent of their minds can be detected on almost every page of their writings. Prominent representatives of this class of philosophers we find in Darwin, Huxley, Haeckel, and Herbert Spencer.

The spiritualists occupy the extreme left wing in science, and are the direct opposites of materialists. The burden of their philosophy is, that there is no matter in existence, that the existence of matter is an optical delusion. That matter only seems to exist, but that it is nothing but the phenomenon of spirit. They tell us that God and spirit are the only substances which exist in the universe. *Drossbach* is a prominent representative of this class of philosophers. He tells us: "The theory of material substances has nothing to justify it. He who seeks material substance will not find it in the wide world. There is no dead substance. There is nothing inactive—there is no matter. All is living, active, immaterial. What we are in the habit of calling matter, is nothing opposed to the immaterial, is none other than force. It is the

immaterial, vital, potential self in special conditions. Matter is nothing diverse from the spiritual, no antithesis to the spiritual, but is the spiritual itself." If these words mean anything, they teach that there are no material substances in existence; and that what we call matter is simply the phenomenon of spirit. The third class of philosophers are the nihilists. These deny the existence of both matter and spirit, and teach that nothing exists.

Fichte is perhaps the most noted of this class. He says: "The sum total is this: There is absolutely nothing permanent either within me or without me, but only an unceasing change. I know absolutely nothing of any existence, not even of my own. I myself know nothing and am nothing. Images (Bilder) there are; they constitute all there apparently exists, and what they know of themselves is after the manner of images that pass, and vanish without there being aught to witness their transition. Thought consists, in fact, of the images of images without significance and without aim. I myself am one of these images—nay, I am not even thus much—but only a confused image of images. All reality is converted into a marvelous dream without a life to dream of, and without a mind to dream, into a dream made up only of a dream. Thought, the source of all existence and all reality which I imagine to myself of my existence, of my power, of my destination, is the dream of that dream."

Such is philosophy and science as taught by the great thinkers. Is there no light to shine into this darkness? Is there no exodus from this worse than Egyptian bondage? Is there no decree announcing an end to this Babylonish captivity in science? Thanks to God, and thanks also to the founder of the Substantial Philosophy, there is a perfect light capable of dispelling this gross darkness. The command has already gone forth for students of science to go out of Egypt and possess the land flowing with milk and honey. The decree has been proclaimed that this captivity and confusion which now hinders the progress of science shall cease.

If the editor of THE SCIENTIFIC ARENA should deem this introductory article from the pen of a novice in the Substantial Philosophy worthy of a place in the columns of that valuable journal, the writer will undertake in another article to show the beauties, harmonies and consistencies of the Substantial Philosophy as first promulgated in the "Problem of Human 'Life," formulated in the seventeen lectures of the "Substantialists' creed," and systematized by Dr. Swander in his book called the "Substantial Philosophy."

ADAMSVILLE, O.

VOLUME V. OF THE MICROCOSM.

BY J. I. SWANDER, D.D.

ONE missing or broken link is a break in the entire chain. This is often an occasion of great inconvenience and loss. Especially is it the case in matters of history. History itself can have no missing link, since it has objective being in unwritten form, as the unfolding process of the world's life, but the record of such evolution may be so neglected, mutilated or destroyed, as to place subsequent generations at a great disadvantage in their attempts to search after the origin and lineal descent of the world's most important movements. This is true as to the records of religion. It is not likely that the "Book of Nathan the Prophet" was an inspired part of God's great volume of Revelation to man, and yet how deplorable its loss! What a matter of great convenience and edification to Christendon would have been afforded by the preservation of its manuscript and positive identity in the sacred archives of Judaism. So too with the "Book of Gad the Seer" and the "Book of the Wars of the Lord."

Yet, while many valuable records of the world's past history are lost forever, the negligence and vandalism responsible for the loss thereof should be a lesson of warning to us who are now called to profit by the examples of past folly in the possession and practice of present wisdom. Though many important records of past struggles in the cause of truth are irretrievably lost, the "wars of the Lord" are still being carried on. The present heroic conflict may be entitled—the campaign of the Substantial Philosophy. And is it not one of the wars of the Lord? Does it not involve the essential principles that underlie the constitution of his mighty empire on earth and in heaven? Is not God in the world's history? Is there not a Shechinah in the temple of science as well as in the tabernacles of religion? Who will dispute the presence of the Invisible Majesty immediately over the depository of nature's laws? Who will dare to affirm that the Divine Presence, which "dwelleth between the cherubims," does not "shine forth" in true philosophy, and go forth with Jehovah's hosts upon the fields of scientific conflict with error? If any, speak, for him have we offended. The Lord of hosts *is* with us, and the God of Jacob is our refuge. Therefore let a book of remembrance be kept, that our children may see in *their* day what things Heaven will have wrought for their fathers. The book of records should contain all the essential chapters thereof, that generations to come may be edified and delighted in the possession and perusal of volumes well filled with ample pages of correct and complete historical contents.

Down to the present time the discussion of the fundamental principles of the Substantial Philosophy has furnished the reading public with some excellent literature. This literature need offer no apology for its appearance in any of the libraries of the world. As a rule, the elegance of its style is unsurpassed, even by the rich treasures of its contents. It possesses a stalwart character, and demeans itself with a manly, modest air of conservative independence. Its merit consists, partly in its vigorous method of expressing the ideas that underlie it, but rather in the subject of which it treats, and the fertile source from which it draws the breath of its revolutionary inspiration. The "Problem of Human Life" will live after nine-tenths of the volumes of modern fictitious gush and scholastic nonsense will have been carted away to the paper mills, and ground over for material from which to issue its millennial editions. In company with the "Problem" THE MICROCOSM will appear with its various articles bearing more or less directly upon the main question under discussion in nearly all of its columns. How like a cloud of immortal witnesses the contributors will look down upon the future! So, too, with THE SCIENTIFIC ARENA. As these pages are scanned by the vigorous intellects of coming ages, the appropriate words of the Psalmist will probably be employed to give expression to their sentiments: "Our fathers have told us. We will not hide them from their children, showing to the generation to come the praises of the Lord, and his strength, and his wonderful works that he hath done."

In order that "the generations to come" may have the full benefit of all that is now being done to drive out the unscientific heathen and to establish the Substantial Philosophy in the world, let every student of this philosophy, and every reader of its excellent literature, secure and preserve, in their most permanent form, the books and periodicals of this new school in science as fast as they are issued from the press and the binderies. They will be greatly sought after and highly prized in a few years, and, with the exception of Vol. V. of THE MICROCOSM, can now be had in bound books. The first six numbers of Vol. V. have been printed and published to the extent of its circulation, which was no where near as great as the circulation of the first four volumes, nor did it compare with the present increasing circulation of THE ARENA. No. 7 of THE MICROCOSM is in plates, and contains important reading matter. There is no good reason why it should not be printed. It is suggested that all who feel the importance of having every link in an important chain of a very important historical record request Hudson & Co. to secure, if possible, the right to print and put Vol. V. upon the market. The seven numbers will make a book of 336 octavo pages of reading matter, which no live Substantialists can well do without. In its excellent table of contents may be found *Prof. Tait on Force*, *The Stridulating Locust*, *Photographing Sound Waves*, *Force*, and *The Heat Problem*, and many other papers by Dr. Hall; *Life*, *Porosity*, and *The Homogeneity of Matter*, by Dr. Mott; and many other valuable papers by an able staff of contributors. In his recent visit to New York the writer of this article understood that initial steps had already been taken toward bringing out this important and needed volume in full. We hope that the work will not be delayed. There is room in our library for one copy, and a demand among our friends for many more. Give us the missing link. Let the book be printed and bound for the market.

FREMONT, O.

[Vol. V. has just been printed and bound, and is for sale by Hall & Co. See last page.]

THE CONTRACTEDNESS OF MATERIALISM.

BY JOHN C. DUVAL.

DAVID RITTENHOUSE, says: "We shall find sufficient evidence to conclude that the visible creation, consisting of revolving worlds and central suns, even including all those that are beyond the reach of the human eye and telescope, is but an inconsiderable part of the whole. Many other and various orders of things may and probably do exist in the unlimited regions of space, and all yonder stars innumerable with all their dependencies may perhaps compose but the leaf of a flower in the Creator's garden, or a single pillar in the immense building of the Divine Architect."

I can see no reason, myself, for supposing that the universe is everywhere the same as it appears to be within the narrowed scope of our vision. General laws, such as that of gravity, may prevail throughout space, but it is certainly reasonable to suppose they may be changed or modified in many ways so as to produce a very different state of affairs from that existing within the contracted sphere of our observation—just as the slightly varying proportions of a few simple substances—oxygen, hydrogen, carbon, etc., give rise to numberless widely-differing organic forms.

One of the most prominent materialists of the day says "that the harmony and unchangeable character of nature's laws is, to him, one of the strongest evidences that there is no power outside of matter capable of controlling it. Arrest, just for a single moment," he says, "the law of gravity, and a God appears." For the last five or six days I have seen a man go by my door on his way to his office regularly every morning at nine o'clock—but I do not infer from that, that he will continue to go by my door regularly every morning at nine o'clock as long as he lives, because I know there may be thousands of natural causes operating, any one of which may prevent him from passing at that hour to-morrow. This materialist says he has seen no interference himself with the

laws of nature, and that the history of the world for six thousand years past [or as far back as we have any reliable records to refer to] does not furnish any credible account of such interferences. But, admitting it to be a fact, that there has been no interference with the laws of nature for six thousand years past, or a hundred thousand years past, is that any proof that there never will be any interference with them, or that there has been none in the untold ages gone by? What are six thousand years, or a hundred thousand years, when considered with reference to endless time and an eternal God, to whom "a thousand years are but as a day?" The fool who has acquired a little knowledge thinks he knows all things—the wise man confesses that he knows just enough to convince him that he knows nothing, that the light he has is just sufficient to render the darkness visible. This materialist, who has obtained a little knowledge of some of nature's laws, boldly asserts that the same laws are and always have been operating in the same way throughout boundless space, and will continue to do so for all time to come; or, in other words, he says: "Knowing something of the laws that govern and have governed the little speck of the universe that comes within the scope of my observation, for the last six thousand years, I assert that the same laws prevail everywhere throughout endless space, and that they have been in force for an eternity past, and will be for an eternity to come."

As this materialist gives to matter the power of enacting laws for its own government, it seems to me, to be consistent, he should not deny it the power to modify or change them, and yet he tells us, "the laws I see in operation upon the little atom of the universe to which my observation is restricted, are, and must be, the same throughout all space."

To say the least of it, this is all the merest conjecture, and, as far as I can see, is in no respect more reasonable than it would be to suppose that there are vast intervals of space, where the laws in operation and the condition of all things are widely different from what they are here.

A few days ago, whilst strolling in the vicinity of the city, I took a seat on the shady side of a cedar bush, to rest myself for a few moments. Near me there was a small hillock in which there was a nest of ants, and I amused myself for some time watching the movements of the little industrious insects, as they hurried to and fro, each one intent on his own business. But at length my attention was drawn to one particular ant whose motions were much slower and more dignified than those of the common herd. When I first noticed him he was on the extreme point of a spear of grass, taking a survey of the world around; but evidently he was not satisfied with the prospect, for, after a hasty glance, he descended and climbed up another near by, from the top of which he took another hurried look that seemed to be equally as unsatisfactory as the first, for he slowly descended and climbed up another. This he did half a dozen times or more, until finally he reached the top of the highest sprig of grass in his vicinity, where he remained stationary for a long time, gazing from his lofty elevation upon the *world* stretched out below him. Then, for the first time, the idea occurred to me that he was a wise, learned, and scientific ant, making his observations upon the condition of the world, or so much thereof as came within the limits of his vision (say about six feet every way). After some time had passed, he slowly descended from his elevated "observatory," and, with a "weatherwise" and knowing look, took his way to the hole in his hillock, where he disappeared from my view, and I saw him no more. But I have no doubt, in his next "lecture," he reported as the result of his observations, to his less learned *confreres*, that, beyond all doubt, the whole world was not only flat, but was composed of sand and gravel, and tufts of grass, with here and there a scattering bush or bowlder. Such things as oceans, mountains, lakes, and rivers were not "dreamt of in his philosophy."

And so it is with our learned and scientific materialist. Within his limited scope of observation (as limited as that of the ant, when compared with boundless space), he perceives certain things and certain forces at work, and concludes he has sufficient data therefrom to pronounce upon the condition of the whole universe, and of the laws by which it is everywhere governed. Like the ant, he sees a little sand and gravel, with here and there a bush or bowlder, but never dreams of the oceans, mountains, lakes, and rivers that may, and very probably do exist, in the immeasurable regions of space.

EL PASO, TEXAS.

THE PLATONIC PHILOSOPHY AND CHRISTIANITY.—No. 2.

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

PLATO, in many respects the greatest of Greek philosophers, was born in the city of Athens, about 429 B. C., and died about B. C. 348. His father, Ariston, could trace his ancestry to Codrus, and his mother, Perictione, was a descendant of the celebrated lawyer, Solon. His original name, Aristocles, was derived from his grandfather, but was changed to Plato, from the Greek *platus*, which means broad, either on account of the breadth of his shoulders, his forehead, or the greatness of his diction. It is said that when he was a child, bees settled on his lips, which was thought to betoken the honeyed sweetness of his style. His writings are all in the middle Attic, the purest and richest dialect, of the most perfect and classic language among all the members of the great Indo-European family of languages.

Plato was born the very year of the death of Pericles, the second year of the Peloponnesian war, which was so fatal to the fortunes of the Athenians. It appears somewhat strange that a youth with the surroundings of Plato, and in the age in which he lived, would select the seclusion of a philosophic life rather than the fortunes of political honor. Political distinction certainly lay open before him; for Critias, one of the thirty tyrants, was a cousin to his mother, and he had other relatives greatly distinguished at Athens. The greatness of his soul is shown in the fact that he was willing to give up all for the study of philosophy. The sacrifice which he made, in that age of the world, might be compared to the man who will now give up everything for that true system of religion and philosophy which solves the greatest problems in the universe.

Plato's education was excellent: in gymnastics he was sufficiently trained to contend at the Pythian games. Like a true Greek, he attached great importance to calisthenics, as doing for the body what dialectics does for the mind; but he did not, like some modern students, let corporeal exercises entirely absorb his mind. He assiduously devoted himself to the study of music, poetry, and rhetoric.

He wrote an epic poem, but is said to have burned it in despair when he compared it to the poems of Homer. His tragedies were burned, when he became acquainted with Sophocles. Some of his epigrams have been preserved. One of them reads thus:

> Thou gazest on the stars, my life!
> Ah! gladly would I be
> Yon starry skies with thousand eyes,
> That I might gaze on thee.

Before meeting Socrates, Plato had given considerable attention to the study of philosophy. He had become acquainted with the doctrines of Heraclitus, and the study of Anaxagoras had given him a knowledge of pre-Socratic physics.

At twenty years of age, Plato came to Socrates, and with that great master he spent eight years. In fact, he continued with Socrates until the death of that great master. Plato appears to have comprehended better than did any other man the true Socratic method and spirit. While others represented one-sided views of the Socratic philosophy, Plato presents it in all of its fullness. When he first came to Socrates, he was a skeptic, but he was not long in learning better things. The philosophy of the age was not sufficient to satisfy such a gigantic mind. In the school of Socrates he found breathing room, and got rid of his doubts by seeking more truth. The best way to get rid of darkness is to let in the light. Socrates directed his attention to the study of ethics, and in that department he became the most distinguished philosopher in the world. Much of the reputation of Socrates was due to Plato, for he placed his own greater developed philosophical system in the mouth of his master. Socrates is made the center of his dialogues, and the leader of all his discourses. There is in reality more of Plato in them than there is of Socrates. If Socrates was the greater saint, Plato was the greater genius.

> Immortal Plato! Thou reverend sage!
> The greatest of any age.

After the death of Socrates, Plato spent about ten years in travel. He first went to Megara, where he associated himself with Euclid, a former fellow-student, and the founder of the Megaric school. Up to this time, he was a pure Socraticist; but now, he endeavors to ingraft the Socratic ethics upon the Eleatic idealistic philosophy. His residence at Megara, evidently, had a great influence upon his philosophy, especially upon the elaboration and confirmation of his doctrine of ideas. In the Grecian cities of lower Italy, Plato became better acquainted with the Pythagorean philosophy; and this was, possibly, the cause of his great fondness for mathematical physics. Plato sojourned, for a time, in Egypt; and some think that he also visited Palestine, Babylon, Persia, and India. There are traces of his Egyptian travels in some of his religious ideas, to which we will call attention hereafter. While some writers have placed too much stress upon the influence of the Orient upon the Platonic philosophy, there are more recent writers, who are not willing to admit the evident influence of Egypt upon the philosophy of Plato. This eminent philosopher did not spend so much time in Egypt for nothing. Like Moses, he received great benefit from the learning of the Egyptians. With what pleasure, we imagine, Plato must have spent his time with the great men belonging to the esoteric schools of ancient Egypt. What great stores of learning that once belonged to the country of the Pyramids, is now lost. It perished beneath the feet of the ruthless Mohammedan invaders. After the many years spent in travel, Plato returned to his native Athens, where he taught philosophy in a garden near the academy. He was now forty years old, and well prepared for his great work. What a contrast between his preparation for a life work and the preparation now made by young men for the learned professions! His lectures were very largely attended, for his preparation had been great, and he was the wisest of men. There was so much interest taken in his teachings that even women disguised as men attended his lectures.

In our next article we will give some attention to Platonic physics and to the dialectic of Plato. The spirit of this great man should inspire us with a greater zeal for the truth, and we should not be satisfied with

anything less than the substantial and the real amid the vagaries of modern speculation.

PREREQUISITES IN SEARCHING AFTER GOD.

BY REV. GEORGE SEVERANCE.

CONDITIONS are essential in seeking truth in any form. Hence human adaptability for every work and every purpose in which we can engage. Want of adaptability and capability causes one to fail where another succeeds. To be a logician, the elements of logic must be inherent in him who would attain to eminence. To be a successful preacher the individual must have the right natural endowments; so of the moralist and inventor.

When the negative side of man's nature predominates over his other faculties in his search after God, he is unsuccessful, because he is wrongly balanced to apprehend what others of the right make-up lay hold of intuitively. Reluctant as many may be to concede it, our intuitions are as safe a guide as is pure intellect viewed abstractly. The semi-intellectual faculties are indispensable aids to the greatest intellect in reaching right convictions. The intellect cannot act until the perceptives present the materials upon which to act. The eye is not intellectual, but it does reveal objects for thought and reflection.

Men who feel justified in discarding the Divine Existence, may demand proofs, which cannot be reasonably demanded. A somewhat prominent atheistical lecturer gave as a reason for not recognizing the being of God, the fact he had never seen him. No doubt he had never seen him; and no doubt to ask that kind of evidence is to ask that which cannot be granted to any man, though no one had ever raised a doubt as to whether God is.

There is a science known as phrenology, which furnishes a basis for the operations of the human mind. This science is so well established but few call it in question. At any rate our perceptive and thinking processes are carried on above the ears, when the region is approached where our reflective laboratory works out its results. No materialist should discard phrenology, because he believes thought to be purely brain work, knowing to a certainty neither a man's toes nor the tips of his fingers are the seat of mental action. Those who hold we are endowed with souls claim that the soul acts on the brain in all thinking processes.

If phrenology had done no more than classify the human faculties, it could be proved it has rendered mental science an invaluable service. There are two organs known as causality and comparison, possessed by all eminent thinkers and without which one cannot become a profound thinker. But when we step into the various walks of life, we find men have attained to great eminence through the agency of other human faculties. Man is not all intellect, though we give a sort of supremacy to intellect. In contemplating the discoveries and improvements in mechanism, we find that an organ known as constructiveness in conjunction with certain other perceptive faculties has played an important part. In other words, discoverers and inventors have not usually been the most profound abstract thinkers. Plato, Aristotle, Bacon Leck, and Kant were not distinguished for their inventive and mechanical genius in a materialistic sense. Every person of note has his specialty, and if he ever becomes eminent it is in that specialty.

Truman Henry Safford and Zera Collrun were pre-eminent mathematicians. In fact this country has never produced their equals. They solved mathematical problems instantly, that would require a long process on the part of many college professors, yet they showed no particular ability in metaphysics, or in solving problems in mental science which perplex profound thinkers. The case of these notable mathematicians proves there is a distinct mathematical faculty or faculties, distinct from purely intellectualism as displayed in metaphysics, political economy, and in theological speculations. The particular organ to which we allude is calculation. Without that organ it is impossible to be a mathematician.

John Locke was a profound thinker, yet as a mathematician he never rose to mediocrity. George Combe, one of the most eminent phrenological authors, could do nothing in his mathematical studies. There are two organs in the human cranium, known as time and tune. No one, whatever his intellect, was ever pre-eminent who did not possess these organs. Mozart and Becthoven, as musicians, have a world-wide notoriety. Without time and tune their names would never have been handed down to posterity. Men who accumulate large wealth have the organ of acquisitiveness large. If the organ is small, whatever the intellect, riches will not be amassed. We call Daniel Webster a great statesman; but he never amassed riches, for he evidently was not gifted in this direction, great as was his statesmanship.

When we come to religion, in its broader signification, we find there are three organs in particular necessary to make one eminently religious—veneration, hope, marvelousness or spirituality. No one, as a religionist, ever shone brilliantly in the pulpit or walks of religious literature who possessed not these religious faculties, which shows that abstract intellectualism of itself does not make one reverent and worshipful.

One with that part of veneration large, near to firmness, will have a profound conviction of the existence of God, especially if the other religious faculties are large. If hope is large, a belief in a future existence follows; if marvelousness, or spirituality, is large, the individual will have a living and devout faith in divine realities.

It is said there is nothing superfluous in nature. If the skeptic repudiates all religious worship, and rules God out of the universe, he will not discard any phrenological organs save the religious. But are all other human faculties except those which make man devout, and a worshiper of a creator, essential? Are the religious organs simply superfluous when their office is to give outward as well as inward expression to our religious nature? There is an organ called *color*. I have seen intelligent people, with good eyesight, so color-blind they could scarcely distinguish one color from another, showing it requires a faculty distinct from pure intellect to distinguish the difference in colors.

I once knew an eminent congressman who told me he could not distinguish between "Old Hundred" and "Yankee Doodle." He stated it was as pleasing to listen to the filing of a saw as to listen to the best choir he ever heard in a church. This man had a commanding intellect and was profoundly religious and highly enjoyed the other services of the sanctuary. Dolly Dutton, a musical prodigy at the age of three years could play various tunes on the piano. Blind Tom, a negro, otherwise idiotic, is not excelled as a musician. Either of these musicians, as such, excelled the intellectual congressman. Pure intellect is incapable of criticising a musical performance, and would be forced to defer to little Dolly Dutton or the almost idiotic colored musician.

If a possession of the religious faculties, not intellect alone, make us religious, and intuitively lead to a recognition of God as manifested in his works and providence; causality and comparison, though as large as in the organism of Bacon or Kant, will not convince us there is a God. Whoever expects, aside from time and tune, through the intellect to become a proficient in music will fail; whoever expects without the aid of the religious faculties to attain to a belief in God's existence, will fail. The trouble with the infidel is he expects to settle the question of the Divine existence without the aid of the religious instincts, and he honestly fails. The atheist will invariably be found wanting when we come to the religious organs. The religious organs are large in the organism of Spurgeon; they were fully developed in Wesley and Whitefield; for this reason such men cannot be infidels, but men will inevitably be infidels and atheists if destitute of veneration, hope, and marvelousness. Men sometimes of small intellects are largely developed religiously speaking; such are often narrow and bigoted, and make religion contemptible in the eyes of the irreligious especially. There is always an offensive angularity about people who are lacking in their mental organism. Innumerable crimes have been committed in the name of religion by imperfectly organized partisans.

It is said theologians are not agreed in their conceptions of God, therefore we have no knowledge of Him. Before Columbus men's conceptions of the form of the earth were erroneous, but then erroneous conceptions did not made the earth a nonentity, nor do erroneous conceptions of God prove His nonexistence. Erroneous views of astronomy do not relegate the heavenly bodies to nonentity. If the organization of the infidel mentally is defective, let him attribute this defection in respect to the God question to the right cause. In some sense the mass of mankind has and ever will recognize the Divine existence, while they worship and adore.

SOUTH ROYALTON, VT.

IS INTELLIGENCE DUE TO AN ACCIDENT.

BY PRES. J. M. SPANGLER, PH. D.

AMONG the many wise things that Herbert Spencer sets forth in his system of "synthetic philosophy" may be gleaned the following:

"*All knowledge is derived from experience; but all knowledge of the individual is not derived from his own experience. The experiences of the race become organized and transmitted by inheritance, and thus have the effect of intuitions or 'a priori' elements in the hereditary intellect and conscience of mankind.*"

"*The mental faculties are the product of the intercourse of the organism with its environment under the operation of the principles of heredity.*"

Let us see. Worcester defines "experience," which is here set forth as being the source of wisdom, as "knowledge or wisdom gained by practice." We *know*, therefore, only by practicing knowing. But each individual is not confined to knowedge gained by his own practice, for he has the "experiences" of his ancestors "organized" and transmitted by hereditary laws, as so much "stock on hand," with which to commence life. This transmitted fund of experience serves the newly created soul as a kind of reminder, "*a priori*," by giving the dead, inert thing an "intuition" to wake up and commence practice. At this stage in life the little thing does not *know much*, notwithstanding the experiences of its ancestors, for countless ages, have been organized and transmitted for its special benefit. All this is only sufficient to give it an "intuition" that it *can know*—by letting "the organism" have "intercourse with its environment"—if it will only bestir itself and commence to *practice*.

Now, let us reason upon this a little, *a pos*

teriori. Will Mr. Spencer, or some of his numerous followers, come to our assistance, and, directing our minds backward to the first speck of organized matter that ever had an "intuition" that caused it to wake up and *know*, tell us where it got it? Remember, as it was the *first* being, there could not possibly have been any organized fund of experiences transmitted to it by its ancestors, for ancestors it had none: and if there was any stock on hand with which to commence business, it was received elsewhere. From whence? Perhaps, as "the mental faculties are the product of the intercourse of the organism with its environment," this first organism, dead and inert, commenced practicing upon its surroundings, in order to have these experiences, which it could not inherit. If so, what enabled it to commence? Then, after it had these "organized experiences" (which the Christian philosopher chooses to designate as spirit), what were they? Something or nothing? If the latter, Mr. Spencer's "synthetic philosophy" has intelligence based upon the transmission of nothing. If the former, were they *real* something, or only the impressions of a real something? If they were only impressions, then intelligence is due to organized impressions. An *impression* is a mark made by pressure. How could you organize marks in order to transmit them by inheritance? What were they like after they were organized? And who organized them?

Should you say that these "organized experiences" are *something*, then will you, Mr. Spencer, tell us if they are material or immaterial. An immaterial something! You dare not admit that, for, if you do, consistency will compel you to admit the possibility of a spirit nature; and *that* admitted, revealed religion would give you scientific lock-jaw and close your mouth. If material, how shall we place them? To which of the sixty-two elements of matter and their compounds do they belong? Shall we trace them under hydraulics, hydrostatics, pneumatics, pyronomics, optics, meteorology, or astronomy?

Again, are these "organized experiences" any property of matter? If so, not a universal property; for philosophy declares that extension, figure, inertia, impenetrability, indestructibility, expansibility, compressibility, divisibility, mobility, and porosity are the universal properties of matter. Compounded or simplified as it may be, matter has always possessed these properties; but it has never yet, under the cunning of man's hand, yielded "organized experiences," or an intellectual spirit nature. Therefore, these are not a universal property of matter; or if they are, the power that can so utilize matter as to produce volition and perception is greater than that of man. For the same reason, these "organized experiences" cannot be an accessory property of matter; and the only conclusion is, that, if they are any property of matter at all, they are an accidental one, and all intelligence is due to an accident (see Watson's Institutes, vol. 1, page 345). In that case it would be possible to have a world, a universe, a first cause of all things without any intelligence whatever. For, taking away from matter this accidental property, matter in all its essence remains. And as the intellectual nature (organized experiences) of man is not essential to his existence, nothing but an accident has kept the whole animal kingdom from being purely material, without perception, thought or volition.

TRUCKEE, CALIFORNIA.

FUTURE PROBATION PHILOSOPHICALLY CONSIDERED.

BY REV. J. W. ROBERTS.

THE belief in a state of future rewards and punishment is as universal as the race of man, and in the main the idea prevails that the condition of those in that future existence is one of fixedness and endless duration. But in a few instances there has also existed a belief in an intermediate mode of being, which has taken various shapes, the most prominent of these being the transmigration of souls, the purgatory of the Roman Catholic Church, and the hell-redemption doctrine of the past ages.

In these latter days the notion has assumed various phases, and having been put through a process of evolution, has finally assumed a sort of definite form, which is quite captivating in its new dress, and has beguiled some men of eminence; many others seize upon it as an excuse for continuing in a life of sin, and one prominent orthodox denomination appears to be in danger of being rent in twain by it. In view of these facts a brief and candid consideration of the doctrine, from a rational standpoint, may be of interest and profit. In its modern habiliments, the creed may be summarized as follows:

"God is too good and too loving a Father to punish any creature He has made eternally for sins committed in a finite state of being; therefore, if men fail to fit themselves for future bliss in heaven during their stay upon earth, they will have another chance, a future probation after death, where the conditions will be more favorable, or the influences more potential to a life of virtue and righteousness than they are here in this present state of trial. Or, possibly, the inducements to a life of sin may be less powerful, or less enticing. At any rate, God's love will provide in some manner for the final restoration and holiness of those who do not repent and reform during this present term of probationary existence."

When pressed for any authority upon which such a belief is founded, none is produced, except the claim that it is founded upon the fatherhood of God and the brotherhood of man, and is reasonable. Claiming to have some respect for the teachings of Christ and His apostles, its advocates reject all such teaching when it does not accord with their views, declare it to be antiquated and contrary to reason; hence to be rejected as divine, or to be interpreted according to "modern thought," which simply means *their* "modern thought." The drift of their argument runs thus:

"When mankind were barbarous it was wise and necessary to keep them in subjection by fear; therefore, as a matter of policy and good government, to hold up before them the terrors of the law, and awe them into obedience to both human and divine administration. But in these days of light it only repels men of refinement to talk about punishment, and hold up before them a hell of fire and brimstone. A mind highly cultured, with elevated, æsthetic tastes, becomes disgusted with such doctrines and sentiments, and men of the finest sensibilities will not teach, preach or promulgate them; and they must be abandoned. Love is the ruling force of this age of progress, and by it must the world be governed and conquered; for God is love, and His government must be a government of love to be like Him. Hence, this doctrine has its chief corner-stone centered and planted in the essential character of God himself, and must be true. It is both philosophical and reasonable, and will stand."

This is quite plausible. It looks pretty. It has a smack of philosophy in it. If not true, it is deceptive and alluring, and so the more dangerous, especially to those who would be pleased to have it so. But before accepting it as true, let us examine this nice theory. The "hell of fire and brimstone" is thrown in to give spice to the statement of the dogma, not as argument, and deserves no further notice. No honest man wishes to be deceived, but desires to know the truth. Reason and philosophy are appealed to by these æsthetic teachers, and by these let the doctrines be tried.

All arguments and theories must be tested by some standard whose authority is unquestioned, otherwise bold assertion may pass current for solid truth. The following self-evident propositions, good and fundamental in this as in all other theological investigations, will aid us in our inquiries:

1. *God is absolutely perfect in Himself and in all His attributes.*

2. *All that God does is perfectly done, and cannot be bettered or improved upon in any manner.*

3. *God cannot improve upon Himself or His administration in fact, in purpose, design or execution.*

4. *God always does the very best thing that can be done in every department and minutia of His government, whether in nature or in grace.*

5. *Any amendment, improvement or change in His methods, either of purpose, adaptation or execution, would be a confession on His part of previous error, faultiness or imperfection—therefore that He is not God.*

From these axioms, which have their root in God himself, the following conclusions are inevitable:

1. *The granting of a second probation on the same general basis of a former one, would necessarily imply that the first one was a failure, or inadequate to the purpose for which it was designed and adapted: hence, not of God; or else that God did not understand Himself nor His plans; and for that reason has made a conspicuous failure in the sight of an intelligent universe, by providing an inadequate remedy for the restoration of a fallen and sinful race, and so must try again, and ascertain if, perchance, He can do better!*

If this is impossible and abhorrent to all just conceptions of a God without blemish or imperfection, then it must be:

2. *That in the essential nature of God, the perfect Father and Governor, a second probation, on the basis claimed, is an utter and eternal impossibility.*

Here the argument might rest, and does rest so far as the boasted reason and philosophy of the advocates of the modern theory are concerned. But now facts instead of philosophy are brought into requisition, and it is asked with a show of great confidence and assurance:

"Has not God already given man *two* probations, one in Eden, and the other since the fall?"

Certainly he has.

"Well, if man has been granted two probations already, is not that fact a good and logical argument for a third?"

At first view this position has an appearance of solidity and strength; but let us examine it and see that there is no delusion about it.

Adam *as a created being* had his probation. He disregarded and violated the conditions of that probation, and was excluded from it *never more to return.* No *second probation as a creature was given him.* And to *prevent the possibility of his return to Eden*, a flaming sword was placed at the gates of Paradise, turning every way to guard the entrance, and bar the culprit from that favored place forever. His probation as a *being under law simply* was at an end eternally.

But in His boundless love God did not for-

sake guilty man in his lost estate, but by *redemption* provided for him a second probation *under the dominion and reign of grace*. The first under *law*, the second under *grace*.

Under the former, Adam had every facility, qualification, and help that it was possible for God to furnish to keep his estate. He was made in God's own image, pure and holy, and placed in the most favored spot on earth. So under the latter man is provided with every aid and requisite possible for a loving Father to bestow. Infinite Wisdom has, as it were, exhausted the treasury of heaven in man's behalf so as to leave him "without excuse."

Now if Adam was banished forever from Eden for not keeping the *law*, of "how much sorer punishment, suppose ye, shall he be thought worthy, who had trodden under foot the Son of God, and hath counted the blood of the covenant wherewith he was sanctified an unholy thing, and hath done despite unto the *spirit of grace?*" That is the most solemn and momentous question a man under the probation of redemption can ask himself.

As there was no second probation for Adam under *law*, so there can be no second under *grace* for any of his posterity; and for the same reason, namely, the granting of a second would be a confession that the first was inadequate, a partial, or total failure, therefore an impeachment of the wisdom and perfection of God. This is clear as light and logic can make it.

The flaming sword at the gate of Eden is but analogous to the "great gulf" that is "fixed" between the righteous and wicked in the future states of being. And if that "fixed gulf" is only a parable, a shadow, what must the reality, the substance be? The circumstances connected with Adam's expulsion from Eden form one of the most conclusive and awful arguments against a future probation that can be drawn from reason or revelation; and it is replete with admonition and warning. Let men be exceedingly careful how they trifle with these momentous truths.

There is only one other probation wrongfully used of which we have any knowledge, and that is but dimly set forth to us, enveloped in shadows, by Jude in these words: "And the angels who kept not their first estate, but left them our habitation, He hath reserved in everlasting chains under darkness, unto the judgment of the great day." And by Peter, who says: "For God spared not the angels that sinned, but cast them down to hell, and delivered them into chains of darkness, to be reserved unto judgment." —2 Pet. ii. 4.

Why God did not provide a probation of redemption for these transgressing angels, we are not told, because it was no concern of ours. But the fact is a most powerful argument against that unreasonable notion that God is too good and loving to punish the wicked and disobedient forever. It also goes to demonstrate that no second probation is granted to any class of transgressors who have outraged God's mercy in a first one.

As this paper is designed to occupy space on the philosophical side of this question, the proofs of revelation are not used, though they are abundant and conclusive.

It is said that God has changed His methods of administration under different dispensations of His providence. This is an entire mistake. All His plans and purposes were laid "before the foundation of the world," and have been adhered to without deviation. He is the "same yesterday, to-day, and forever." If He were not He would not be God. His plan is a unit, and it all centers in the Lord Jesus Christ, who has been the light, life, and hope of patriarch, prophet, apostle, martyr, and saint in all the ages. Without Him redemption is a blank, hope a delusion, life a snare, and death oblivion.

(*Concluded next month.*)

CHARGED WITH ORTHODOXY.

BY J. I. SWANDER D. D.

In the December number of THE ARENA we took what we supposed to be a proper liberty of presenting a short paper to the public upon the tendency and teachings of the Andover Professors, together with some animadversions upon the ecclesiastical proceedings already then instituted against them. The topic thus discussed was one of general interest to wide-awake theologians, and progressive Christian journalists throughout the country. Our poor, little, innocent contribution was headed "*Charged with Heresy.*" It now seems that the article, like most of the contents of THE ARENA, has attracted very wide attention and provoked some very narrow criticism. The February number of THE ARENA contains a specimen of the criticism alluded to. It is from the masterly pen of our good brother, Rev. T. M. Walker, whose former contributions to THE MICROCOSM did much in the way of adding variety to its contents. By reference to page 100 of Vol. V., the reader will notice that a writer of the same name takes the position that God created the heavens and the earth "in six natural days of twenty-four hours each," and that He performed the most remarkable part of the feat by working three "natural days" of "twenty-four hours each," when according to our "natural" method of measuring time, and Dr. Walker's method of measuring Moses, there was as yet no sun or "greater light to rule the day." It now seems that this same writer who has no regard for the obvious teachings of geological science, and who is brave enough to defy the unimpeachable "testimony of the rocks," is courageous enough to step to one of the front pages of THE ARENA and announce to the intelligent readers of this magazine that "The Andover trial is not on the charge for heresy." In the reading of Dr. Walker's communication in the February ARENA we found our eyes so completely deluged with floods of the solution of laughter that we concluded not to make any reply to the same. We have now reconsidered our rash and hasty decision, and here we are with our spluttering pen in hand. His criticism calls for some attention. It is so unanswerable in its syllogistic elements of amusement and so destitute of "progressive thought," "universal charity, as well as any other pious cant," that we have concluded to tender him the fragments of our broken sword in token of our unconditional surrender. As evidence of our complete conversion, we have hauled down the caption of our former article, and now unfurl the sackcloth of our contrition at the mast-head of this our public recantation.

But, seriously speaking, what are the essential facts of the case? We frankly concede that the Professors, as arraigned before the board of visitors, were not formally on trial for heresy; but still the trial involved the question as to whether they were not teaching, in some form, heretical doctrines. We also concede that any society of people, in New England or elsewhere, have the authority (possibly the right) to say what kind of doctrines shall be taught by men who take their money as a remuneration for such services; neither do we dispute the correctness and reasonableness of the claim made by Dr. Walker, the self-constituted attorney for the prosecution, that persons filling such positions should not commit a "breach of trust." Yet, even this question of "breach of trust" is one that has another side to it. History is not altogether without precedents which might be quoted as not entirely condemnatory of the course pursued by the Andover Professors. Luther and Zwingli were priests and teachers under the iron-clad oaths administered by the regularly constituted authorities of their stirring and startling age; and yet they continued to remain in their positions of influence and authority while they taught "doctrines subversive of the system" from which they had received their commission. They continued in the church in which they believed themselves called to remain and do a great work for God and evangelical truth. And what is the result of that "breach of trust" on the part of the two great Reformers? The god of history has signally vindicated their heroic conduct before the bar of nearly four approving centuries. The Pope tried to "eject them from the house without ceremony," but they refused to go; and we are not aware that they are "held in contempt by all honorable men." In fact, we know of but one "honorable" man who is bound by his own logic to hold the Reformers "in contempt."

However, the points conceded in the foregoing paragraph did not enter into the gist of our former paper. We said distinctly that, "*underlying* this and all similar investigations * * * there are certain fundamental questions which should be settled before the court is really ready to proceed to business in any particular case." The trial of the Andover Professors *does* involve either a trial for heresy or a trial of "progressive orthodoxy." Our central position was that there is progress—history—in man's apprehension of the truth, whether in religion or in science, whether truth be revealed through the Bible or through nature. In our occupancy of this position we have plenty of good company. There are very few men who *now* believe that God created the world "in six natural days of twenty-four hours each." "Outsiders" are not disposed to interfere in the investigation of the case so far as it involved only the question of a "breach of trust," and so far as it was cooped up in a Boston hotel, but they *have* a right, and some of them propose to *insist upon their right*, to discuss all questions of general interest to the more comprehensive "system" of the Gospel in which its great Author has given us all to have part. New England may monopolize the business of manufacturing nutmegs, but the right to discuss questions of progressive orthodoxy has not been so limited. The pages of THE ARENA is the eminently proper place for these discussions. This monthly journal announces on the title page of every number and every copy that its discussions are to have a "bearing upon the religious thought of the age." Does not the movement at Andover involve some of the "religious thought of the age?" Keeping the proper purpose of this magazine in view, the writer discussed the *significance* of the situation at Andover. For that position then taken he has no apology to make; and, if he had, he would hesitate somewhat before making it to the man who is trying to bring the Master Workman of the universe down to the twenty-four hour law.

Dr. Walker's paper is conspicuously empty of everything bearing upon the principal point pressed in our former communication. It is simply childish in its claims. True, as public sentiment began to speak out upon the subject the announced scope and purpose of the investigation began to narrow itself toward a trial for "breach of trust," but it was not so from the beginning. At least it was not so in the estimation which "outsiders" placed upon that significant sign of the times. All Christendom had something at stake in that promised investigation; and all intelligent theologians had a right to watch and note and criticise the proceedings of that great assize, the true and central issue of which had never been submitted to any board of visitors. Every intelligent student of modern church history knew that the Andover Professor had been indicted with what involved a charge of heresy. It is also known that no small portion of the religious press reiterated the

charges and issued weekly bulls of excommunication. The fixed and finished orthodoxy of the country kindled its censorial fires, and sent the smoke of its own torment to the skies. The particular "theological system" in which the alleged heresy originated was manifestly exercised over the affair. In its annual assembly last fall several sessions were occupied in discussing the matter as it came up for consideration in the subject of Foreign Missions. No one who is not "too dull to see the point" will deny that the question discussed by the assembly of great and good men convened at Des Moines did not involve the question of sound doctrine as well as sound policy. Why, it is said that during the sessions of that memorable convention, as the holy and impassioned eloquence of those good men rolled over the grassy plains of the West, the prairie fowls in the vicinity of Elk City, Kansas, created a scene of cackling animation; and yet our good Doctor did not, and does not seem to know that the Andover Professors were even supposed to be suspected of holding and teaching doctrines not in accordonce with the Word of God as interpreted from the standpoint of some of the fossilized theories of the 15th century.

THAT HOLE THROUGH THE EARTH. —ANOTHER ANSWER.*

BY H. G. RUSH.

THE question proposed by Geo. Dunn in the October number of THE ARENA, viz., "if a cannon-ball were dropped into a hole passing through the center to the opposite side, where will the ball first stop?" has elicited various answers; some contending that the ball would pass through the earth into space; others, among whom is Pres. Abernethy, that by reason of back action as they call it, the progress of the ball would be gradually arrested, and that the ball would come to rest the first time it reached the center; while still others, who are indorsed by Dr. Hall, advocate an oscillatory movement resulting in final rest at the center.

The fact is that all these answers are short of the truth, as will appear.

It is, no doubt, a granted condition that atmospheric resistance and all other frictional causes are precluded, so that the movement of the ball is subject to gravitation only.

Within the crust of the earth gravitation varies as the distance from the center, but the result in this problem is the same whatever the *law* of gravitation.

Suppose now, that the ball is allowed to drop, from a state of rest, at the mouth of the orifice. In its progress the ball will be subject to opposing tendencies. The matter which lies in advance of the ball by its attraction will accelerate motion, while the matter in the rear of the ball, by its attraction, will retard its motion. At the start the tendency is exclusively accelerative. On to the center the accelerating tendency is the stronger. After the ball has passed the center the previous ratio of accelerating and retarding tendency is inverted. The same amount of matter that serves to increase velocity as the ball approaches the center serves to retard as the ball recedes from the center, and *vice versa*.

In obedience to the law of inertia, the ball will continue to move until the sum total of retarding attraction is equal to the total of accelerating attraction, which is manifestly at the mouth of the orifice opposite to the starting point. At this point the positive and negative effects of attraction will be just equal. The correct answer, then, to the problem as stated is that the ball will first come to rest exactly at the mouth of the orifice opposite to the starting place. Should the ball enter the hole from a given elevation or with a given velocity it would emerge from the opposite end with the same force or momentum as it entered.

If free to move, and subject to no other influence than gravitation, the future behavior of the ball would be vibration from side to side, always attaining to the same elevation.

Should the resistance of the atmosphere not be precluded from the problem, there are not sufficient data to warrant a conclusion, and it is doubtful, conceiving the neccssary density of the confined air and the friction caused by its displacement, whether the ball would not sink gradually to the center and remain there.

Theoretically, the pendulum vibrating in vacuum free of friction, would continue to oscillate just as constantly and unvaryingly as the ball, for the force acquired in the descent requires an equal ascent for counter action. Atmospheric resistance as well as all other friction interferes equally during descent and ascent of the pendulum, which accounts for its declining momentum.

Pres. Abernethy commits quite a mistake in losing sight of *acquired* momentum. He is right in saying that at the center the accelerating force is zero. It is *acquired momentum* that carries the ball from the center to the circumference.

The philosophical question as to whether the motion of a body is the result of inherent force or simply an effect of foreign force, is not a part of the solution to this problem; but we agree to say that there is no use in going to war about the use of such terms as "momentum," "centrifugal force," "accelerating effect," etc., which are right enough if rightly comprehended.

REMARKS BY THE EDITOR.

When we gave our decision in reply to Mr. Dunn's inquiry (see ARENA for October, page 74) it was with the understanding that the "hole through the earth" was supposed to be filled with air, in which case the ball dropped into it would necessarily pass the center of the earth a distance corresponding to the resistance of this air; then return, again passing the center to a distance not so great, and thus keep on oscillating just like a clock pendulum till it would finally settle to rest at the center.

But on the supposition that the hole is a perfect vacuum, and that the ball meets with no frictional resistance, Mr. Rush is unquestionably right. The ball would reach the surface of the earth at each extreme of its oscillation, and thus keep on forever, just as would a pendulum in a perfect vacuum having no frictional resistance at its point of suspension. Such a pendulum, once started, would swing on forever. (See Newton's Principia, page 90). It is plain, if all this be true, then a practical test of a pendulum in vacuo, could it be absolutely suspended without resistance at the hitch-point, would be an accurate test of the approach toward a perfect vacuum by the length of time it would oscillate, and the consequent resistance the remaining air would oppose to it.

At the time of receiving this communication from Mr. Rush, we also received an exactly similar solution of the problem from Mahlon Ross, Esq., of Virden, Ill. But Mr. Ross' paper was much longer and the case was much more elaborately carried out by argument and elucidation. Both gentlemen are right, and the problem of the "hole through the earth" may now be considered as definitely and finally disposed of.

* ERRATUM.—In the article headed "A Hole Through the Earth," last month, the types made us say (page 139, first column, line 11 from bottom) "one hundred and two feet," instead of *ninety-six feet* as it should have been. Figures won't lie, though we know that types often do.

A SURPRISING FROG NARRATIVE.

SOME time ago we received an account from Mr. Schermerhorn, Sweetwater, Texas, of a live frog having been taken from a solid ledge of gypsum, in which it had probably been confined for unknown ages We wrote Mr. S., intimating if the story could be fairly verified by affidavit, we would give the facts to the readers of THE ARENA, at the same time inviting a solution of the mystery, if any such solution is possible. The statement of these marvelous facts as written out by Mr. Schermerhorn and given below, is signed by several eye witnesses who were cognizant of all the facts as stated and was duly sworn to before the clerk of the Court of Nolan County, Texas. At present we are not prepared even to suggest an explanation of a fact so startling as that any animal could survive for unknown ages thus confined in an original mineral ledge. We only know that after the most careful precaution, the facts come to us so well authenticated that we cannot refuse giving them to our readers. Here is Mr. Schermerhorn's statement:

Sweetwater, Texas, Nov. 10, 1886.

In the summer of 1881 I was in the office of the Plaster of Paris Factory, near Sweetwater, Nolan County, Texas.

One evening a quarryman laid a frog upon my desk that he stated had just been blasted from the gypsum ledge attached to the factory. The frog appeared perfectly dormant, the eyes being closed, and no signs of respiration or motion being visible. It was nearly white (the color of the gypsum in which it had been entombed) and translucent, the bones and intestines being easily discerned upon holding it to the light. It was moist, clammy, and as fleshy as an ordinary frog. Gradually the color changed to a dark brown upon the upper part of its body, the sides assuming a lighter shade of the same color, with mottled appearance, resembling the color of the walnut desk upon which it laid; the under part of the body a deep cream color; the throat when distended in respiration had a pink tinge.

The colors were assumed in about a half hour, at the end of which time it began to breathe. About fifteen minutes later it opened its eyes, which were brown, bright, and sparkling. About a quarter of an hour later the frog commenced working and stretching its limbs, which had been extended, and remained in the position in which they were placed, and in a few moments drew them up in the position occupied by a frog prepared to leap. After sitting in this position for half an hour the frog made four short jumps, with intervals of a few seconds between them, each jump being longer than the preceding, the entire distance being about two feet to the back of the desk, where it remained concealed. About three hours after its release from the ledge, I carried it a distance of about half a mile to Thomas Douthitt's drug-store, and placed it on the showcase in a quinine bottle, where it remained without partaking of food or water for two days, when it finally escaped.

This frog was about the size of a large tree-frog, which it resembled in shape. The gypsum ledge, from which it was blasted, is at the crest of a low hill underlying several feet of earth, and had not been previously disturbed. The quarrymen state that the nest occupied by the frog conformed to its size and shape, being a perfect mold of it, and that there was neither crevice nor passage communicating with it. I know from observation that the part of the ledge in which the blast was made was solid.

WM. W. SCHERMERHORN.

Our Subscribers who are interested in the spread of Substantialism through its organ should read the publishers' items on page 159.

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MOTION, MATTER, FORCE, ENERGY.

THE MOLECULAR THEORY EXAMINED.

BY THE EDITOR.

WITH all we can say on this subject, or have said, still it seems impossible to impress scientists with the true distinctions which exist, and which should constantly be kept up, between the words placed at the head of this article. We have definitely and repeatedly urged that *motion, per se*, is *nothing* except a phenomenon of force exerted upon some substantial thing, just as the shadow of a tree is nothing but the phenomenon of the force of light. Take away the stored-up substantial force which causes the body to move, and the motion absolutely ceases to exist, just as the shadow ceases to exist the instant the substantial light-force which produced it is removed or shut off. We cannot too often impress the reader with the conclusive fact that motion, being intrinsically *nothing*—having no existence before the body commenced moving, and ceasing to exist whenever the body comes to rest—can neither be force nor energy, but must in every case be the result of the energetic application of force. Hence it follows that no mechanical effect can be produced by the *motion* of any body, material or immaterial, any more than a mechanical effect can be produced by a shadow.

A very learned scientist attempted to reply to this position by saying: "True, motion is nothing, *per se*, but it is not so with motion as identified with the moving mass; in other words, it is the motion of the mass, as in the case of a flying cannon-ball, which does the mechanical execution observed," etc. This, however, is a weak fallacy, on a par with all the mode-of-motion theories of modern science. The *motion* of a cannon-ball, as a mere phenomenon, has nothing at all to do with the destructive effects of that mass of matter as when it strikes a material body, as we will soon demonstrate, but it is the stored-up mechanical and substantial force communicated to the ball by the exploding powder, which, in combination with the iron mass, produces all the destructive effects observed.

Does the reader ask the superficial question: "Could the cannon-ball do its work of destruction by means of the stored up substantial force within it, except it were in motion?" We answer no; just as a falling tree, when the sun is shining, is necessarily accompanied by its nonentitative shadow. But who would be so weak as to infer that it was the accompanying shadow of the tree which crushed in the building upon which it fell? The *motion* of the tree, like its shadow, was an incidental phenomenon accompanying the substantial mass, moving by means of its stored-up substantial force of gravity, and produces no more effect in the accomplishment of the mechanical result witnessed in the crushing of the building than does the other phenomenon—shadow—which was the phenomenal effect of the substantial light-force acting upon the same tree.

This is one of the elementary principles of Substantialism, and, as a consequence, also of true science. The same learned scientist just referred to also demurred to our position, by asserting that our view of motion as *nothing, per se* or of itself, was not new, but that it was held in common by all scientists, not one of whom holds that motion is force, or that of itself it can do anything. Now, bald assertions are easily made. We simply deny the truth of all this broad statement, and challenge its author or any one else to name one authority that ever took the position that motion was absolutely nothing, causing no mechanical effect whatever, being simply position in space, changing as we have claimed. On the contrary, we assert that it is the drift and teaching of all the modern mode-of-motion theories that *motion* and *force* are equivalent terms. In other words, that when *heat*, as a mode of motion, does anything, it is simply *motion* that does it, and nothing else: and that when *sound* or *light* produces any effect, according to these mode-of-motion theories of force, it is *motion per se*—of itself—which does this work. Let us now silence all opposition on this question by giving a conclusive quotation from Prof. Tyndall's late edition (1883) of his standard treatise on "Heat as a Mode of Motion," at page 49. His words are:

"When I say of *motion* that it is the genus of which *heat* is a species, I would be understood to mean, not that heat generates motion, or that motion generates heat (though both are true in certain cases), *but that heat itself, its essence and quiddity*, IS MOTION, AND NOTHING ELSE."

We would like to see any later or higher scientific authority than this, which conflicts with Tyndall's definition of force *per se* as motion *per se* "and nothing else." Substantialism gave the first true definition of *motion* as mere position in space, changing, and consequently, as *nothing* in and of itself; and it also gave the first true definition of force, including heat, light, and sound, as *immaterial substance*, and in no sense motion, though force may both possess motion and and produce motion in other substances. Prof. Tait, of the University of Edinburgh, has recently come out flatly and indorsed the position of Substantialism making both *heat* and *sound* real entities or objective things, thus virtually repudiating the mode-of-motion theories of modern science. (See THE MICROCOSM, Vol. V., first article.) Let the above be a warning to scientists to exercise caution in their public avowments.

As the absolute proof just promised that the *motion* of a cannon-ball in and of itself has nothing to do with the crushing mechanical effect produced when this mass strikes a material object, we have only to refer to the simple but manifest fact that a toy rubber balloon of the same form and size of the cannon-ball may have precisely the same motion, and yet, should it strike one of our learned scientists full in the face, it would scarcely break his spectacles. Yet the *motion* is precisely the same in both cases. Surely if it be the *motion* of the mass which produces the mechanical effect in the case of the cannon-ball, the result should be the same with the toy balloon, since the *motion, per se*, in both instances, is exactly the same.

Does some learned scientist reply: But the *masses* are not the same? All right; this touches scientific bottom and comes right down to practical business. The mass of the cannon ball is far greater than that of the toy balloon, and, therefore, requires more of the substantial mechanical force from the powder to be stored up in it in order to keep up the *same velocity of motion* as in the case of the toy balloon; and consequently the mechanical effects produced in the two cases are exactly proportioned to this quantity of mass and the amount of stored-up substantial force they will contain and carry. A ball of cork, when fired from a cannon, will start with precisely the same velocity of motion as will a ball of iron of the same size; but the cork ball will stop within a few rods, while the iron ball will continue on for miles, simply because the iron ball permitted the exploding powder to store up more of its substantial force among its material particles than among the particles of the cork If the *motion* of these balls has anything to do with their effects in striking an object, *why does not the cork ball go as far as the iron ball, since they both had the same motion at the start?* The answer is, that the *motion* in both cases is an incidental phenomenon, their distance of travel and their mechanical effects when striking depending entirely upon the respective amounts of stored-up force they are capable of carrying, and which alone constitutes what we call *momentum*. As the motion in the two masses may be exactly equal, while the mechanical effects on striking an object are vastly different, it becomes a scientific demonstration of the truth of our general position that the *motion, per se*, of any mass has nothing whatever to do with the effect it produces in striking, simply because *motion* is nothing but "position in space changing," as Substantialism teaches.

These fine distinctions, though essential to true science, are difficult to make. *Motion*, being a nonentity, its *rate* or *velocity* must be equally *nothing*. Hence stored up *motion* or stored up *velocity*, of which scientists sometimes speak, is an impossibility, except by shear accommodation of language. An absolute *nothing* may also possess properties or characteristics as well as the grossest material bodies. A shadow may have motion, velocity, length, breadth, shape, etc., and still all of these be pure nonentities; just as *darkness* and *silence* may possess the properties of duration, location, etc., and still be *nothing*. A man who is incapable of these nice distinctions in physical philosophy does not possess the real stuff of which Substantialists are made.

We assert that modern science, in making sound, light, heat, etc., "modes of motion," absolutely and of necessity makes *nothing* the cause of the sensations and other effects which these various natural causes produce. If this is not so, as Professor Tyndall distinctly admits it to be, then there is no sense or meaning in calling sound, light, or heat a mode or manner of motion. What is a mode or manner of motion but motion itself, "and nothing else," as Tyndall expresses it? What would a mode of rest be but rest itself? or a mode of silence be but silence itself, "and nothing else"?

In keeping with this general view of the language employed by modern science, we have several times taken occasion to refer to Sir William Thomson's statement in his late lecture before the students of the Midland Institute, at Birmingham, England, in which he positively declared that the force of magnetism was *nothing* but the motion or rotation of the molecules of the magnet! If this is not making magnetism absolutely *nothing*, then there is no meaning in language, since we have shown motion to be nothing.

Sir William, in making magnetism motion "and nothing else," as Tyndall describes *heat*, does not even say a word about extending this "rotation" to his rigid gelatinous ether-waves, which mode of motion of another absolute nonentity he believes to constitute light, instead of light being an actual substantial, but immaterial force, as it really is. Of all the childish impostures which modern science has imposed upon the world, this doctrine of an all-pervading, material, inert, elastic, and rigid ether "with the mechanical properties of a jelly," is the most far-fetched, as well as unnecessary. Yet it is gravely set forth by the learned authors of our text-books as if it had some foundation in fact.

In the name of ordinary human intelligence, why cannot scientists just as well assume *light itself* to be a substance radiating in pulses by a law of diffusion suited to that form of force, as to invent another substance, to all intents as intangible as if immaterial, to accomplish only the same result, with not one single advantage or convenience which substantial light pulses would not possess? This circumlocutory method of explaining light by introducing a useless and intermediate substance (ether) that has never been shown to have an existence and for which there is no real necessity in nature, shows about the same degree of original scientific and mechanical perspicacity as that exercised by the puzzled farmer who rigged a windlass in his barn to lift his cow into the haymow to keep her from starving, never thinking of the simpler expedient of throwing down the hay! Yet the greatest of these modern scientific investigators, not content with the impossible view of Sir William Thomson, that magnetism consists of the mere motion of the steel molecules, really try to give some sort of explanation as to how this *motion* of the molecules, confined as they are to the magnet, can reach out to a distance and move a bar of iron. And what is the explanation which their mode-of-motion theory enables them to furnish? Why, it is the profound idea that the rotary motion of the molecules of the magnet in some way gets up a rotary wave-motion of this assumed rigid and gelatinous ether, sending it forth in the shape of whirlpools or vortices to the distant iron bar, thus drawing it to the magnet! And thus they continue to enact over and over the silly performance of the farmer with his windlass, when the direct action of the magnetic substance itself, with its endless threads of substantial but immaterial force circling from the magnetic poles by a law of radiation given to it by the all-wise Author of nature, is all sufficient to seize the piece of iron in defiance of all interventions, and through the correlation and co-operation of this form of immaterial substance with the cohesive force residing in the bar of iron itself, can forcibly bring the two bodies together. But this simple, beautiful, and consistent view of magnetism, as a substantial but immaterial force, doing its work direct without any intermediate and useless "jelly," was too weighty a problem for Sir William Thomson or any of his modern confreres, until Substantialism, brushing aside the mode-of-motion mist of these fabricated ether-waves, presented the harmonious theory that every form of natural force, whether physical, vital, mental, or spiritual, must in the nature of cause and effect be as really substantial as are the material bodies which such forces put into motion or otherwise affect.

A self-reliant investigator of physical science needs only to glance at the intrinsic impossibily of the present theories of force, consisting of the perpetual bombardment of material molecules and atoms and the resultant jelly-waves of ether thus sent off, to feel a contempt if not an unqualified disgust for this entire department of physics as set forth in our text-books and as now taught in our colleges.

Instead of the natural and rational conclusion that magnetism is an immaterial but substantial force radiating from the poles of the magnet and directly seizing the distant iron bar, thus without circumlocution drawing it to the magnet, modern science, by aid of all the giant intellects which have assisted in framing it, requires us to believe first, that the iron constituting this magnet consists of isolated molecules and atoms, too small ever to be seen or known to exist, separated many times their diameters apart, that is, not touching each other at all, but kept apart by repulsive force, while at the same time held in proximity by a corresponding attractive force, that they may not get out of range of each other. Then it requires us to accept the assumption that magnetism, by which a distant bar is lifted, consists primarily of the motions of these undiscovered and undiscoverable molecules and atoms which are in a constant state of motion, flying hither and thither at great velocity and throughout distances many times their own diameters, bombarding each other in a perpetual cannonade. Then, secondarily, it requires us to believe that by some scientific hocus-pocus these oscillating molecules stir up an inert, all-pervading material and rigid substance called ether, sending it off in waves to the distant bar of iron by which, in some inconceivable way, the said bar is drawn or repelled, as the case may be. All this and other things too numerous to specify, equally guessed out by aid of a vivid fancy, and we have a glimpse of the modern doctrine concerning force which a great scientist recently assured us was "the most consistent and beautiful scientific theory ever formulated by man."

When we asked him, if the theory was so consistent, and if force was simply the result of these molecular bombardments, what it was that caused the molecules to move, he replied that, according to theory, they always vibrated in this way. When we asked him what this repulsion and attraction was which did the mechanical work of keeping these molecules of the magnet many times their diameters apart, while they were moving in all directions, he explained that the theory claims this repelling and attracting force to consist of the bombarding collisions of the finer molecules and atoms of the *ether*, an atmosphere, as Tyndall expresses it, in which the atoms of a solid body float like suspended grains of dust. And when urged to explain by what bombardment these still finer molecules and atoms of *ether* were kept in their relation to each other, or what their repulsion and attraction consisted of, he did not say, though the consistent theory ought to have supposed them to be knocked about by particles of a still finer *ether*, and so on and so forth.

> "There never was a flea so small
> But has other fleas to bite 'im,
> And these again have lesser fleas,
> So on *ad infinitum*."

If the *magnetism* which moves the distant piece of iron consists of the *ether-waves* set in motion by the rotating steel molecules, the consistent theory ought to tell us how these same ether-waves keep the steel molecules in motion!

Of course this molecular theory does not pretend to explain why the "jelly" surfaces of these tiny inter-etheric molecules do not stick fast to the enormously larger steel molecules as they crash together; nor does it tell us, in its redundant consistency, how the *atoms* of steel, which are the "*smallest conceivable divisions of matter*," can swing like widely separated grains of dust in an atmosphere of ether, whose material atoms are thus infinitesimally smaller than the smallest conceivable particles of matter in existence! Nor, finally, does the beautiful and consistent theory give a word of explanation as to how these steel atoms and molecules, whose motion constitutes magnetism, are kept "many times their diameters" apart by "repulsion and attraction," while at the same time they are not kept apart at all, but keep hitting each other!

And when these bombarding molecules have expended their energy or power to do work, in hitting each other, this beautiful theory tells us that their *energy* is not lost, but is converted into *heat*. Yet heat is "*motion* and nothing else," as Tyndall says, and thus the so-called energy of the molecules is converted into *nothing* "and nothing else," since motion is demonstrated to be *nothing!* As the shortest swings of these molecules constitute the body a *solid*, according to this theory, and as longer swings constitute it a *liquid*, and still longer swings constitute it a *gas*, the only difference between the three being the difference in length of swings of the continuously flying molecules, it follows that this "most consistent theory ever formulated by man" virtually makes a solid body both a liquid and a gas, only its liquid and gaseous condition is down too fine for our superficial observation! Had we a magnifier powerful enough to make molecules and atoms visible, a mass of solid iron would be as liquid as an effervescing jar of acid.

Thus, our highly consistent modern theory of force depends upon molecules and atoms which have no existence in fact, then upon their bombarding each other, which is pure guesswork and a figment of the fancy; and, finally, upon a jelly-like ether which is not known to exist, and which, if it could be proved to exist, is wholly unnecessary in the economy of nature. And this is what constitutes the head and front of the opposition to Substantialism. But, say our etheric scientists, prove, if you can, that molecules and atoms do not exist, or that they do not bombard each other, as the molecular theory claims? Such a challenge is about as consistent as that of Prof. Haeckel, by which he satisfied himself, and tried to satisfy others, that spontaneous generation must be true. Here are his words:

"The *impossibility of such a process can in fact never be proved*, for how can we know that in remote primeval times there did not exist conditions quite different from those at present obtaining, *and which may have rendered spontaneous generation possible.*" (See "History of Creation," Vol. I., p. 341.)

About similar to this ridiculous challenge to prove a negative, is the demand of present science concerning the molecular theory of force. But difficult as the task may appear, we now undertake to demonstrate the negative proposition that all this assumption of molecular motion and bombardment is false from root to branch. Here is the proof in a self-evident law of nature: The normal state of all matter, when in a condition of contact and friction with other matter, is necessarily rest, and under such circumstances, even should it be put into motion by extraneous force, it will immediately come to rest by this very retarding influence of contact and friction. In the very nature of things this must be as true of small bodies as of large ones. To assert otherwise is to stultify reason. We know it to be true of a lot of suspended balls of visible size set promiscuously into oscillation, thus allowing them to come into collision as they swing hither and thither. They will inevitably, and almost instantly, subside into quiescence by their own contact and fricton.

We also find the same law to prevail as the oscillating bodies become smaller and smaller, even down to the minutest range of the microscope; *rest*—absolute quiescence—being the uniform law. Hence, the law, being thus established, must hold good for all matter even down to particles a million times smaller than these supposed molecules

and atoms. Thus do we at one single blow annihilate all this frivolous assumption of the molecules of matter, even if they exist, oscillating, bombarding each other, and never losing their motion by this continued contact and friction. The man who could conceive such self-annihilating assumptions must have been insane when he put them on record, so preposterous must the whole thing be to any clear-headed thinker.

If, for example, a system of suspended cannon balls, extending to the very outskirts of creation, should be put into the most violent agitation and bombardment, thus representing these smaller material balls called molecules and atoms, and should these in turn be bombarded by still smaller interstitial balls representing material ether particles, it only puts the annihilation of the ridiculous theory still further off; for come it must, and that inevitably, whenever the original force exerted on the various sizes, forms, and qualities of balls shall have expended its energy in the work of collisions. This very law of frictional contact just stated must bring the whole mass of balls to rest. The puerile attempt to argue any other way as possible or conceivable, by reducing the various systems of bombarding balls beyond the range of all human knowledge or experience, is but the story of the pursued ostrich right over again, which by shutting its own eyes vainly imagines it has annihilated the hunter.

But does our scientific friend raise the point of order that all matter, even a cannon-ball, is constantly in motion, from changes of temperature, only these motions are too small to be observed, even by aid of the most powerful magnifiers? Let us now wipe out this last resort of the mode-of-motion theorist. First, admit it true, and it breaks down the whole theory of molecules inherently moving forever without the constant application of new and extraneous force, since the cannon-ball only makes its supposed infinitesimal movements by the changes of temperature which result from the force of heat variously applied. But the annihilation of the molecular-vibration theory becomes complete when, by this very analogy claimed, a lot of suspended cannon-balls should constantly vibrate, after having been once started vigorously, and keep on going, not infinitesimally, *but through distances many times exceeding their own diameters, since this is what the tiny cannon-balls called molecules do according to the theory!* Thus breaks down the theory of perpetually vibrating molecules of matter by the rigid application of infallible physical law.

From the foregoing, it becomes manifest that no rational view of nature's laws and forces can be entertained for one moment, as causes adequate to the effects everywhere observed around us, except on the basis of Substantialism, which takes such a common-sense, direct, and rational view of every phenomena-producing cause within the range of our observation. Whenever science shall consent to adopt this substantial standard in its use of scientific terms and in its methods of solving problems in the physical, vital, and mental realms, may we expect to witness the true inauguration of the reign of law.

With Substantialism as our guiding light into the otherwise hidden recesses of nature, we learn what is meant by the *correlation* of the forces upon which some men delight to harp and pipe on all occasions, as if they understood what they were talking about, but without the first true conception of what the "correlation, convertibility, or conservation" of force signifies. There manifestly can be no correlation or conservation of "modes of *motion*," any more than a correlation or conservation of modes of *rest*. It would show the same scientific intelligence, on the part of grave physicists, to talk of the conservation of modes of *darkness*, or of the correlation of modes of *silence*, since darkness, or silence, *per se*, is as much an entity as motion. And the same would apply equally to the convertibility or dispersion of force as a mode of motion. How can the motion of a body be conserved or preserved, when it positively has no existence before the body commences moving, and absolutely ceases to exist when the body comes to rest? How can one nonentity be converted into another?

Unless the forces of nature shall be accepted as real, substantial entities, it is the veriest prattle of little children to rattle off dissertations on the "correlation, conservation, or convertibility of the forces," neither of which terms has any meaning in science only as Substantialism gives it meaning. A man, claiming to be a scientist, who will stand before a public audience, as we heard one do recently, and object to Substantialism on the ground of its incompatibility with the doctrine of the "correlation and conservation of the forces," when this philosophy furnishes the only possible ground upon which the correlation and conservation of force can even be conceived of as existing, shows his ignorance of the principles of Substantialism to be only commensurate with his total want of comprehension of the meaning of the terms he employs.

Are we reminded here that there is no such thing as the conservation of *force*, that this has been given up by modern scientists, and that it is only the energy of the universe that is supposed to be conserved? We answer, first, that this is not strictly true, as a fact of scientific history, since the latest edition of Tyndall's "Heat as a Mode of Motion" still maintains the old phraseology of the "conservation of *force*." But admitting it true, that energy is the thing conserved instead of force, what difference does this change of terms make in practical result? If force is only *motion*, according to modern science, as we have proved by Prof. Tyndall and Sir William Thomson, then *energy* can be no more than *motion* practically applied in doing work; and since motion has been shown to be *nothing*, the conservation of energy, therefore, as well as of force, is practically the conservation of *nothing*.

But considering force as a real, substantial entity, how does this conflict with the idea of the conservation of *energy*? Practically, all this is but a distinction without a difference—a change of terminology without an essential change of idea. The *energy* of a ton of coal is simply the force, potentially stored up in it, by which it possesses possible *power* of doing work, and in this sense the potential *energy*, as well as potential *force* of doing it. Active energy, as when a cannon-ball is moving, is simply the dynamic force of the exploded powder stored up in the ball, and carrying it forward. In other words, magnetism, electricity, heat, etc., immaterial agents as they exist in the force-element of nature, or when not doing work, are more properly denominated *force*, but when actively engaged in performing work, these same forms of force, thus stored up and at work, may properly be designated as forms of *energy*. And, therefore, when they cease to be active energy in the performance of work they constitute, more accurately speaking, *conserved force*, or quiescent energy in its primordial condition, thus marking out the distinctions as well as similarities of meaning in these respective terms. Surely water is none the less *water* because it exists under the name of *ice*; nor is it any the less *water* because it exists under the dynamical or energetic name of *steam*; but in every *name*, and under ever *condition*, it is an *entity*, and virtually the same entity.

Webster's second definition of *energy* is: "*Power* efficiently and forcibly exerted." *Power*, as here applied, means simply *force*, and when "forcibly exerted" is called *energy*. What more appropriate use of language can be found on record? Hence, since our definition of *energy* agrees with Webster, being *power* (an entity) "forcibly exerted," or the "*power* of doing work," as all science agrees, and since our definition also agrees with the latest phases of science, in that *energy* can be *conserved* by conversion into other forms of energy, and consequently must be an *entity*, as we have shown, we may well defy the quibbling scientific world to gainsay our general position. We do not fight modern science, however, for the sake of disagreement, but we rather aim to agree with it wherever and whenever it is possible to do so without compromising truth.

By the foregoing distinctions and relative uses of scientific terms, we see how beautifully and harmoniously Substantialism reconciles science with itself, and by making every form of force, or that which has the power of producing a sensation or of doing work, as much an entity as is gross matter, we completely establish the reign of law in physics and maintain the essential relations always existing between cause and effect.

HASWELL ON SOUND-VELOCITY.

BY THE EDITOR.

MR. W. D. OWENS writes us that he has a copy of the "Mechanics' and Engineers' Pocket-book" by Charles H. Haswell, forty-sixth edition, in which the author declares that "*the velocity of sound is proportionate to its volume*," page 195. Mr. Owens then wants our opinion as to the correctness of this scientific statement.

We answer that Mr. Haswell is considered high authority in engineering matters, and as a mechanics' guide he is regarded as very reliable. But we must protest that in physics he does not impress us so favorably, if this is the best information he can give us on the matter of sound-velocity.

In a word, Mr. Haswell is wrong, and so badly wrong that there is not a shadow of scientific correctness in the law he lays down. So far from the *velocity* of sound being proportionate to its *volume*, it matters not what the volume of sound may be, whether it be the report of a hundred-ton Krupp cannon or the report of a toy pistol, it is well known that all sounds travel with the same velocity, namely about 1120 feet in a second in summer temperature.

So self-evident is this statement, that any one who has ever listened to the playing of a brass band, at a distance, knows from observation that Mr. Haswell's statement is altogether wrong. If the loud sounds of the brass horns or the voluminous reports from the bass drum should travel with greater velocity than the sounds of the piccolo flute or other faint instruments, it is plain that all harmony or synchronism of the different instruments would be destroyed at the distance even of a few rods away from the musicians. Instead of this, not the slightest discrepancy or want of time between the loud and the soft notes of the different instruments occurs, even when the listener is stationed a mile away, as is often the case over a body of placid water of a still evening.

Is it possible that as experienced a civil engineer, and as critical an author on mechanics, as Mr. Haswell is reputed to be, has never made so simple an observation as the one to which we here allude? The truth is, this investigator, with a moment's reflection, would know intuitively that we are right and that he is entirely wrong. How, then, did he come to fall into such a superficial error on a question so well understood. We will explain it. He fell into the error just as Prof. Tyndall did, and just as all the great authorities on sound have done before him, in supposing that the *condensed air-wave* driven off from a magazine explosion, and which shatters windows miles away *was*

identical with the sound of the explosion. Startling as it would seem in this age of close and critical scientific investigation, neither Prof. Tyndall nor any other physicist had ever made the observation that this condensed air-wave driven from an exploding magazine, was entirely distinct from the sound report, till we had the honor of first pointing it out and exposing the error in the "Problem of Human Life," pages 103 to 108. None of those great authorities on acoustics had ever suspected but that the compressed wave of air, caused by the thousands of cubic yards of powder-gas instantaneously generated by the explosion and added to the air, was identical with the "sound report" or "noise" which accompanied this condensed wave. Prof. Tyndall positively describes this crushing condensation which broke the windows at the village of Erith, as the "sound-pulse" from the explosion miles away.

Of course. if Mr. Haswell held the same view with Prof. Tyndall (and why should he not when all professors of physics in our colleges taught it?), he could only teach consistently, as he does, that "the velocity of sound is proportionate to its volume," because such condensed wave, caused by the added gas of the explosion (thus mistaken for the sound), must of necessity travel with a velocity proportionate to the amount of gas instantly generated, and the volume of compressed air thereby sent off. Believing, as Mr. Haswell undoubtedly did, that this condensed wave was the veritable "sound-pulse," the same as did Prof. Tyndall, he consistently taught the erroneous doctrine as laid down in his mechanical "Pocket-Book."

For more than eight years the true explanation of magazine explosions has been before the public, and the error of acousticians distinctly pointed out and exposed in the "Problem of Human Life," while the attention of physicists has been called to it over and over in THE MICROCOSM and in THE SCIENTIFIC ARENA, and yet not one single authority or writer on sound, to their dishonor be it stated, has had the unbiased candor and fairness, not to say magnanimity, to confess that our point was well taken, and that the whole scientific world was in error upon that subject up to the time we gave the true explanation to the world.

More than ten thousand professors in the various schools and colleges of the country are at this very time teaching the scientific fallacy thus exploded, and young students go home from their graduation surcharged with this erroneous doctrine. A true theory of acoustics would have informed them that sound, so far from destroying buildings and breaking windows, stirs nothing except sounding bodies in exact unison with such sound, and as the result of sympathetic action; and such sympathetic vibration, at its very best, is so slight, even by the loudest unison tone, that no appreciable mechanical work can be accomplished by it. When lightning, for example, strikes a building, the thunder-peal accompanying it is the most intense sound report known to human ears —vastly surpassing in loudness that of the explosion of Flood Rock in this city, two years ago last October, which we witnessed in close proximity to it—*yet not a pane of glass is marred in the very house where the bolt strikes!* Why? Simply because *thunder is pure sound, unaccompanied with any addition of generated gas by which to drive the air away in a densely compressed wave.* This fact alone destroys the wave-theory of sound, when looked at in all its bearings. Yet this radical and beautiful scientific distinction has always been overlooked by physicists up to within about eight or nine years ago.

We challenge any professor in any college or university of this land to point to one sentence in any work on sound which even hints at this true cause of the breaking of windows at a distance from an exploding magazine, previous to our explanation in the general attack we made upon the wave-theory in the "Problem of Human Life." Yet, as before hinted, no recognition is taken of such a revolutionary discovery in Acoustical Science. Had it been some prominent wave-theorist who had chanced to make the discovery of so gross an error, and had he pointed out the true law and solution of the problem involved—some such scientist as Prof. Mayer, Prof. Rood, or even some lesser light—the news would have been heralded and spread over the scientific world.

We are not complaining of this, however, but only referring to it the more strongly to emphasize the fact of the importance of the discovery itself. It is probably according to the eternal fitness of things, that revolutionary claims to discovery should be tabooed and fought down at first; and we are perfectly willing, therefore, to bide our time. When history, with her impartial pen, shall come to make up the record, these, among all other facts of real scientific merit which deserve to live, will stand out in bold relief.

DOES ALCOHOL EXIST IN GRAIN?

DEAR DR. HALL,—A week or two ago I sent a request for you to give me your opinion as to whether or not there is alcohol in the apple, or in wheat or rye. Some persons here—and not a few—claim there is no alcohol in grain in its normal and natural state. I claim there is, or it could not be evolved from it. Please give me your opinion, *pro* or *con*, in a few words, and very much oblige, Yours very respectfully,

JAS. SMITH.

OTSEGO, ALLEGAN CO., MICH.

REPLY BY JOHN W. HIGGINS, ANALYTICAL CHEMIST.

Ordinary alcohol is the product of the decomposition of glucose, grape sugar, by fermentation. One part of glucose, represented by the formula $C_6 H_{12} O_6$, is split up, by the ferment, into two parts of alcohol, $2 C_2 H_6 O$, and two parts of carbonic acid gas, $2 C O_2$.

Alcohol may be obtained from any body containing glucose or from any body which, by its decomposition, will yield glucose.

The apple in its normal condition does not contain alcohol, but does contain that which, by its decomposition, yields alcohol; viz., glucose or grape sugar. The average proportion of sugar in the apple, at different stages of maturity, has been found to be as follows: unripe, 4.90 per cent.; ripe, 11 per cent., decaying, 7.95 per cent.; the loss of 3.05 per cent. in decaying apples being due to a partial conversion of the sugar into alcohol and carbonic acid gas.

Cider is the fermented juice of the apple. Its keeping qualities depend upon the presence of a certain amount of alcohol and sugar, and the absence of all nitrogenous fermentable matter. The alcohol acts as a preventative against acetous fermentation, whereby vinegar is produced, and the careful removal of the introgenous matter lessens the liability of an after fermentation.

In its normal condition grain contains no alcohol. But alcohol is obtained from grain by a process of fermentation and distillation, by which the starch of the grain is indirectly converted into alcohol and carbonic acid gas.

The grain is mixed with malt, which converts the starch into glucose, and the soluble parts are extracted with water. The extract or "wort" is then fermented when the glucose is decomposed, yielding alcohol and carbonic acid gas. The alcohol is then separated by distillation.

The same conversion of starch into alcohol and carbonic acid gas takes place in the raising of bread by the use of leaven or yeast. If flour and water be mixed to a paste and baked, a dense compact mass is obtained. But thus prepared it is difficult to masticate, and is not easily digested, as it tends to form a cohesive lump and presents but little surface to the action of the gastric juice of the stomach.

Bread which has a spongy structure is more easily masticated and digested, as a large surface is presented to the action of the gastric juice. Leaven and yeast are the almost universally adopted means of giving porosity to bread.

Leaven is a portion of ordinary dough which has been left in a warm place until fermentation has set in, and yeast is the froth which rises to the surface of liquids undergoing alcoholic fermentation. By the action of these ferments a portion of the starch of the flour is converted into glucose, and the glucose is decomposed, alcohol and carbonic acid gas resulting. During the baking the alcohol is driven off, while the carbonic acid gas becomes entangled in the dough, giving it a spongy structure.

It has been estimated that in London alone 300,000 gallons of spirit are annually lost during the process of bread-making. Attempts have been made to collect the alcohol given off during the baking of bread, but without success, as the cost of the necessary apparatus far exceeded the value of the alcohol obtained.

[The foregoing concisely written and highly interesting treatise, by our new contributor, on alcohol, in reply to Mr. Smith's inquiry, contains a mass of valuable information which very few general readers possess. We welcome Prof. Higgins to our columns.—EDITOR.]

GENIUSES versus CRANKS.

BY THE EDITOR.

IT is often the case in this world's history, that novel and original ideas of vast intrinsic importance to mankind, will be suggested and even advocated by some one regarded by his compeers as a scientific innovator, if not a philosophical crank. This practical genius (for such he often proves to be), disheartened by the jeers of his acquaintances, or prevented by the iron barriers of poverty, from carrying out his discoveries, dies in obscurity, if not broken of heart, at least, justly disgusted with the bigotry and ingratitude of mankind. And so his ideas are forgotten till, by accident, in another generation some one more favored with the wealth and surroundings, if not with intellectual ability, stumbles upon the seed-thoughts of his less fortunate brother investigator, and out they come in their matured form to bless the world with their revolutionary advantages.

But the original uncoverer of this golden lead gets no credit for the same, unless, perchance, some incidental record of his researches may have been left which falls under the eye of some fair-minded student of musty lore who corrects the history of the past and immortalizes the name of the long-forgotten "crank" who sunk into obscurity without pity or reward.

But true genius, after all, in nine cases out of ten, is more the result of environment taken advantage of by hard work than of any providential endowment or any special or inspirational ability. We have been credited with genius on account of certain original scientific investigations and discoveries, and younger men have often written to us, enviously repining at our success in this direction, and lamenting their own want of genius. Let us say to all such, that if we have any genius or talent for original ability in the pursuit or acquirement of knowledge, it has come from sober, persistent and unremitting brain-work, while others have wasted their time in sleep or play. To speak the truth, we have little faith in so-called *geniuses*, but possess the most unbounded

confidence in *cranks*—the men who, when they strike an original idea, in whatever branch of natural research, have the energy and pluck to work it out for all there is in it, or, as we often say, for all it is worth. Those are the men, though generally of one idea at a time, who force the world to listen to them, and by persistent hammering finally achieve success, thereby lifting the race to a higher plane of progressive achievement. Let us have more cranks who are willing to work, and less geniuses who sit listlessly and roll up their eyes, sighing for an inspiration.

THE SOUTHERN METHODIST REVIEW ON SUBSTANTIALISM.

BY THE EDITOR.

IN the above-named ably-conducted quarterly for January a writer by the name of E. A. Yates, treating on "The Value of Conservatism," steps out of his way to give an uncalled-for slap at something concerning which he either has no definite knowledge, or else which he willfully misrepresents. That the readers of THE ARENA may have the benefit of the entire paragraph to which we allude, before commenting upon it, here it is:

"Unfortunately for the cause of true progress, the times seem to be propitious for the destroyers of established order; for it requires no genius to tear down, and a little cheap reputation is pay enough. The most venerated and satisfactory results, as the accretion of the best scientific thought of years, are attacked with a vandalism as ruthless as it is thoughtless. As an example, a few years ago Mr. Wilford Hall put forth a little volume entitled 'Problem of Human Life Here and Hereafter.' It attacked the wave-theory of sound and the theory of the attraction of gravity—claiming that both sound and attraction were *material*, but material which he chose to call 'substance,' because so extremely attenuated. His object was to reach the immortality of the soul through the indestructibility of *matter*—the most refined, subtle, and attenuated matter being the most indestructible. God, therefore, as well as the human soul, was of the same 'substance'—that he did not create or bring things from *not-being* into being, but that all things were simply a *condensation of a part of God!* Sound, therefore, is really a portion of the vibrating body. Gravity is the same thing. And so the scientific theories of sound and gravity go by the board without a look to see where they fall. A master-builder surely! I confess that I have never fully made up my mind as to whether Mr. Hall was serious in presenting his theory or was simply perpetrating a huge joke. A pantheism so gross as to be disgusting, and a theory so destitute of philosophic basis, must surely have had its origin either in abnormally developed destructiveness or excessive jocularity."

COMMENTS BY THE EDITOR.

The first thing which must impress the reader as unquestionably a fact, is, that this contributor to the *Review* never read nor even saw the "Problem of Human Life;" which he pretends to criticise. Had he ever seen it, he manifestly would not have called it "a *little* volume," containing as it does more reading matter than two annual volumes of the great *Southern Methodist Review*, or an equivalent of about 1000 pages of any of the *Quarterlies* now published. Thus, the reckless adventurer into unexplored regions, by trying to damage a cause of which he absolutely knew nothing except by hearsay, placed the seal of condemnation upon what he did write, by unwittingly advertising himself to thousands of *Review* readers who own that "*little* volume," as totally disqualified from saying a word on the subject. Judging from letters we have received from all parts of the South where the *Review* is read, the contempt which this paragrapher has aroused is only equaled by the commiseration felt for his self-stultified predicament.

Look at the demonstrated innocence of the man in asserting our teaching to be that *sound*, as well as other forms of force, is "*matter*," that we thus base the evidence of immortality on the indestructibility of "matter," and that "*God*, therefore, as well as the human *soul*, was of the *same substance*" —*matter*. A more outrageous falsehood and excuseless slander were never put into the same number of words.

The drift and substance of all our writings upon this subject, from the first paragraph in the "Problem" to the present number of the ARENA, have been the exact opposite of the doctrine so falsely charged to us by Mr. Yates. If there is one single feature of Substantialism which we have reiterated to superfluity and made to stand out, in bold relief, in almost every article we have written on the subject, it has been that all the forces of nature, including sound, light, heat, magnetism, gravitation, electricity, life, soul, mind and spirit, are neither "matter," nor are they the motions of material particles. The leading feature of Substantialism is that there are *immaterial* as well as *material* substances, and that the human soul and spirit, like the essence of the Deity himself, are the very reverse of "matter," being the most refined form of *immaterial substance*.

With tens of thousands of copies of the "Problem of Human Life," and as many volumes of THE MICROCOSM and THE SCIENTIFIC ARENA in circulation everywhere in the South, there was not a shadow of excuse for this writer thus exposing his deplorable want of information on a question now agitating the philosophical world. That this gratuitous falsifying of the scientific record was not a slip of the pen, he amply proves by adding: "*Sound, therefore, is really a portion of the vibrating body*"! If any of our readers could tell us where Mr. Yates lives, we would cheerfully send him a bundle of our published editorials out of pure compassion, to save this public exposure of ignorance from repetition in the future. Take, as an illustration of our teaching, this single question and answer from the "Text-Book on Sound":

"Q. 82. Would not a bell rung continuously in vacuo be reduced in its material substance, and finally be entirely dissipated in the form of sound-force?

"A. No. Herein lies the superficial mistake of those who oppose the Substantial Philosophy. They do not grasp the broad distinction between *material* and *immaterial* substances. *A ringing bell gives off none of its material substance in the production of sound*, and is only the material instrument by which the force-element of nature is reached and this peculiar form of force developed and manifested to our senses through proper conducting media, etc."

The conclusion of the paragraph quoted from Mr. Yates, in which he indulges a rhapsody on *master builders*, *huge jokes*, *pantheism*, etc., based as it all is, upon his own preposterous misapprehension of the whole question upon which he writes, literally breaks the record for literary and scientific boomerang performances. If some reader of the ARENA, knowing his address, will send him this copy marked, he will no doubt place a benighted wayfarer under lasting obligations, especially should he prove to be a young man.

SUPPLY OF ELECTRICITY.

Dr. Hall:

DEAR EDITOR.—Please answer the following questions in your next ARENA:

When electricity is generated by a battery or dynamo-machine, is there any more electricity in existence than there was before? Does the lightning strike any more frequently now than formerly? If it does, has the generation of so much eletricity by so many batteries over this country anything to do with it? Yours truly,

Brooklyn, N. Y. D. J. SANTMIER.

REMARKS BY THE EDITOR.

The queries of Mr. Santmier are very timely and important, as they reach down to the very bottom of Substantialism. According to this philosophy no force can now come into existence *de novo*, but all present forms or manifestations of force are evolved from the universal fountain or force-element by the appropriate means appointed in nature to that end. The battery or dynamo-machine, in some form, is the means of eliciting electricity, a form of force ever ready to be evolved from that fountain; and though it exists everywhere in inexhaustible abundance in its elemental form, it only appears in its sensuous or tangible form when the means for its manifestation are employed. Hence it matters not how many dynamo-machines might be put to work at the same time—even if the entire earth were full of them, and if its whole surface were one unbroken blaze of electric lights—no conceivable exhaustion of the electric supply would thereby be caused. As well ask if the sound-force of nature would become used up, and if a tendency to absolute silence would thereby be superinduced, if the entire human family should conspire to make all the noise they could during a certain specified day. This universal din would simply draw the requisite supply of substantial sonorous force from the elemental fountain, each blast of horn or crash of drum returning continuously to this same force-element to be again called forth as long as the sound-producing operations were kept up. So with substantial electricity or whatever other form of physical force might be involved.

SOUL-CULTURE.

BY I. L. KEPHART, A.M., D.D.,
President of Westfield College.

HAVING in a former article, (see THE ARENA of July, 1886,) discussed the *fact* of men's religious nature and the importance of its recognition, the purpose now is to notice the proper culture of the susceptibilities of that nature. Just as man's intellectual nature is susceptible of vast development by culture, so is his moral nature. And just as his intellectual nature may remain dormant for *want* of culture or be dwarfed or rendered useless and even vicious by unwise and vicious culture, so may it be with his moral nature. Safety lies only in proper, efficient culture. Two questions then present themselves:

First: What is *proper*, efficient soul-culture?

Second: How can it be most successfully accomplished?

Replying to the first of these questions, the answer is: It is that culture which so develops man's moral, spiritual nature as to enable it to clearly and satisfactorily apprehend the great truths of the spiritual world —the "truths that pertain to God and our own immortal being." Of all the truths of the universe, these are the greatest. Consequently, none others have so great a claim upon our consideration, and any culture that leaves man short of the ability to apprehend these truths, or leaves him content without giving these a place in his soul, is radically, disastrously deficient. And as these truths are only apprehended by the religious, spiritual faculties and susceptibilities, *when properly cultivated*, the cultivation of these is para-

mount in importance, and superior to all other interests in their claims upon us.

Proper soul-culture so enlightens man's moral nature, that he recognizes the great fact of the existence of God; the fact of his superintending providence; the fact of his divine moral government, including man's accountability; the fact of his love for sinner and saint; the fact of his willingness to forgive those who repent and reform. A recognition of these facts is essential to an upright, pure, holy life, without which there can be no peace of conscience, and, consequently, no real happiness here, and no hope of happiness hereafter. And as these are absolutely essential to man's well-being, any culture that fails to bring him to a recognition of these important facts is ruinously defective.

From this it will be seen, that proper soul-culture implies far more than merely moral culture. Morality is an important step in the direction of the apprehension of the great facts above mentioned; but he whose soul-culture stops with an outward moral life, will never apprehend in their fullness these essential truths.

The great want of the human race, all through the ages, has been, and still is, *a remedy for the guilt of sin and the love of sin.* Human experience has demonstrated that, without these, man cannot be at peace with himself, much less at peace with the God of the universe. Hence, the soul-culture that would bless and happify the race, must supply this great want—must direct him to a complete remedy for the guilt of sin, and for the love of sin.

Again, reason and experience demonstrate to man that only by co-operating with the God of nature are the comforts and blessings of natural life secured. They demonstrate to him that, although the God of nature is benevolent, yet, if he would reap he must sow; that if he would have even a cabin to live in, he must build or buy one. He readily recognizes the fact that although for centuries the broad western prairies possessed the great wealth of soil, sunshine, and showers necessary to the growing of an abundance of wheat and corn, yet for want of the diligent, intelligent co-operation with the God of nature, upon the part of the Indians, necessary to produce good crops, they were forced to roam around through the long winters and often suffer for food.

So, a proper soul-culture must impress the mind with the all-important fact that if man would secure the blessings of "peace and joy in the Holy Ghost" in his soul here, and a blissful immortality hereafter, he must co-operate with God *by making a proper use of the means* by which these are to be secured—a proper use of the means which reason and revelation declare are essential to secure these precious boons for himself. And this leads me to notice my second question:

How can the proper cultivation of the soul be most successfully accomplished?

In answering this I would say: It is a well-known fact that in its *natural* condition, the soul—the spirit of man cannot apprehend the great truths above specified, no more than the intellect in *its* natural condition—can solve quadratic equations or demonstrate a proposition in Euclid. Culture development is no less necessary in the one case than in the other. Every permanent habit of the soul is a matter of culture and growth. No mere effort of the will can thoroughly establish in the soul a correct moral attitude. By an act of the will the will may be at once committed to the truth—that is, to a determination to regard and treat the truth as true—exercise faith in it and act accordingly; but nothing short of continued contact with the truth will bring the soul *permanently* under its power. Hence, just as time and constant contact with mathematical problems, with problems in physics and metaphysics, are necessary to the development of intellectual ability, so are time and constant contact with the great problems that pertain to God and human immortality necessary to the proper development of the soul.

The soul has its intuitions, pointing it to and causing it to hunger after the pure, the true, the good, that is, God, just as the intellect has its intuitive thirst for knowledge; but just as the latter, without proper instruction, remains dwarfed; so the former, if left to itself, remains undeveloped, falls into error, and becomes a slave to the most repulsive superstitions. Want of proper soul culture has strewn the pathway of the human race with all the moral wrecks, with all the terrible crimes and degrading practices perpetrated in the name of religion.

As in intellectual culture, the mind must by degrees be so brought into contact with the great truths of intellectual science, as to enable it to correctly apprehend them, so in soul-culture, the mind must be directed (intelligently, efficiently directed) to the great truths of moral, spiritual science; and as no one is competent to impart instruction in the intellectual sciences who has not a clear, practical knowledge of those sciences, so, only those who have a clear, intelligent, *experimental* knowledge of the great truths of the moral, spiritual sciences are competent to successfully impart instruction in them.

The Bible must be *the* text-book, and the teacher must wisely use it so as to impress the young, inquiring mind with a wonderful harmony between the teachings of this book and the teachings of Nature in all that pertains to the natural moral government of God and human accountability. This is a wide field from which the wise gleaner may gather the richest treasures, leading the young mind up to an overwhelming sense of the perfect harmony that exists between God's word and His works, and thus establishing an abiding conviction of the authenticity of the Scriptures.

The fundamental teachings of the Bible must be dwelt upon, especially man's need of a Saviour, and a Saviour provided. Here he finds his panacea for the guilt of sin and the love of sin.

The reasonableness, beauty, and joy of a life devoted to benevolence, must be set forth by the instructor. This can be done in such a way as to captivate. A holy life, when presented in its *true light*, has wonderful attractions for the sincere inquirer after *the right way.* He then sees that "her ways are ways of pleasantness, and all her paths are peace." He joyfully opens his eyes to the great fact that Christianity requires nothing of a man but what he ought to be, and *must* be to be a gentleman in the true sense; and the false notion that it is superstitious, and imposes unreasonable and heavy burdens, takes wings and flies away.

In conclusion, I would say that, to be successful, the instructions must be so imparted—the truths must be so presented, as not only to convince the judgment, but to awaken the emotions of the soul, and thus move to action. As stated above, want of co-operation with God in His method of producing a crop of wheat, will deprive man of wheat. The young mind should be directed to this fact—this invariable law of God in the natural world—and impressed with the fact that, inasmuch as He has clearly declared that this same law does and must and will continue to govern in our spiritual interests; therefore, if we would reap the benefits of peace and joy in the Holy Ghost, and everlasting life, we must diligently co-operate with God to secure these, by a proper, timely use of the means He has ordained. I say *timely* use, for as a few weeks' delay in sowing the wheat will result in failure of a crop, so it may reasonably be expected that careless delay in the more important matter of the soul's salvation may result in utter failure.

Only when these great truths are so presented as to ultimate in moving the one instructed forward along the upward plain of an active, aggressive, holy life, is the proper cultivation of the soul successfully accomplished.

WESTFIELD, ILL., Jan. 15th, 1887.

COHESION AND WORLD MAKING.

A CONSIDERABLE while ago Dr. Hall wrote an article in THE MICROCOSM on cohesion. He took the ground that cohesion was as much a substantial entity as electricity, magnetism or any of the other unseen entities.

The believer in Substantialism has but little use for the words "nothing" and "mode of motion" in the discussion of science. In sound he sees a veritable immaterial substance; likewise in light. And that thing called cohesion, which acts with Herculean power, and which all pseudo-scientists have considered as considerably more attenuated than *nothing*, the Substantialist views as one of the most powerful of all the list of invisible, yet substantial, entities.

If we gathered the drift of the editor's article referred to, it was that cohesion is one of the principal elements in the formation of all tangible substances. The thought that occurred to the writer was, that if cohesion was a substantial element that went into the formation of tangible substances, why not sound? And if sound, then why not electricity, magnetism, light, heat, and so on through the entire list, just in proportion as these things were needed to form the substance in hand. Then I thought if we only had the power to collect, condense, transform and combine in the proper proportions a little sound, considerable cohesion, some electricity, and enough of a few other substantial ingredients, we might make a piece of gross matter. Why not, since we now have the power to unite some of the unseen matarial elements and make a tangible drop of water? I think all we lack to be able to make a world, is an endowment of Almighty power to collect, transform, condense and combine the existing incorporeal elements.

ALBION, NEB. D. J. POYNTER.

[Just so. Editor.]

P S.—If a shadow is nothing, as Dr. Hall labored, in a long article, to prove, why is it we can obtain its photograph? A photo of nothing, seems to me, would be a *thin*-looking thing if, indeed, it could be seen at all.

Please explain to one in trouble on this point. D. J. P.

[See "Positive Concept;" ARENA for October, page 74.—EDITOR.]

OUR PAPER ON SUBSTANTIALISM.

As promised in the January ARENA, our paper on the "Substantial Philosophy" was read before the members of the Institute of Christian Philosophy, in this city, on the evening of the 3d of last month. Although the reading took an hour and twenty minutes, the greatest attention and interest on the part of the audience prevailed throughout. By request of the president, Dr. Deems, the first installment of the paper, as promised in this number of THE ARENA, was deferred until the April number, in order to allow its appearance in *Christian Thought*, the organ of the Institute, to have precedence, as is the custom in such cases. Had we strength for such work, we would be only too glad to comply with the wishes of friends by visiting distant sections of the country for the purpose of presenting orally the

claims of the new philosophy. But our time for public speaking is past. We are glad to say, however, that our associate, Mr. Hudson, whose ability as a lecturer is only equaled by his devotion to the cause of Substantialism, will cheerfully become our substitute for all such occasions, leaving the editor in his more natural element of wielding the pen.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

"CHRISTIANITY A FACT," by Wm. G. Thomas, A. M. 5x8 inches, 200 pages. Ramsey, Millett & Hudson, Kansas City. Price 75c., cloth.

"CREATION OR EVOLUTION," by George Ticknor Curtis. 5 1-2x8 inches, 565 pages. Cloth, $2.00. D. Appleton & Co.

Mr. Thomas in his "CHRISTIANITY A FACT," has in the guise of a dialogue between "Professor Evolutionist and Mr. Orthodox," put into a very readable form his reasons for holding to a belief in "God." "A Hereafter," and "The Bible."

There are fifteen chapters, in which are discussed with considerable ability, the three foregoing points. The evidences of Christianity are especially rich in citations from a wide range of writers.

"CREATION OR EVOLUTION" is one of the latest results of the book-making powers of *Evolution*, or perhaps it should be called a work of intellectual *Creation*. Mr. Curtis very clearly adopts the theory of Creation as the solution of what Bronson Alcott sagely terms "the Thingness of the Here."

Certainly, as a whole, the work is an admirable creation, and well worthy the subject and the writer. The arrangement in the dialogue form puts a fresh force into the treatment given a somewhat stale subject, and contributes largely to sustain the first interest. Chapter I. states the importance of the discussion. Chapter II. compares the Platonic Kosmos with the Darwinian theory. Chapter III. takes up the Darwinian pedigree of man. Chapters IV. and V. review "the doctrine of evolution according to Herbert Spencer." These are among the best chapters in the book, and in them Mr. Curtis has done valuable service for the average reader by stripping the sophistry from the Spencerian system. What is left of the "system" after this admirable husking process, reminds one of Pat's direction for making a field-piece: "take a *long hole* and pour brass around it." Chapter VII. treats of "Spencers' agnosticism," etc., etc.

We feel sure the careful reader of "Creation or Evolution" will entirely agree with the author's statement in the preface:

"The result of my study of the hypothesis of evolution is that it is an ingenious but delusive mode of accounting for the existence of either the body or the mind of man; and that it employs a kind of reasoning which no person of sound judgment would apply to anything that might affect his welfare, his happiness, his estate, or his conduct in the practical affairs of life."

Publishers' Department.

Volume Two of The Arena.

WE take this early opportunity to call the attention of our readers to the near completion of *Vol. I* of THE ARENA.

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Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

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Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SKETCH OF THE REV. PROF. J. M. SPANGLER.

BY THE OFFICE EDITOR.

THE subject of this sketch was born in Holmes County, Ohio, August 20th, 1846, and is consequently only forty years of age, being just in the prime of life. He is a fine specimen of healthy manhood, being six feet three inches tall, and weighing two hundred and twenty-five pounds.

Like most men who have made their mark in the world, he was born poor, and when a very young lad commenced his career of usefulness as a chore-boy upon his father's farm.

When eighteen years of age, he was considered the "crack wood-chopper" of the neighborhood, and though at that time quite ignorant of school education, was well respected, and looked upon as a sober and industrious young man.

At about this age he left home, and enlisted in the Seventh Iowa Cavalry as a common soldier, and served his country during the last two years of the war. This incident seemed the turning point in the young man's life. While at home, surrounded by people who were not particularly distinguished for their education, he was naturally not supposed to understand the needs and advantages of having an education, his only goal of ambition at that time being to surpass his neighbors in manual farm labor; but after going out into the world and meeting with people of more and less scholastic ability than he himself possessed, his natural inquisitiveness and intelligence were aroused, with exceedingly satisfactory results to both himself and friends.

He commenced his studies by reading whatever he could get of an instructive character, using whatever money could be spared from the results of his own hard work and rigid economy to buy books, until, at the age of twenty-one, he was able to enter the State Normal School of Kansas, having decided upon teaching as his life-work.

After three years of hard study he graduated with high honors, and his efficiency and intelligence may be surmised from the fact that he was promptly chosen as an instructor in the same institution, which is, by the way, a school of no mean repute in its line. Since that time his years have been spent almost entirely in the schoolroom, with a success that is rarely attained by the ordinary class of professors.

At about the time he entered the Normal School as a student he was converted to the cause of Christ and became a member of the Methodist Episcopal Church, and his labor in his chosen field, the schoolroom, was only set aside for two things—to edit a paper in the interest of laboring men, which brought on financial ruin and disaster, and to preach the Gospel.

REV. PROF. J. M. SPANGLER.

Prof. Spangler, not satisfied with his merely Normal School education, has ever since been a close student. He has mastered Latin and Greek, as well as the German, Spanish, Portuguese, and Italian languages, and is a man who, through his extensive reading and study, is thoroughly posted in both ancient and modern philosophical thought.

In 1882 Prof. Spangler was appointed President and Director of the American College at Concepcion, Chili, South America, which position he filled with ability and success until January, 1885, at which time he was compelled, with great reluctance to himself and regret to all connected with him in his work, to leave in order to save the life of his wife, who was, as the result of the climate, fast going into consumption. The Professor writes us that after the cholera scourge, which is now rampant in Chili, is passed, he expects to return there and continue his duties as supervisor of the college. If he comes by way of New York, we shall be pleased to welcome him at the ARENA office.

As an author, he is regarded as quite up to the age by those who have read his book entitled "Civilization in Chili, Past and Present," which he published shortly after his return to this country, and which has met with quite a large sale.

Prof. Spangler was last year ordained a minister of the Gospel in the Methodist Episcopal Church, and is at present supplying a pulpit at Truckee, Cal., and his ability and industry in this direction are certified to by the fact that during the four months of his labor the membership has increased over five hundred per cent.

When the "Problem of Human Life" was placed in his hands, some years ago, unfolding the scientific gospel of Substantialism, its lack of popular respectability and acceptance, and its opposition to what he had already learned and accepted as true science, did not inveigh against his reading the book, and to read, as is usually the case, was to be convinced of the truth of its teaching and the falsity and absurdity of the mode of motion doctrines of physics attacked by it. Since that time, Prof. Spangler has spoken with no uncertain sound with regard to his scientific convictions, and we regard him to-day as among the strongest advocates of Substantialism.

He is but a young man yet, and with the experience which he has derived from his past twenty years of successful labor in the schoolroom, sanctum and pulpit, he promises to leave, as Longfellow would express it, "footprints in the sands of time."

A THEORY OF CREATION.

BY ROBERT WALTER, M. D.

THE reconciliation of the declarations of Scripture with the truths of Science is "a consummation devoutly to be wished for." The conflicts of the past necessarily weaken the confidence of men in the certainty of knowledge, causing the religionist and scientist to diverge so widely from each other as to give every honest man who believes there is truth in both, much uneasiness. In no respect are the conflicts of science and religion more pronounced than in their theories of creation. The Bible affirms creation through processes of evolution, from THE GREAT FIRST CAUSE onward through all time, while science asserts, evolution from (substantially) nothing. *Evolution* is an exceedingly suggestive word, which, taken in connection with the term *development*, has done more to the advancement of the "development theory" than any arguments their advocates have ever produced. Wouldn't it be a startling fact if we should demonstrate that Spencer and Darwin are not *evolutionists* at all, but *involutionists;* that their whole system is intended to establish the universe by processes which *involve* the whole from the part—which gather in from the external what is supposed to produce the real and internal. Induction and involution go together, and are the true representatives of modern agnostic science. Let Christian men stop right here on the threshold and refuse to abandon the terms evolution and development without careful consideration.

But this thought is intended to be suggestive, and not to form the topic of this article. We prefer at this time to show a perfect

agreement between the declarations of Scripture as to the processes of Creation, and the deductions of science, as established by men who are able to demonstrate in practical application the correctness of their theories, and who do not rest for corroboration upon plausible conclusions arrived at through the redundant use and misuse of terms.

One of the means by which Mr. Spencer has sought to establish his so-called evolution, is explained in the following words from his FIRST PRINCIPLES: "There is no mode of establishing the validity of any belief, except that of showing its entire congruity with all other beliefs." If Mr. Spencer waits until he can accomplish this, he will wait forever. The congruity of falsehood with truth can never be shown. One wonders why he did not say, that the true measure of truth is its congruity with truth, and its variance with error. That he did not say this, is only another evidence of his attempt to establish a system by the congruity of its parts, while as yet no foundation has been reached. He commences at the roof to build his house, hoping by and by to get something to stand upon. The first step he acknowledges is assumption, and from assumption he proceeds to assumption, and having obtained a congruity of assumptions, he has established a SYNTHETIC PHILOSOPHY which pleases himself. The philosophy which we urge is one based upon the theory that in order to get something, we must have something to start with. Truth is the only yardstick which we can employ to measure truth. All assumptions unverified by truth will leave us floundering in the mire of speculation till the end of time.

The unfortunate fact of Mr. Spencer's system is, that he has nothing to begin with, and, we affirm, has nothing to end with. Add nothing to nothing and nothing results. He dare not draw upon the truths of Archimedes, Newton, Lavoisier, Dalton, because these truths would directly controvert his system. His law of evolution bears no analogy with that of Newton or Dalton, nor with any other laws of the universe; so that he is compelled to abandon every attempt to measure his system by the truth already established. We propose to follow the opposite plan, and shall call up the Astronomers and Chemists to verify the conclusions of our theory of Creation.

Who created the universe? The human mind, whether of savage or civilized, instinctively recognizes A GREAT FIRST CAUSE. This belief is universally existent in human consciousness, and if there ever was an evidence of necessity and of truth, *universality* is that evidence. Worship is instinctively implanted in the human breast, and men who have no power to worship a conception of the mind, an Invisible God, make for themselves one that they can see and feel. Idolatry in all the ages but suggests a true God which men ought to worship. The altar which the Athenians had erected "TO THE UNKNOWN GOD," "in whom we live, move, and have our being," expresses this necessary conclusion of fact that there is a God. If we live in Him, we must, in our interior consciousness, know something of Him. If He made us in His likeness, the processes of mind which *we* illustrate must correspond with those which He exhibits. It is an interesting fact that all reliable thought proceeds outward from some premise or starting point, and so illustrates the workings of nature which everywhere is a process of evolution, from the thought, the seed, the germ, to the fully developed organism. True science is deductive, just as nature is. Having attained to a demonstrated first principle, we are enabled to deduce conclusions, and carry on practice, which exhibits the power and value of science. All other forms of science are speculative. Mr. Spencer strives to give us a science, not such as Newton gave, but a science which involves no fundamental discovery upon which to base it. He calls his systen evolution, but it is no more evolution than the tree is evolved from the leaf. He starts at the topmost branch, and absolutely forgets the necessity of a root, from which science, like nature, must grow. Let us see if different results may be obtained by different methods.

First, it would seem to be a necessary conclusion that the human mind, being in the likeness of that which is Divine, must operate upon similar principles, for it would be an absurd proposition that man's likeness to the Creator is physical rather than mental. Not that the finite mind comprehends the infinite, but only illustrates it; not that its conclusions correspond with Divine conclusions, but that its true processes correspond. If the processes of thought in nature are universally alike in important respects, we must infer that these processes illustrate those from which the human mind is derived, and in order to obtain a suggestion as to how creation was effected, we may simply ask ourselves what would be the plan of the wisest man for doing such work. And if the plan illustrated by the wise is found to be universally exhibited whenever success is obtained, we are warranted in the suggestion that creation follows a similar plan.

What is the invariable first process in all successful work? Is it not the conception of the plan? and is not this immediately followed by the power to carry forward the plan? Who ever intelligently built a house before he had arranged its leading parts, at least? Who ever built a machine until he had conceived, not only the relation of its parts, but the power which should keep them in operation? Who ever made a sentence until he had conceived the thought, or wrote a book until its subject was determined? If such an one may be found, then we may suspect that the universe is the product of chance, as Mr. Spencer would seem to infer. We choose to believe the contrary; that the universe, as we have it to-day, is a system in process of development in accordance with a plan *conceived* and *expressed* in the beginning.

Was creation effected in six days of twenty-four hours each? That depends upon what we mean by creation. If it means the completion of the universe, we reply that creation has not yet been effected. A hundred years ago, none of us were in existence; each new being born into the world is as certainly a new creation as the sun, moon and stars were ages ago. A short time ago he was not, but by some mighty power he has come to be. Mountains and valleys, plants and trees, animals and men, are in perpetual development from principles long ago established.

Again, if creation is the work of a perfect being, it should be (when completed) a perfect work; but who will assert that nature, as we have it around us, is perfect? Are not improvements being continually effected? If this world of sin and sorrow is perfection, our ideas must be very limited indeed. What is there in all the realm of being that is perfect, except "the law of the Lord?" The plan which He brought into operation in the beginning was perfect, and is working out results which shall be correspondingly perfect when creation is finished. When that time comes, He will reign supremely in all the universe, and nothing that hurts or destroys shall be found within it.

The Scriptures are quoted by Christ as saying, "Ye are gods," and is it not wonderfully true that man has been endowed with the power of production, even of creation, as long as he works in obedience to the laws of the Infinite. What wondrous power mechanics and chemistry have conferred upon man, only because he has learned what is the expressed will of the Eternal Law-giver. The dynamite, which destroys a ship or overturns a mountain, is illustrative of the power which a knowledge of God's laws confers upon man.

But what is law? Is it not *the expressed will of the law-giver?* Will not this definition hold true of the great Law-giver, as well as of those who imitate Him? When He said "Let there be light," did He not express His will, or, in other words, formulate the law of light, and was not this Word of truth the "first-born of every creature," who afterward "became flesh and dwelt among us," "by Him all things were made," "who upholdeth all things by the word of His power." The first day's work, if we read aright, consisted of ordaining the plan by which light was to be obtained—a plan which, while in practical illustration through all the ages, the discovery of its law is the fact of modern chemistry. Chemical science is the first great science, because the first great fact of existence, and men who have learned its laws have attained to the power and wisdom of the gods.

What was the second day's work? Was it not the gathering together of the land and water, and the spreading out of the broad expanse of the heavens? Was this not *the expressed will of God, His word, His law*, the power and universality of which was the discovery of Sir Isaac Newton? What wondrous power this interpretation of the second day's work has conferred upon man!

What was the third day's work? Was it not ordaining the law of vital existence? "Let grass and herb and seed appear," and as the discovery of the laws of chemical affinity gave to the chemist wondrous power, and the discovery of the law by which gravity works gives corresponding power to the astronomer, would not the discovery of the law by which vitality operates give infinitely more valuable power to the vital scientists? And as these three days' work constitute the basis of all future development, will not the discovery of the will of God in these departments confer upon him who has achieved it a power to explain creation such as can be obtained in no other way? Is not attraction of gravitation the true principle of Mechanical Evolution and chemical affinity the corresponding principle of Chemical Evolution? What reason is there for supposing that nature's great department is not under the control of a great law of Organic Evolution, the discovery of which will complete the circle of science, and demonstrate each by its consistency with all the others? And if it be true that nature and revelation are written by the same consistent hand, will not the discovery of the laws of nature in these varied departments give a perfect interpretation of the declarations of Scripture? We affirm that the Mosaic account of creation is *absolutely, literally, and emphatically true*, as demonstrated by the discoveries of science. It is not true that these laws accomplished their purpose and finished the work in days of twenty-four hours each, nor is it so affirmed in Scripture; on the contrary, the record expressly shows that sun, moon and stars did not appear until the fourth day, and fish and bird on the fifth day, and animals and man on the sixth.

Creation is indeed progressive. The work has not yet been completed, and never will be, until Israel shall be redeemed from the bondage of sin, and all the world shall know the Lord our Creator.

After the whole PLAN had been wrought out in the creation of man, and the Sabbath was instituted, a corresponding *system of work*, to be also followed by a Sabbath of rest, began, on the more practical scale. As the Mosaic Law necessitated a Sabbath on every seventh day, so it proclaimed a Sabbath every seventh year, and still another one every seven times seven years; each Sabbath being but a more extended application of the previous one. So as Creation's plan was established and put into operation in six days with the seventh day for rest, it has con-

tinued to operate, keeping up a succession of development now nearly through six ages of work, culminating in the Nineteenth Century, with its hurry and bustle in preparation for the Millennial Sabbath soon to be. Each day's work on the extended scale closed with judgment and promise—promise to Noah, and judgment upon the scoffers of his time for the first day. The second day or age closed with the promise to Abraham, and judgment upon Sodom and Gomorrah. The third age closed with the promise to Moses, and the destruction of the Egyptians. The fourth age with the carrying away into Babylon. The fifth, with the preaching of Christ, and the destruction of Jerusalem, while the sixth day culminates in European conflagration, or even worse, preparatory to that millennial age which must come when God is known as he knows.

To recapitulate, therefore, let us remark that creation has been effected by the declaration of an omnipotent will, enforced by the power of his government. The plan of the circle of existence was completed in three days, in the establishment of chemical, mechanical, and vital laws. These laws produced results under the immediate direction of the Creator during three successive days, after which a day of rest was enjoyed, to be followed by ages of work and a Sabbath of rest still in the future.

The great law of vital existence having been discovered, demonstrates the trinity of Nature as well as of THE DIVINE, and enables us to affirm a perfect, literal, and everywhere clearly consistent explanation of Scripture. from the first chapter of Genesis to the last chapter of Revelations. The attempts of men to explain away the Word of God, so as to make it conform to the teachings of false science, is a sad fact of our times. Let Christian men once and for all absolutely refuse to abate one jot or one tittle of confidence in the declarations of this record of truth, for they will be found to be exactly and literally true, and no commentator who ever existed could state the truth more exactly, concisely, and clearly than have the inspired writers. When Moses, and Isaiah, and Paul make a statement they mean just what they say, and say just what they mean, in the fewest possible words, and with absolute correctness.

THE PRINCIPAL CAUSE OF APOSTASY.

BY J. I. SWANDER, D.D.

WE see it announced in some of the news columns of the religious press that Rev. Wm. M. Gilbert, of Philadelphia, has recently withdrawn from the gospel ministry on account of his "loss of faith in the truths of Christianity." We sincerely hope that this floating statement has no foundation in fact. The reading of the item must be most startling and painful to all Christian observers. It begets a sickening sensation, and awakens a sudden emotion of mingled sympathy and sorrow. To leave the ministry of one church for the purpose of taking orders in another is not uncommon, and sometimes not unjustifiable; to discontinue the performance of ministerial duties by a gradual falling away into retirement, or going away into some secular pursuit, is an occurrence not unfrequently repeated in the degenerate tendency of these times; but the public announcement that a regularly ordained minister of the everlasting gospel has, deliberately and in cool blood, "Crucified the Son of God afresh," is the chronacling of an event so unusual in its occurrence, so remarkable in its character, and so saddening in its effects upon the true yet trembling disciple of Christ, as to shake his soul into a sickening shudder over the cause and consequences of such apostasy.

Before inquiring directly after the immediate cause of the "loss of faith" alluded to in the foregoing paragraph, it may not be amiss to raise a few suggestive questions in a preliminary way. How many interrogative propositions spring into existence at our very start upon this general line of inquiry? Is there not room for the possibility that Mr. G. never had any genuine faith to lose? Is there any reason in tolerating the thought that he had only built a questionable something upon the sand, and that consequently his loss was merely a loss of sand with the appurtenances thereto? Does true faith ever build upon the sand? Does genuine faith ever build wood, hay, or stubble upon the true foundation? If faith is the gift of God, planted in or built upon the sand, who is the foolish planter or builder? As "the Author of our faith" is "the only wise God," does it not follow that all the folly of false architecture and all the responsibility of any consequent collapse must be with the man who does not take sufficient heed as to how and what he builds? Was Mr. Gilbert's faith a new principle of heavenly life begotten within him from above as something that could not possibly have been born of the flesh? If so, was it not an entity within him as really substantial as his own physical being? If thus begotten in him, was it not nourishable with heavenly food? Assuming the affirmative of the last interrogative proposition, it is proper to inquire still further—Why did not "the seed remain in him"—why was there such a sad miscarriage?

Apostasy generally results from a want of clear discernment—a failure to distinguish between the outer form and inner substance of Christianity. The same general cause which leads to false reasoning in science leads also to false faith in religion. There is no possibility of enduring unto the legitimate end except as the individual sees the invisable. If the foregoing sentence involves a contradiction, the Bible contradicts itself. For want of proper insight men fail to discern between the vibratory motions of the air and that substantial form of force called sound; and for want of ability to distinguish between the essential and the incidental in Christianity, men lose faith in the latter, because they never had any faith in the former. The outward archive of the Bible is mistaken for the Word of God, which, being "forever settled in heaven," "abideth forever." The visible emblems of the sacrament are likely to be substituted for the invisible yet substantial grace of which the institution is designed to be the bearer. Opposition to mere form may lose its course and wander away into the wilderness of mere sentimental gush. When such false opposition to formality imagines itself to be very highly charged with respectable electricity from the upper clouds of mere human society, it is in danger of substituting high-toned social culture and refined dissipation for the genuine Christian's most reasonable service in the vineyard of the Master. Carnal delights are mistaken for Christian duties. Whitewashed sociability palms itself off upon the poor deluded devotees of pleasure as the veritable communion of a higher life, until Satan is led to laugh at their calamity. Thus the undiscerning church member sacrifices the sweet and legitimate peace of God for the wild delights of worldly dissipation. This dish of forbidden dainties is sumptuously shared until the gluttonous guest loses his relish for "the husks that the swine did eat," and, instead of rising and going to his father, he takes his last step in the wrong direction, and quarrels with the world because the world has allowed him to make a fool of himself. This is apostasy. His verdict is: "I have tried religion and find that there is nothing in it." He *has not* tried religion, but has himself been tried and found fearfully wanting.

Is it not probable that the Philadelphia preacher apostatized for the want of such discernment, and on account of the general tendency of our modern churchism toward the point indicated in the foregoing paragraph? If so, is not the prevailing materialistic trend of modern philosophy largely responsible for such and similar consequences? How can Christianity be consistently held as a veritable entity worth holding to, when the Christian professors of the physical sciences in our colleges teach that heat is a mere mode of motion; that electricity is only a *condition* of something else; that light is nothing more than an ethereal vibration: that sound is an undulatory movement in the conducting medium of a nonentity; and that force is "nothing at all," except a "rate of change," as advocated by Prof. Tait, one of the leading Christian physicists of the world. We verily believe that when the fundamental principles announced in the "Problem of Human Life," and formulated in "The Substantial Philosophy," are generally accepted by Christian people throughout the world, and applied to the absolute religion as consistency requires, there will be a clearer discernment between things which are seen and temporal, and those things which are unseen and eternal, and, as a consequence, no such general falling away from the strong hold of the only and Everlasting Gospel.

But many nominal Christians are guilty of carnal practices as well as the victims of a prevailing false philosophy. What authority does God give his church to sanction or even to tolerate any of the many questionable indulgences now serving as the milestones along the broad road to a more general apostasy and its consequent "abomination of desolation in the holy place" of our boasted Protestant Christianity? Are we yet to learn from our Roman Catholic neighbors the lesson that we taught them when Luther confronted Tetzel and throttled the peddlers of sinful indulgences at the gates of German cities, and when the Swiss Reformers drove Samson and his iniquitous traffic beyond the Alps? The Catholic priests of this country are already reading manifestoes from the higher dignitaries of their church. Balls, picnics, church-fairs, excursions, and other entertainments in the name and for the support of religious enterprises are forbidden within the jurisdiction of some Catholic bishops. While this is being done, some of our Protestant churches are scandalizing our holy religion by running their mistaken zeal for God into an excess of carnal riot. No wonder that even our watchmen are beginning to fall from the walls of Zion. Away with nine-tenths of the sacrilegious nonsense brought into our church socials! Out upon religious baboonery and buffoonery in every form! There is little sense and less piety in having a "kirmess" in the church, by the church, or for the church of the living God. From euchre and whist-parties among Christians, and every accompaniment of the gambling-table, good Lord deliver thy peculiar people, if, indeed, they still have any peculiarities to distinguish them from the inhabitants of the world. Is it not time for some Elijah to come and break down the altars of our modern Baal, and dash the seductive gods of our fashionable idolatry to the earth? No money should be given by Christians for church purposes except what is contributed in a spirit of heaven-born benevolence. Charity never seeketh to have its own returned in strawberries, ice-cream and raw lobsters. Almsgiving, pure and unadulterated, should be a part of that worship which is offered to the Christian's God in "the beauty of holiness." For our part we do not see how there can be any holiness in the voluptuous heels of a church-dance, or in a neck-tie party, where a gentleman is in danger of being chosen by a game of chance to lead some other man's big ugly wife out into the dining-hall of the sanctuary.

We have not lost faith in the substantial essence of the Christian religion Neither have we lost faith in the popular notion that the temple of God can be built with untempered mortar; we never had any faith in or respect for the miserable pretension. During twenty-eight years of active ministry we have never raised a cent for church or charitable purposes by resorting to any such questionable expedients; and we never expect to make an effort in that direction until after we shall have "lost faith" in the essential substance of Christianity. These things are the manifestations of apostasy on the part of churches too cowardly to admit that they have fallen from the faith. And what is to be gained for the kingdom of Christ by resorting to the disguised methods of hell? If we cannot raise money to send the pure gospel to the heathen without making heathens of ourselves, then let the darkness of paganism continue to reign from the equator to the poles. Probation or no probation over the border of this present life, the condition of the heathen in the judgment day will certainly be no worse than ours if we thus continue in such mock-piety. If the Church cannot reach her desired haven by sailing under her own true colors, she may as well founder and flounder first as last. But she will not fail—not even through her own inconsistency—and her safe arrival in the heavenly harbor will, under God, be largely attributable to those who will have had discernment enough to discriminate between the kernel and the shell of Christianity, and self-denial enough not to eat the meat on which so many church idolators feed, and from the false strength of which they will ultimately apostatize into perdition.

FREMONT, O.

FUTURE PROBATION, PHILOSOPHICALLY CONSIDERED.

(*Continued.*)

BY REV. J. W. ROBERTS.

THE argument that this is an enlightened age is a two-edged sword, which cuts both ways. If the poor benighted heathen, who gropes his way under the dark shadows of ignorance and superstition, is worthy of chastisement, what shall be said of the individual who sits down in the glory of his illuminated surroundings, and "thanks God he is not like other men," and yet is a transgressor? Where "much is given, much shall be required," and no government not administered on this fundamental principle of justice can stand. So the Ninevites and Sodomites shall condemn the Jews of Christ's day in the judgment. How much more these æsthetic gentlemen of the nineteen century?

A future probation is most distinctly contradicted by God's providential dealings with men. Take the case of the flood. Why destroy the antediluvians from the face of the earth if they were merely transferred to a better probationary state, while good old Noah was left to a life of toil and temptation here? Or why send the wicked inhabitants of Sodom by fire to a more propitious clime, and consign righteous Lot to a life in the midst of sin? Or why drown Pharaoh and his host in the midst of the sea, that they might go by water to a more desirable realm beyond, where such judgments for cruelty, oppression, and defiance of God are not known, while Moses and the escaped Hebrews were doomed to wanderings in the wilderness, where all should be buried but two? And what a travesty of common sense was the song of deliverance which the Israelites sang at the overthrow of their foes!

And why did Jesus weep over Jerusalem? Why this exhibition of sorrow, this plaintive lament, if these "children" were only to be transplanted to an estate of better covenants under the watchful care of this same loving Lord? Why did Christ ask: "What shall it profit a man if he should gain the whole world and lose his own soul?" if the soul is not lost, but consigned to a more propitious condition of trial? The man might readily reply: 'My profit will be the exchange of an imperfect for a more perfect probation, with an assurance of ultimate happiness." And he might ask in turn: "Why does my Lord propound these questions with such solemn emphasis and sorrowful gravity, when He knows I am only to leave this state of trial for another and better one, with the assurance at last of final bliss?" Can any array of arguments present the question in so strong a light as these simple statements of facts?

As the general proposition of the advocates of a future probation is that for finite acts God will not punish eternally, and as all probations are necessarily finite, if they have an end, it follows that on this hypothesis, the sins of a future probation would partake of this finite element, and therefore could not be forever punished; so future probations must follow each other *ad infinitum*. This conclusion is beyond question or controversy.

As probations succeed each other forever, each added one will be a motive and inducement to sin. "Because sentence against an evil work is not executed speedily, therefore the heart of the sons of men is fully set in them to do evil."—Eccl. viii. 11. Hence, *God would become a copartner in the transgressions of his own law, and by holding out a prolonged or perpetual hope of escape from the consequences of sin, when persisted in, would practically offer a bribe to the sinner to continue in evil-doing forever.*

This is manifest. Let men beware how they attempt to bring God down to their own level. He warns them at this point. "Thou thoughtest that I was altogether as thyself; but I will reprove thee, and set them in order before thine eyes."—Ps. l. 21.

"But may there not be a future probation involving some new principle?" What new principle can be evolved? Man's first estate embraced God's creative and proprietary rights in him to the fullest extent. It was God's to command and man's to obey in the most absolute sense. Nothing could be added to or taken from this inherent right of God and duty of man. This was a perfect probation of law requiring obedience from man. Do this and live. Transgress and die. The terms were plain and easily understood. But the estate was irretrievably and hopelessly lost. Then "God so loved the world" that He provided redemption, and gave man the probation of grace. Thus we have creation and redemption, law and grace, as the inhering qualities of the two probations extended to the human race. Can there be any other? Neither intuition nor reason can find any basis for a third. Revelation is not only silent as to such information, but is full of the most conclusive declarations to the contrary. He lacks every essential of true wisdom who will risk his eternal welfare upon a chimera which finds no support from any source of information in the universe.

If God has done *all* for man—his vineyard—that He can do, which He declares, then there is left nothing more possible to do. And this is in exact accord with the perfection of Himself. God's word and perfection, thus conjoining, as they ever do, renders this great fact impressive beyond measure, namely, that the probation of man upon earth under grace, is all that God can make it, or could make it were it extended eternally. No future probation, therefore, could be made more favorable to man than the one provided for time, nor more likely to result favorably in "redeeming a sinner from the error of his way." Hence, useless at best, but in every aspect of the case liable to harmful and disastrous results, as holding out inducements to sin without fear of serious punishment.

It is argued that sin brings misery, and by this means will furnish its own cure. This is not only unphilosophical, as sin can only produce its like, and not its opposite; but it is contrary to the facts, for in spite of pain and death as results of sin in this present life, men not only sin on, but they "roll sin as a sweet morsel under their tongue," and continue in their mad career "with a high hand and an outstretched arm." If in an experience of six thousand years, with its lessons written in blood and tears and fire, no reformatory influences have been evolved from this source, how can any reasonable being expect better results in the future?

One more argument is advanced in favor of a future state of trial, which is this: That the consequences of sin will be more apparent, and the certainty of its punishment more visible there than here, and that these will open the eyes of the sinner and cause him to flee from the error of his way. Besides being a pure assumption, this position is illogical, unreasonable, and contradictory of known facts. In the first place, sin operates to blind the eyes instead of opening them, and the more and longer a man sins the blinder he becomes. In the next place, punishment has no reformatory principle in it. It is penalty, not precept; it is law, not love; it is justice, not grace; it bruises, but does not heal; it inflicts stripes, but does not "mollify with ointment;" it hardens the heart, but never mellows it into repentance.

It follows that neither sin nor punishment can add to man's capacity for virtue, or produce for him any remedy as a transgressor. If, then, any benefits are to be derived for man from a future state of probation, they must be the direct gift of God; for no other being in the universe can "give good gifts." But as the perfection of God precludes any improvement upon Himself or His mode of administration, this cannot be. Besides, if it were possible for God to do more for incorrigible sinners than for those who repent and love Him, it would be gross injustice on His part and in violation of every principle of equity and good government. Indeed, as already shown, such a procedure would be offering a premium for sin, and put virtue and righteousness at a discount.

No, God is no respecter of persons, and is impartially just and loving to all His creatures, and if the "knowledge of the glory of God in the face of Jesus Christ," which is given as the light and the life of the world, will not bring men to repentance and to heaven, no power in the universe is sufficient for this work. If the cross of the atoning Lamb is rejected, whereby "God is reconciling the world unto Himself," then there "remains no more sacrifice for sin," but a "fearful looking for of judgment and fiery indignation which shall devour the adversary." He who goes out from the protecting shadow of the cross of Christ, lays down hope at the grave, and steps out upon the "cold pavement of death" with his back toward heaven, and his doom written in imperishable letters before him: "You knew your duty, but ye did it not."

There is, there can be, no room or place for a future probation of grace in the economy of a perfect God.

The theory of a future probation, provided especially for the heathen, will require a separate paper devoted to that particular branch of the subject.

OSKALOOSA, Kansas.

THE PLATONIC PHILOSOPHY AND CHRISTIANITY.—No. 3.

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

THE cosmogony of Plato is expounded mostly from a Pythagorean standpoint, and did not arise, even in the mind of Plato, above a reasonable conjecture. He maintained that the world was created, and did not exist from eternity; that it was, at first, in a chaotic state, and was framed, from the model of a perfect archetypal world, out of a formless mass. While he believed in the creation of the world, he also thought that matter, in some sense, had existed with God from eternity. He was really a Substantialist, but did not discriminate between material and immaterial substances. He could not arise to the Biblical idea of the creation of the world out of the unseen substances of Jehovah's own being. He clearly taught the spherical shape of the world, and that it is in motion. He was not a pessimist; but he conceived the world as the image of the good, and the work of divine munificence. Plato taught that the world has a soul as well as a body, and compared it to a large animal. His reasoning on this subject is very fanciful; and it cannot, in any sense, be made of practical value.

In the divisions of the Platonic philosophy, the religious ideas of Plato are comprehended in the department of physics. Plato thought that man has three souls: (1) The rational soul, whose seat is in the head; (2) the courageous soul; (3) the appetitive soul, which seeks sensual pleasures. This great Greek philosopher presents the following arguments for the immortality of the rational soul: (1) From the principle that contrarities spring from contrarities, death from life, and consequently life from death; (2) from the soul's independence of the body; (3) from its nature, which renders it incapable of dissolution; (4) from its superiority to the body; (5) God does not will the destruction of that which he has put together in such a beautiful manner and endowed with such high aspirations. Plato really believed the rational soul to be a substantial entity, and therefore incapable of dissolution. Modern philosophers can present no stronger arguments in favor of the immortality of the soul than those contained in the Phaedo of Plato. A number of theories have been derived from the religious and philosophical teachings of Plato, which we will endeavor to bring out when we come to the direct influence of the Platonic philosophy upon Christianity.

The Platonic philosophy largely centers in the great philosopher's theory of ideas. There has been much discussion by realists and idealists as to Plato's true position in philosophy. He has been claimed by both parties, but neither party can fully justify its claim. Plato was too great a man to adopt either one of the extremes. We can say for the three greatest Greek philosophers, Socrates, Plato, and Aristotle, that they did not go to the extremes of either realism or idealism. They were all genuine substantialists. We cannot question the fact, that the disciples of Plato had a tendency to idealism, and the disciples of Aristotle to realism; but the masters were able to steer clear of these breakers. In modern times the philosophy of John Locke has been carried into materialism, but that great philosopher was far from being a materialist. He did not teach that sensation is the only source of ideas, but placed great stress upon reflection.

The Platonic idea was the pure archetypal essence of things. Plato meant by idea about what modern philosophers mean by concept. The great idea or type of things originated with God; that was, of course, a perfect model. Jehovah made everything according to a plan—that is, according to an idea. Man, in the image of God, also works after plans, or ideas. Jesus Christ, who was God manifested in the flesh, fulfilled the types, or ideas, of the Old Testament. To my mind, there is something beautiful in the Platonic doctrine or ideas. Realists have to permit Plato's teachings, in order to get any support from him for their claims. Plato had learned from Socrates the important principle that the criterion of truth must no longer be sought amid the ever changing phenomena of the sensible world. The philosophers of the Ionian school had undertaken this, and ended in failure and defeat. It must, therefore, be sought in the intelligible world, and not upon opinions founded on sensation. In other words, it must be looked for from within. Whatever superiority the philosophy of the present age can claim over the materialism of the past, is due to its adherence to the principles and methods of Plato.

No philosopher in modern times can describe more grapically, than did Plato, the faculties of the human mind. He placed proper emphasis upon self-consciousness, without which we cannot know anything. Deny its authority, and science as well as philosophy would be a farce. Plato recognized two general faculties, the faculty for apprehending necessary truth, and the faculty of perceiving sensible objects: he made several subdivisions of these, of which it is not necessary to speak. The dialectic of Plato is an effort to lead the mind back to those ideas, which he believed had been learned in eternity, he claimed that they were in the memory, but had been lost to consciousness. Plato represents Socrates as experimenting with a slave of Meno, and that he had drawn out of the youth a knowledge of mathematical truths which the boy had had no opportunity of learning. While this does not prove a pre-existent state, it does prove that there are principles in the human reason not derived from sensation. While experience furnishes the occasion for the development of these principles, they logically existed in the mind before experience.

The Dialectic of Plato was an analytical and inductive method. Modern scientists claim that they have an advantage over philosophers and religious teachers, in the fact that they use the inductive instead of the deductive method. The inductive method did not originate with science, but with philosophy. Lord Bacon, the greatest of scientists, styled the father of the inductive method, admits that this method was used by Plato. These are his words: "An induction such as will be of advantage for the invention and demonstration of arts and sciences, must distinguish the essential nature of things by proper rejections and exclusions, and then after as many of these negatives as are sufficient by comprising above all, the positives. Up to this time this has not been done, or even attempted, except by Plato alone, who, in order to attain his definitions and ideas, has used to a certain extent the method of induction."—"Novum Organum," Vol. 1, p. 105. The difference between the method used by Bacon, and the same method as used by Plato, was the fact that Bacon conducted it into the world of matter, and Plato directed it to the world of mind.

The final effort of Plato's Dialectic was to ascend from the ideas of absolute truth, absolute beauty, absolute goodness, to the absolute being, in whom they all united. He went back to the Great Father of the universe to find the eternal model. The great object of inquiry among the philosophers of ancient Greece was to acquire a knowledge of the existence of a Supreme Being. Plato arose above the polytheism of his age to a knowledge of the existence of a Supreme Being. He was, doubtless, assisted in this by the traditions which all the Gentile nations preserved of the one true God. Paul recognized this light among the Pagans in the following language: "For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse." Rom. i., 20.

We wish to call attention to three arguments used by Plato to prove the existence of God. 1st. Beneath the changeable there is an unchangeable Being, who is the nurse and protector of the universe. 2nd. Beneath the phenomena of mind there is a permanent mind, who is the great rational Being, antedating and creating the universe. 3rd. Beyond all finite existences there is an Infinite Existence, the First Principle of all principles, the Ruler and Law-giver of the universe. Plato taught the absolute perfection of this Infinite Being, that He is the fountain of all law and justice; the Beginning and End of all things. The Divine beauty is the formal cause; the Divine power the efficient cause; and the Divine goodness the final cause of all existences.

LIFE'S ORBIT.

THOMAS MUNNELL.

WE all start out from the cradle. We first explore the nursery, the family room, the up-stairs and down-stairs, and then the little yard around our home. Having mastered all these situations, we undertake the neighborhood of wonders, and are agreeably surprised by its innumerable beauties.

> "Each object we beheld gave pleasure to our eyes,
> While Nature all our senses held in bonds of sweet surprise."

Then we canvassed the county and considered ourselves quite enterprising. Then the state, then all the states, and if still more ambitious we visit the East, and perhaps sail round the world.

We are now at our fortieth birthday, and if we are prone to reflection it may be tinged with sadness, for there is something pensive in the thought that we can no longer count ourselves on the young side of life—half through, at any rate—and although we do not then start downward as to strength and usefulness, there being a broad plateau of twenty years of undiminished vigor, still we have fairly reached our aphelion, and must begin our journey homeward. Forty-five soon comes round, and to the delicate amusement of our friends we begin to turn up the lamp and hold the book a little further off, without suspecting the need of a pair of specs. And when forced to use them we feel a little ashamed of it for a time. Then comes fifty with its iron gray, and you feel so strange when called grandpa, and people begin to call you "*Old* Mr. Jones." You don't thank them for calling you "old," and wonder why they can't have manners enough to call you simply Mr. Jones. Nor do you become reconciled to be called "old" much this side of seventy. You feel complimented when they say you are straight, active, and well preserved; but having entered the last ninety degrees of your orbit you have to acknowledge, to yourself at least, that your generation is slipping away from you, and that you are in the minority. If you are ambitious and slightly envious, this will be a silent aggravation to you, and if you are not a good thinker and not a well balanced mind, you'll feel just a little slighted when you are not brought to the front and counseled just as in former days. But you'll soon find out that they think you've had your day, and now ought to give up the world to the management of the new generation. But if you are wise you will cheerfully let the youngsters do the rough work of spring and summer, while you attend to the mellow and higher duties of the glorious autumn of life. And then if your life has been a good one

and true to the Lord, and if your aspiration has been "Nearer My God to Thee," you will have the honor of dying in Christ—dying, it is true, but dying *upwards*. Then when you shall have reached your perihelion, and got back to God from whence you started, you will not be required to describe the same old cycle again through time, but will stay "before the throne of God, and serve Him day and night in His Temple."

There is a great deal of cuteness and no little appropriateness manifested in that little chromo that represents three little chicks just coming out of their three little shells, with the words below—"Rooms to let." Your earthly life has been, and is, so closed in all around, and your longings so intense to know what is just beyond in the spiritual realms, that you sometimes are almost willing to "let" "the earthly house of this your tabernacle," knowing that

"There thou shalt walk in soft white light with kings and priests abroad,
And thou shalt summer high in bliss upon the hills of God."

No wonder that while "here in this body pent" we should greatly desire to know "what we shall be," for we can gather no hint of it except from the very inadequate symbols furnished by the physical world. Robes, crowns, mansions and trees of life are the best the Lord could do for us, and yet we are left somewhat like those subterranean children born in Siberian mines a quarter of a mile underground, and who have never seen the sun. Should their parents try to represent it they could do no better than to point to a miner's lamp and say, "The sun is a great lamp;" but how inadequate such a symbol of a luminary 800,000 miles in diameter and that floods a shell of space whose equator is far outside the orbit of Neptune. And when we say "the Lord God is a sun and a shield," we may understand that His light as far excels the center of our system as it outshines the Siberian lamp.

It does not follow that when we shall have completed our little orbit here—shortening our journeys from continents, and states, from the county to the old homestead and back to the little bed—that we'll never travel more, for Moses and Elias and many other heavenlies have visited this world, and possibly other worlds. And inasmuch as "things present and things to come—all are yours," it may be thought a proper thing to let you see the extent of your possessions; and if, as astronomers think, the Milky Way is but the edge view of our universe like the edge of two convex surfaces placed together, the Lord may some day give you a free pass around that rim of creation, and let you "take the whole idea in." And as such an organized "substantial entity" as a spiritual body may overcome both time and space, you may be able to sweep round that vast periphery in less time than was required for Paul to be caught up to the third heaven to hear those ineffable words. Even now your spirit is as quick as thought. Think of the morning star and you are there; think of Jupiter and you are there. But if the spirit in the future world is to be as much mightier than it is here as a spiritual body is mightier than a mortal body, it would be a small enterprise to take in the Galaxy, to count its stars and find the center around which they all revolve. And if to compass such an orbit as this should be found inadequate to the demands of your ever-expanding spiritual nature, you may some day at a single bound leap to the zenith and view all the thousands of nebular universes and at one broad glance see what you're worth, "for all things are yours."

Now, if all this, and a million times more, is ahead of us, we should not "despise the day of small things" here on earth, where we settle the question of character. Here we determine our direction, up or down, for billions and decillions of years to come. Of all simpletons, he is the simplest who "barters off eternity for time," and sells his birthright for a mess of pottage: for we are either to perish at death like the brute, or to live on through interminable cycles, through vigintillions of centuries. May we find no tangent from the orbit of a true life, nor wander off into darkness and "lose ourselves, or be cast away."

THE TUNING-FORK'S VIBRATIONS MEASURED.

BY CAPT. R. KELSO CARTER.

THE readers of THE MICROCOSM and SCIENTIFIC ARENA will remember the somewhat famous experiment, first performed by Dr. Hall, and afterward extended by the writer, by which it was estimated that the prong of a large tuning-fork, while sounding audibly, was only moving at the velocity of *one inch in two years*. The overwhelming effect of this report can easily be imagined, when every writer on acoustics has always agreed with Prof. Tyndal in believing that the fork "*swiftly advances*," and with Helmholtz, the great German acoustician, that the fork moves like a pendulum, "*only very much faster*."

During the many months which have elapsed since I last wrote for Dr. Hall's periodical I have often thought of that experiment, and desired to try it more accurately, especially as I was told that *Prof. Mayer* of Hoboken and *Prof. Stevens* of Brooklyn were at work to show that my calculation of the fork's decrease in motion was incorrect. The months have gone by until nearly two years have elapsed, and as yet nothing has appeared from either of the gentlemen mentioned, and I have been so pressed by other work as not to find time for experiments. But I have at last thoroughly tested the matter, and *recorded*, not estimated, rates of motion by *actual measurements*, and these measurements I now lay before the scientific world.

In my previous experiments I simply held a very fine scale (sixty parts to an inch) behind the vibrating fork, and roughly estimated the amplitude of the vibrations, after striking the fork heavily, then at the end of fifteen seconds, and at thirty seconds. An ordinary magnifier revealed slight motion at the end of forty-five seconds, but failed to show any at the end of a full minute. The rate of decrease appeared to be about one quarter during each fifteen seconds; at least it seemed safe to assume that much, with all allowances; and as the fork was plainly heard to sound at the end of four full minutes, the motion was easily calculated, it being one-sixteenth (the amount of the vibration immediately after being struck) multiplied sixteen times by one-fourth.

Now, we never pretended that this was exact; but simply claimed that it was sufficiently near the truth to show the frightful absurdities of the wave-theory under a very plain glass. But to-day I have the honor to furnish numbers that are as nearly precise as the possibilities will allow. Here are the details.

The same fork was used—a Koenig C^3 of 256 vibrations. I secured a sharp steel pin to one prong near the end, and then drew this pin, while the fork was vibrating, across the surface of pieces of smoked glass. I thus secured a number of wavy lines, some very sinuous to the naked eye as when the fork was first struck, others very faint as when the fork had been sounding some time, showing the waves only under a strong glass. This method of securing traces of a fork's vibrations is well known, and will be found in most books on acoustics. But no one ever before measured these vibrations with an eye to testing the truth of the wave-theory.

From a number of exceedingly careful measurements, made with one of the best Powell & Leland microscopes in the United States, using a filar micrometer that shows 1-100,000th of an inch, I obtained the following results from a number of experiments:

After striking,	amplitude,	- -	1-20 inch
" 15 sec.	"	- - -	1-100 "
" 30 sec.	"	slightly over	1-200 "
" 45 sec.	"	over - -	1-400 "
" 60 sec.	"	about -	1-900 "

The greatest care was used to strike the fork each time with the same force, and in the same way; and a number of experiments were tried, and the lines traced and patiently measured under the microscope.

The numbers given are *certainly* a tritle in excess for this particular fork, so that any calculation made upon them is absolutely within the limits of truth.

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* making the trace upon the glass, though much of its vibration was checked in making it. The amplitude measured was 1-17,000 of an inch, which is precise to at least 2-100,000.

Now this fork makes 256 full swings in one second; hence we have for the actual distance traveled in one second 256-17,000, or 1-66 of one inch. This is equal to nearly 5 1-2 inches an hour, or to just 11 feet in twenty-four hours. A regular seconds' pendulum, 39 inches long, swinging through an arc of 10 degress, acquires a velocity at the center of just 6-8 inches per second, which is 74 times swifter than the above accurately measured fork motion, instead of very much slower, as held by Helmholtz, and all other authorities in acoustics. *Remember this fork was still sounding audibly, after recording this microscopic measurement.*

From the general rate of decrease which may be fairly assumed from the five numbers I have first given, we might run the calculation down through the four full minutes during which my Koenig fork will sound, and the result would be $\frac{1}{100} \times (\frac{1}{4})^{12}$, or something less than 1-4,000,000 of an inch for the amplitude. And this would amount to about one *inch in a month and a half*, or a velocity of *eight inches in a year*. But there is no use in this, as it is not needed. The actually measured 1-17,000 of an inch, giving a velocity of only 5 1-2 inches in a whole hour, utterly breaks the record of any snail that has ever crawled since Noah's flood, and shows the wave-theory to be in error by the difference between 1-66 of an inch prong velocity per second, and 1,120 feet a second for the air-wave sent off.

Undoubtedly, the fork prong moves somewhat more swiftly in the middle of its swing than its average velocity; but this so manifestly will fail to come within a thousand miles of meeting the difficulty, that it is entirely unnecessary to go into further calculations.

Finally let the objector note that *no time whatever* is consumed in the stops and starts of the prong. A pendulum, a swinging prong, and a stone rising in the air and turning to fall again, do not consume any time in the act of turning. A theoretical zero mark exists as the *point in time* where the change of direction is made; but no *period of time* whatever is occupied, as the circular or conical pendulum demonstrates. If this be not true the necessity arises for explaining what supports the stone and pendulum against gravity, and the prong against the elasticity of the steel, *while this stop* occurs. I give this record to the world as the most exact and conclusive objection to the wave-theory of sound from actual measurement

yet offered. If the pendulum of a clock cannot condense the air, owing to its slow movement, but merely displaces it, allowing the air in front to slip around to the right and left and take its place behind, as both Prof. Tyndall and Prof. Stokes tell us, surely the prong of a fork, moving thousands of times slower, must send off sound-pulses constituted of something besides "condensations and rarefactions" of the air.

Pa. Military Academy.

EVOLUTION, GROWTH, DEVELOPMENT.

BY REV. A. D. POTTS, A. M.

THE thinking world has been so wonderfully exercised with the consideration of the theory of evolution in its modern scientific relations that to endeavor to harmonize the different and antagonistic views would be a herculean task, and one too gigantic for a limited article like the present. It cannot be denied that some of the exponents of *causative* evolution have, by their extravagant and elastic methods, evolved themselves entirely out of the respect of conscientious and Christian men. Whether, according to the ideas of some such scientific minds, the evolved individuals can by a process of degeneration return to the sphere of respect and confidence is a mooted question. In a word, I can see no ground for the toleration of evolution as it is embraced by many philosophic minds of to-day.

And while the word constitutes the first part of my caption to the present article it must be remembered that I have no sympathy whatever for the latitudinarianism governing the treatment of the isolated word in its application to a special theory. Indeed, wherever it may be necessary to use the word at all in our present discussion it will be with the express understanding that I accept it with marked qualifications.

To distinguish it from the other words accompanying it in our subject would give an authoritative definition of it so that no commingling with the false may take place. Webster defines the word thus in a general sense: "The act of unfolding or unrolling; hence, in the process of growth, development; as the *evolution* of a flower from a bud, or an animal from an egg."

In a physiological sense the same author gives the following definition: "That mode of generation in which the germ is held to pre-exist in the parent, and its parts to be developed, but not actually formed, by the procreative act." Such evolution attempts no phase of creation, but simply refers to the process according to which certain lawful changes take place.

Let us see what the same lexicographer has to say about growth.

His definition is this: "The process of growing; the gradual increase of animal and vegetable bodies; the development from a seed, germ, or root, to full size or maturity."

Now let us view the word development in the light of the same author.

He speaks thus: "Gradual advancement or growth through a series of progressive changes."

In all the definitions given we have not found anything but what could naturally be expected. The processes referred to give results in keeping with the original matter under consideration. The *evolution*, *growth* and *development* thus defined give us natural and legitimate products, and in no instance abnormal attendants, or huge monstrosities.

Thus, then, when we speak of evolution we do not mean any other evolution than that which is governed by subjective and well established laws. Without challenging discussion, or inviting criticism, I use the word as serving the purpose intended—namely, to show how gradual and successive are the stages of growth and development in the case of those things concerning whose legitimate and true origin there is not room for even the shadow of doubt and perplexity. Any other evolution strives to erect a philosophy subversive of justice and right. That evolution which intimates that it has within itself, in its intricate mechanism, the power to create the developing germ must necessarily antagonize itself to the best thinking of honest men of every age, and finally undermine the foundation which its own false hands have laid.

Some such evolution has exhibited itself in the theory that man in his present state is the result of successive unfoldings from a lower type of being than now attaches to him or distinguishes him as man.

The prince of this theory, before entering upon the particular consideration of the "bodily structure of man," says, "we will first see how far the bodily structure of man shows traces, more or less plain, of his descent from some lower form." And this determination, from the very beginning of the study of man, sets itself up most insultingly against the teachings of the Bible concerning man's origin.

Darwin holds that man was the *reflection* of the *imperfect*, while the Bible expressly and clearly teaches that man was the *reflection* of the *perfect*.

Darwin's theory conflicts with the Bible statement from the fact that his evolutionary process only sets forth man, as man, after quite a duration of time, while the Bible strikes this ill-fledged teaching with a deadly and intelligent blow when it speaks of man, as man, at once. Darwin would read in his formulated book of Genesis, or Biology, that God made the orang, and that the orang in turn made man. Moses, in the accepted language of the real book bearing the name Genesis, says that God made man.

Not only so, but he states emphatically that God "created man in his own image, in the image of God created he him; male and female created he them." Not only did God create man, but he said "let them have dominion over the fish of the sea, and the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." This language is so definite and clear that no misconception can possibly arise as to the exact nature and peculiar make-up of man at his beginning to exist upon the earth. Darwin would have us believe that God was compelled to make a particular being of lower type than man, in order that man as such might stand forth in the habiliment of manliness. There is no need of our entering into an elaborate treatise on the nature of man's image of and likeness to God in this connection, as all candid Bible readers and scholars are ready to admit that man's image of and likeness to God were bound up in man's original righteousness. That man had this original righteousness as soon as he was created none will attempt to deny. 'Tis true that the defenders of Darwinian Evolution will contend that this original righteousness had reference to man's holiness, his morality, and his spirituality, and not to his animal or bodily structure.

But they dare not forget that, if the *imperfect germinal orang* evolved the *perfect physical* man, it was possible for the same unseen and inherent excellence to also evolve the higher and holier instincts, the more sensitive and refined qualities, the purer and more righteous properties of the immortal part of man. That man once possessed original righteousness in its primal purity and power must be admitted. That man, through willful disobedience and downright sin, lost that original righteousness, all consistent persons must acknowledge. Such being granted, are we to believe that man, then, was in the proper condition to degenerate into the prototype which his evolutionistic friends claim to be his origin? Henry Drummond, a celebrated English writer, in his treatise on "Natural Law in the Spiritual World," holds that that which ceases to develop, deteriorates or degenerates.

If such reasoning is correct under all circumstances, then it would appear that man should have returned to his kindred.

But turning our attention to the Bible account of man's beginning we find no proof that man was evolved. On the other hand, we find that he was made, and the material out of which his physical or bodily organism was made is well defined.

The Divine Record says, "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul."

Here it is distinctly stated that God did the work; that God breathed the life, and not the orang, or any rough evolutionistic prototype. If man was not evolved, neither was woman. She too was made or created from the rib taken from Adam's side. While the rib was taken from a living, intelligent, human being, still it did not possess inherent and potentially alive germ matter, independent of supernatural predisposition and formative power. We verily believe that the rib thus taken, if left untouched by Deity, would have *forever refused* to produce another human being. The whole transaction was a profound mystery, and the result nothing short of a miracle.

And here it may be stated that there is a vast difference between evolution as a *producing, creating* cause, and evolution as a *principle* of progress. The modern scientific evolutionist starts with the orang and endeavors to prove that by care, oversight, fine corresponding forces, necessary attendants, the orang *evolved* and *evolved* until man—the first man I suppose—was produced.

If such be true what caused the original progenitor to abandon its accustomed and glorious (?) work? If it did not cease to thus produce, where, in this habitable world, is the manufacturing process being conducted? If it has ceased, when? and why? The misleading theory puts the potency to evolve certain results into certain receptive causes, and thus teaches that these causes without limitation, or aught else, are able to produce things very different in form, degree and responsibility from the original. Let us test this by a common illustration. Take an egg for instance. In the vitalized or fertile egg we have potentiality.

But will that potentiality develop into the moving, feathered chick unless proper conditions are brought to bear upon the structural arrangement of the egg compound?

Suppose you place the egg in cold water for three weeks instead of under a hen or in an incubator, will you get a chick? How comes it that there is no evolved chick since there was potential matter in the egg? Does the hen or the incubator put potentiality into the egg, or do they simply lend to the unfolding of that power? Is it simply the fact that it is a hen, or an incubator, that the result is a chick? Or is it because these have a certain something relative to them that is necessary to the developing process? How came the potential germ-matter to exist in the egg at all? Was the egg simply an egg laid by a hen altogether removed from her male companion? Was the egg evolved by a hen or by the incubator? Certainly not by the incubator, for it possessed no potential germ-matter. What conclusion, then, do we reach if not this: that the egg from which the chick was evolved was once fertilized by the coition act of the birds?

It is not argued that the birds, even in their sexual contact, formed the germ that was afterward, under proper and natural circumstances, developed into the chick.

That the birds could have produced any

other result would be to say that there is no law of kind.

What I mean is this: that the simple coition act of the birds did not create the germinal matter in the egg in the sense that had they been so disposed they could have caused the development of a creature very different from their own kind. The conclusion I wish to reach is this: that according to the peculiar producing power with which the first birds of their kind were endowed, it could not be otherwise than that the result should harmonize completely with the designed law of their being, as that law was given to the special class of birds by their original Creator when He said, "Let the waters bring forth abundantly the moving creature that hath life, and the fowl that may fly above the earth, . . . and let the fowl multiply in the earth, . . . and every winged fowl after his kind."

And the same law governs to-day in the animal kingdom. Where changes take place or improvement is made there is no ground for modern evolution as a scientific, special theory. Change or improvement is not evolution in the strict sense of language.

To illustrate this point let me instance the case of color. Mixing various colors together does not evolve, in a *creative sense*, a new color.

The process simply changes the properties that have been invisible under ordinary and isolated circumstances.

The mixing in no way annihilates the former separate colors.

In fact the quantity, taking colors in the sense of mineral paints, is not lessened, but augmented.

Correspondences will develop reciprocal changes. And this thought leads me to cite the case of the grain of wheat in the hand of the mummy. If the germ contains matter potentially alive, why don't it evolve a stalk under such circumstances? We find no such evolution there.

But take that wheat grain and plant it in the necessary ground and note the result. Then and there we have unfolding, development and growth. Was it simply because the germ was alive? or was it due to the fact that the grain was placed in contact with an environment suited to its nature and capabilities? We have found that the same grain will grow under certain circumstances and lie inoperative or dormant for thousands of years under other circumstances.

But will it evolve, grow or develop, in a true sense, except when placed in juxtaposition to its correlate surroundings? And when placed in the ground are we to believe that the ground possesses, *per se*, the fructifying qualities necessary to give us a result of which the grain is capable? Is not the ground dependent upon some other causes outside of itself for its imparting qualities? Are not sunshine, rain, day and night needed to keep the ground in its nurturing condition? And whence these natural laws and concomitants? They have, yea, must have a first cause, and that cause can be none other than God.

In our whole observation of men and things we have found that God permits and requires all natural and ordinary things to come to their desired perfection according to natural and normal laws.

If this be true with respect to things in the natural world it must be admitted that God is no less the God of order and principle when we take into account the conditions, growth, and development of things in the spiritual world.

Accepting such facts, I am ready to say that I do not believe in a *creative* or *causative* evolution—an evolution *self-generating* in the finite and natural world, but that I do believe in a *created* evolution, an evolution involving an unfolding principle or property which is guided and energized by a law enforced by the power of the infinite Creator of all useful things.

Evolution, in its *proper* and *restricted* sense, is as much a principle under certain laws formulated and executed by God as growth and development. Being thus circumscribed, evolution, like growth and development, subserves the purpose intended, and works out, as it were, the designed and natural result.

As the evolutionary beginning of a certain something is controlled by fixed and sensible laws, so also is the evolutionary ending of that something governed by definite laws. For instance, in the unfolding of the plant bud we have *created* evolution, growth, and development, until the flower has opened and beautified according to the law of its nature. Were it not so, evolution, growth and development would necessitate unfolding and beautifying processes until the world would cease to be large enough to contain the result, or time too short to chronicle the continuous unrolling feature. The same aspect will hold good with respect to man.

The boy becomes a man, all other things being equal, by *lawful* evolution, growth and development.

The boy does not, however, evolve the man in the sense that the boy causes or creates the full-grown man. Man, physically and mentally considered, is the legitimate result of the developed boy. Were evolution, growth and development unrestricted by well-defined and rational laws, laws under the control of divine wisdom, the boy would continue in the process of growing and developing until there would be but one giant man in the world, and that man fill the whole earth. God wisely prescribed the limits to all things right and good, and hence no fatuity governs any of His creations.

If we enter the realm of mental activity we find this truth plainly verified. It is a well-known fact that study, application, and knowledge enlarge and invigorate the finite mind But were the limit to this improvement indefinite or unknowable we might reason that man could and should advance mentally in this world until he had arrived at an equality in this respect with God Himself. The history of mankind proves that such a condition was never, in the sense defined to attach to the range of the finite mind. The Bible, in its best construction placed on the mind's ability, never hinted at such a possibility. The only time such a view entered the mind of the human was when the devil, in his fiendish subtlety, tried to make our first parents believe that it was their duty to be as wise as God himself.

The most sensible solution to the whole problem is this: That God made all things to occupy places according to their natures, and beyond this these things cannot, and have no right to go. All this does not limit or hamper Divine Wisdom and Omnipotence, but when rightly viewed, augments the sovereignty and goodness of God. When I began this article it was my intention to show the legitimacy and feasibility of using the terms *evolution*, *growth*, and *development* in the consideration of man's spiritual surroundings and claims, but in order to set forth properly the use of the same when considering man's natural relations, I discovered that so much time had been consumed, and that so much space will be required, that I deem it prudent to take up the subject from a spiritual stand-point in my next discussion.

PLEASANT UNITY, Pa.

ROBERT G. INGERSOLL.

BY P. OSCAR JENKINS, M. D.

THE distinguished lecturer and orator whose name heads this article, and which name at once associates a distinctive character and history, has put forth some radical and aggressive views regarding the existence of a God, and the future existence of man. Whether Mr. Ingersoll's negations of these facts are to be considered as *fixed* with him or not, they unmistakably place him, until modified, upon the plane of materialism. And while it must be conceded that he has the right to entertain and promulgate his views, it must, also, be conceded, that others have the right to take exceptions to them. Many have already done this, but generally in a spirit of dogmatism and intolerance. Mr. Ingersoll is evidently no "man of straw" for an antagonist, and he who regards him so, does not *know* the man, or is a bigoted and ignorant egotist. In taking issue with this distinguished gentleman, it is no part of the writer's design to serve any party, church or creed, but to act from the love of truth *per se*, and from a deep sense of duty and obligation toward a common humanity. In the discharge of this duty and obligation, Mr. Ingersoll will be treated with that fairness and consideration due to his acknowledged abilities and generous nature. While the so-called Christian world is *over* credulous on religious questions—which require for the independent investigator *evidence in fact* sufficient to inspire belief—may not the opposite party, or anti-Christian, be found on the other extreme? and may not *Mr. Ingersoll* be *implicated* in this? That this bold thinker should ignore the Bible as competent authority to settle the question of the existence of a God, and of the immortality or future life of man, is not singular; but that he should indulge in *specious* reasoning to prove his position, only shows that he *feels* that his views on these questions are not invulnerable; and that they *are* not only vulnerable, but absolutely erroneous, I propose to show. Mr. Ingersoll assumes that Matter and Force constitute all the God there is, and that mind or thought is only force, and can only act through or within a brain. Now if this postulate be correct, it offers a complete annulity to the fact of the existence of a God, and of man's future life as well. This, in plain logic, is an unavoidable conclusion. Mr. Ingersoll further assumes that Matter and Force are co-eternal and eternally *co operative* as the sole factors of all life and being in the universe, and that there is no cause in its vast realm that is superior to them. Now to test the truth of these postulates, we shall institute an inquiry as far as comes within the power of our reason, into the *constitution*, *functions*, and *possibilities* of this *assumed* dual power. First, then, we ask, *what is* matter in its constitution and being? After disposing of this initiatory question, the others named will follow.

Matter in its general sense, is defined to be substance—or the "substance of which bodies are formed"—but this is too general; we find in our inquiries, that by a synthetical process ever found operating in the great Laboratory of Nature, that *all* forms of matter are made up of gases—of these gases as to *kind*, we take cognizance, as the *constituents* of the bodies or matter formed of them—but here we are suddenly brought to a pause, and find ourselves at the *Ultima Thule* of our powers of further investigation of them, for they resist all appliances for their analysis, being found to be the *elements* or *ultimates* of their forms, and are absolutely *indivisable!* Thus we see that at the very threshold of our inquiries, we reach the *limits* of our possible knowledge of them. If, then, we have no solution for the mysterious existence of *matter*, which in its varied forms is so tangible

Continued on page 172.

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THE SUBSTANTIAL PHILOSOPHY.

BY THE EDITOR.

THE announcement of a new system of philosophy at any past period in the world's history, might well have been looked upon as an act of presumption on the part of the claimed founder thereof; but the public announcement of such a system of novel and original philosophical doctrine, based upon fundamental principles of natural law which had escaped the attention of all former investigators, especially at this advanced age of refined literary culture, marvelous scientific discovery, profound philosophical research, startling mechanical achievement, and ennobling Christian thought, can hardly fail to be regarded as an act of excessive assurance if not almost of public effrontery.

We frankly admit at the threshold of this discussion, charged as we are with being a setter-forth of strange philosophical gods, in the shape of mischievous and intolerable scientific innovations, that we should shrink utterly from the task before us did we not, from careful investigation and study, feel an abiding conviction that *Substantialism*, as this philosophy is more commonly termed, fills a place in the domain of human research not hitherto occupied by any other system of philosophical belief. Did we not, in fact, entertain an ineradicable assurance that the basic principles of this claimed philosophy involve elements of physical science as novel and revolutionary as we believe them to be important to the world, this paper would not have been prepared for this occasion. Let those, therefore, who shall hear or read the statements, propositions, and arguments to follow, judge for themselves whether or not Substantialism rests on a foundation novel enough, broad enough, fundamental enough, and true enough to entitle it to a place and a standing among the philosophies of the world.

What, then, is the Substantial Philosophy? This is by no means a trivial question, viewing the whole subject involved from the standpoint which we occupy, so ramifying and far-reaching do we regard its elementary principles and their legitimate outgrowths. Hence, it will be totally impossible in a single paper, much as we might desire it, more than briefly to state these principles, with a very few specimen facts and natural phenomena upon which they are based, leaving their more complete elaboration and application to our various publications on the subject.

Concisely defined, the Substantial Philosophy is a system of scientific, philosophical, and, in its ultimate bearing, religious teaching, growing legitimately out of one single broad and basic principle of science never before taught, namely, that every force or phenomena-producing cause in nature, by which any sensuous or other observed effect can be produced, must, in the very necessity of things, be a substantial entity or objective reality; and, consequently, that light, heat, sound, electricity, magnetism, cohesion, and gravitation are as intrinsically and as really substantial entities as are the physical sources from whence they emanate, or as are the material bodies which they affect. This is the basic element of the Substantial Philosophy, and it is the chief corner stone upon, and over, and around which the superstructure of Substantialism has been reared, and is now being formulated and wrought into presentable shape. In thus assuming the physical forces to be substantial entities, this philosophy is scrupulously careful on all occasions to keep up the distinction which must exist between *material* and *immaterial* substances as the natural causes of all physical, as well as vital and mental, phenomena, a distinction admittedly new to the Substantial Philosophy, as will be fully elaborated further on.

Of course this broad statement of physical law flatly antagonizes much of the current doctrines as set forth in our scientific and philosophical text-books, and much of the scholasticism taught in the schools and colleges of the world. Such a broad law as the basis of a Substantial Philosophy also necessarily repudiates the idea that force in any of its forms, or that any sensation-producing cause, can be a mere mode of motion; that is to say, it totally denies that any phenomena-producing or sensation-producing cause in nature can consist of the mere motions of material particles of air, ether, or anything else, as our text-books tell us with reference to several of the recognized natural forces.

The new philosophy, on the contrary, maintains that the mere *motion* of a body, whatever may be its size, is the phenomenal effect of some substantial and extrinsic force as its cause, and hence the assumption that the motions of air-waves constitute sound in its external or physical sense, while the force which must of necessity accompany such waves as their cause, to keep up their condensations and rarefactions, is *nothing*, is too great an error to be entertained for one moment by an intelligent investigator of physical phenomena. Hence Substantialism lays down this proposition as one of its basic principles, that motion, *per se*, as the effect of some form of force as its cause, is intrinsically *nothing* and can produce no mechanical effect whatever, just as a shadow is nothing except the phenomenal effect of the substantial force of light as its cause. Motion, therefore, according to this, is a mere changing of the position of a body or substance in space, and since position, *per se*, is nothing, whether at rest or changing, being pure space, just as shadow is nothing, whether moving or at rest, motion is, therefore, demonstrated to be a nonentity, since motion, of whatever character, had no existence before the moving body commenced changing position, and manifestly, as all will admit, must cease to exist as soon as the moving body comes to rest, a fact which cannot be predicated of any substantial entity, however tenuous or intangible it may be to our sensuous observation.

Such is the fundamantal conception and definition of all motion according to the Substantial Philosophy, which conception and definition are regarded as lying at the very foundation of all true scientific or philosophical knowledge, and a radical misconception of which has led to every error concerning the nature of force now taught as physical science. This radical view of motion, as a mere phenomenon of some substance, whether visible or invisible, whether corporeal or incorporeal, and not in any possible sense as a force, or as an entity or objective thing, disposes at a single stroke of all the so-called modes of motion as taught in physics, such as those of sound, light, heat, electricity, magnetism, etc., a fact which will more fully appear as the unfoldment of this new philosophy advances.*

And now, before entering into this detailed unfoldment, and the physical proofs we have to offer, that every force of nature, *per se*, is and must be a substantial entity, even including sound, light, heat, etc., let us devote a few minutes to a pertinent digression most suitable to an Institute of Christian Philosophy, assuming, as we will have to do for the instant, that Substantialism is the only true philosophy in the realm of physics, and that every form of natural force—physical, vital, mental, and spiritual—is a real substantial entity. We aim, by the digression which we are about to make, to impress every mind present with the absolute necessity for just such a system of philosophy as here outlined, as well as the unavoidable necessity for its immediate acceptance and application by Christian philosophers, unless they are prepared to depend exclusively upon revelation as proof of a hereafter for humanity, and thus abandon into the hands of materialists all the analogies of nature, as well as all other scientific and philosophical evidence claimed for the truth of religion.

From the latest treatises on natural philosophy and physical science familiar to all well-read students, we gather the impression that *motion* is considered almost everything in the physical, vital, and mental economy; that it really constitutes *force*, and is the cause of the various phenomena of nature, as well as of the sensations produced in our consciousness. These various authoritative writers, many of whose works are standard text-books in our schools, tell us that sound, light, heat, magnetism, gravity, and electricity are but modes of motion of material molecules, in various degrees of attenuation, and that such motions are thus causes of the various phenomena and sensuous effects observed, while Profs. Haeckel, Huxley and other advanced scientific thinkers of the old world, seizing upon this universal *motion*-doctrine concerning the physical forces also carry it naturally, logically, and irresistibly into the realm of vital, mental, and spiritual phenomena. These scientists contend boldly and defiantly from such motion-data of the schools that the life-force, mind-force, and physic-force of human beings, on which religionists base their hope of immortality, are but other natural modes of motion of the material molecules of the brain and nerves; or in other words that the life, soul, mind and spirit consist of the intermingling of the smallest conceivable particles of such brain and nerve matter, vibrating, as supposed, in a varied and complex manner, etc. Hence it is now the boast of German atheists and materialists that if the doctrine of the physical forces, or phenomena-producing causes, as taught in our Christian colleges throughout the world be true, that is to say, if sound-force, light-force, heat-force, etc., be but the motions of air and ether-particles, which motions necessarily cease to exist the instant the moving air-particles and ether-

* This paper was read before the American Institute of Christian Philosophy, in this city, by the Editor, on the evening of Feb. 3, 1887.

* Persons desiring to see this view of *motion*, as contradistinguished from *force*, more fully elaborated than was possible in this paper, will find it in the leading editorial of last month's ARENA, on "Motion, Matter, Force, Energy," p. 153.

particles come to rest, then manifestly, and by every principle of logic, the soul-force, mind-force and spirit-force of human beings, which exhibit analogous phenomena in nature, being only a similar complex motion of brain and nerve matter, must also cease to exist at death when these brain and nerve molecules cease to vibrate.

Prof. Tyndall, in his latest writings, tells us, and he surely ought to know what modern science teaches, that sound-force, light-force and heat-force consist exclusively of the *motions* of air and ether waves. Some may be disposed to doubt this, but here is a single extract which will put the question to rest:

"When I say of *motion* that it is the genius of which *heat* is a species, I would be understood to mean, not that heat generates motion, or that motion generates heat (though both are true in certain cases), *but that heat itself, its essence and quiddity*, IS MOTION AND NOTHING ELSE."

(Tyndall's "Heat as a Mode of Motion," edition of 1883, page 49.)

Thus Prof. Haeckel had an unimpeachable basis in the accepted doctrines of physical science upon which to found his materialistic doctrine that the soul, being but the *motions* of brain, molecules must of necessity cease to exist at death, and against which no believer in the modern mode-of-motion theories of science dared to rise up.

This legitimate application of the analogies of science to our vital, mental, and spiritual phenomena, appalling though it be to Christian philosophers, is most logically and invincibly maintained by Prof. Haeckel of the University of Jena, in his "History of Creation," "Evolution of Man," and other writings, as an unavoidable deduction from the teachings of our religious colleges everywhere, insisting as he does, that just as sure as sound, light, and heat are but the *motions* of material air and ether particles, and not themselves substantial forces, such motions ceasing to exist as soon as such air and ether particles cease to vibrate, just so surely will the soul, mind, life, and spirit, as corresponding phenomena of material brain and nerve molecules, cease to exist at death when these brain and nerve particles shall cease to move.

This bold and aggressive materialist of Jena triumphantly asks, without any Christian professor of physics daring to controvert him, cannot vital and mental phenomena as readily result from the complex motions of material brain and nerve molecules, and without mind or life being anything substantial, as can the phenomena of light and sound result from the motions of material air and ether molecules without either of them being a substantial force? And if these *motions* of matter, called sound and light, have no existence whenever the vibrating air and ether particles come to rest, who, he sneeringly asks, dares to assert that the analogous phenomena of life and mind will not of necessity cease to exist at death when the brain and nerve matter no longer continues to vibrate? And if human mentality and activity can all result from the molecular vibration of matter, then the creative power of the universe, exhibiting like mentality, only on a larger scale, is but an extension of the same vibratory motion of material molecules, thereby dispensing with any necessity for a substantial and personal God! For surely, if man's vital, mental and physical powers are but modes of motion irresistibly deduced from the physical forces as similar modes of motion, it follows that God Himself is thereby resolved into an infinite mode of motion of the material molecules of the universe by the logical and necessary application of the scientific theories taught and advocated by every religious college in the world.

Most positively, if *heat*, as the motion of an all-pervading ether, "*and nothing else*," as Prof. Tyndall teaches, can make this whole earth a molten mass, as was once its condition, why, in the name of reason, could not mere "*motion* and nothing else" create the world in the first place, *and thus easily dispense with all necessity for a God?* Thus does Haeckel, by his logical and invincible application of the *motion*-theories, as taught and insisted on in our Christian colleges, ruthlessly wrench from the grasp of Christian philosophers, not only the immortality for which they hope, but the very personal God whom they "ignorantly worship."

We take the liberty of asserting here in the presence of the learned members of this Institute of Christian Philosophy, that no successful reply has ever yet been made by Christian scientists to this overwhelming analogical proof that there is no God, and that death ends all as shown by Haeckel to be the legitimate fruits of modern science, nor is it possible, in our judgment, to frame any such reply that will have the weight of a feather against materialism except by the total abandonment of the whole curriculum of modern scholasticism as relates to force, including the present theories of sound, light, and heat as modes of motion. We repeat, and without boasting, that no answer has ever been given or even attempted to this paralyzing argument of Prof. Haeckel, until the whole thing was exploded and swept from the board by the revolutionary doctrine of Substantialism which so clearly shows sound, light, and heat, along with other forms of physical force, to be real substantial but immaterial causes in nature, thus proving by analogy the most invincible that life-force, mind-force, and spirit-force are likewise necessarily substantial but immaterial entities, and which, by the law of the conservation of the forces, can never cease to exist or be annihilated.

How important, then, is the Substantial Philosophy, if it be true, in thus meeting and wiping out this single phase of materialism, thereby reconciling science and religion, even if its mission had ended here! But we trust that this audience will see that this is but the beginning of its missionary work.

Now to those present, who have received a scientific education in our regular college courses, and whose attentions have here for the first time been called to the absolute irreconcilability of the motion-theories of science with the existence of a God, or with the future substantial existence of the soul, we say, in all kindness, advocate if you will the wave-theory of sound or the undulatory theories of light and heat, out of regard for the great authorities who framed them, or out of love for respectability in our institutions of learning, but so surely as logic means anything, you will be forced to the wall of materialism and compelled to accept Prof. Haeckel's undulatory theory of life, mind, soul, spirit, and even God himself as but the motions of material particles placed together and vibrating, as he expresses it, "in a complex and most varied manner." Nothing, we may add, and with all the emphasis that our language may command, can save the religious world from the withering effects of Haeckel's materialistic logic but an unreserved acceptance of the principles of Substantialism, which claim, and as we believe effectually, to break down all such superficial reasoning and deductions, by shattering their very foundations, as laid in the present teachings of physical science. Substantialism does this by adducing the most direct and positive proofs that no sensuous or other effect in nature can exist without a substantial cause, either material or immaterial, and that instead of sound, light, and heat being modes of motion of material particles, as the materialistic basis of the vibration theory of life, mind, and spirit, as taught by Haeckel, the new philosophy shows them to be real objective entities, and thus the substantial but immaterial causes of the phenomena produced and observed as their effects.*

A practical demonstration of the unanswerable character of Prof. Haeckel's materialistic reasoning in favor of the vibratory doctrine of the human soul or his theory of vitality and mentality as modes of motion, was given some years since by the distinguished lecturer, Joseph Cook, than whom no more profound reasoner against materialistic objections to personal immortality exists. Mr. Cook, in one of his lectures, came directly upon this phase of Prof. Haeckel's objections to the possible existence of the soul after death, and being an educated, scientific man, and consequently a believer in the universally accepted mode-of-motion theories of sound, light, and heat, he found himself unexpectedly, but absolutely, balked in the presence of the difficulty as presented by Prof. Haeckel as we first quoted and pointed it out in the "Problem of Human Life," at pages 71 and 72. This signal failure, on the part of so eminent a Christian philosopher and scholar, to answer this serious analogical objection to religion and to a belief in the immortality of the soul, was naturally to have been expected under the prevailing doctrines of the schools concerning the non-entitative nature of the physical forces. Until Substantialism had prepared the way for the overturn of this materialistic wave-theory of life, mind and spirit, and this mode-of-motion doctrine of the existence of God, by demonstrating that the wave-theories of sound, light, and heat were superficial fallacies of science, how could even as great a philosopher as the Boston lecturer be expected to reply to that shrewd materialist of Jena? Believing and avowing his conviction, as did Joseph Cook at that time, that sound, light, and heat were but the vibratory motions of material particles, as taught in all the schools, and in no sense substantial entities or forces, how could such a philosopher be expected to meet the assaults of Haeckel against the soul as an entity so consistently based on his vibratory theory of life, mind, and spirit established on the admitted analogies of the mode-of-motion theories of science?

We have been informed, however, that Mr. Cook now accepts Substantialism, and the new doctrine of force as an entity, as the only possible method of meeting the materialistic and atheistic theory of Haeckel, and that he stated in his late lecture at Cleveland, Ohio, that if the phenomenon-producing and sensation-producing causes in nature, such as sound, light, heat, etc., are not substantial forces, then the vital, mental and spiritual manifestations on which hinge the doctrine of a future life, must also go by the board as modes of motion of the vibrating molecules of the brain. So say we all, and so say all Substantialists, and so teaches the Substantial Philosophy from its alpha to its omega. And we may further add, that as soon as this substantial view of the physical forces shall prevail and Substantialism shall take its predestined place at the head of the scientific curriculum in our institutions of learning, it is confidently believed that materialism, as the arch enemy of the Christian religion, will disappear from the land, leaving the old religion and the new

* The objection has been urged since this paper was read that our language in this connection is too strong. That instead of assuming Substantialism to be the *only* possible means of meeting and wiping out the materialistic argument of Haeckel, it would be nearer the truth to call it *one* of the means. We reply, with all the emphasis we can put into our words, that Substantialism involves, as we firmly believe, the *only* possible escape from Haeckel's logic in favor of the utter annihilation of the soul at death. If any man thinks otherwise, and believes he can devise or imagine any other method of escape than by way of the Substantial Philosophy, *let him write it out concisely and send it to* THE ARENA, *and we will cheerfully print it.*—ED.

philosophy in peaceable possession of the field.

Having thus digressed and premised, by showing the necessity of something more than is now taught in our schools to counteract the growing tendencies of this age toward materialism, and to meet these hitherto unanswerable objections to a future conscious state of existence for man, let us proceed to a more detailed examination of this claimed universal system of philosophy which has been offered to the world and to the church as the fundamental antidote for such evils, and which, as its adherents believe, is destined, as it becomes known, to lift humanity to a higher plane of intellectual achievement and rational anticipation.

It was in the year eighteen seventy-four or five that our attention was called to the necessity of meeting materialism on its own ground, and either silencing its objections to religion in the manner as just set forth, or else publicly abandoning any substantial or rational hope of a future life based on the analogies of science. After studying carefully the mode-of-motion theories, as set forth in our text-books and as everywhere taught in our schools, and after trying in vain to reconcile them with the possible substantial nature of life, mind, soul, and spirit as a basis for belief in future immortality, we came to the most solemn, deliberate, and what we regarded as the most important conclusion of our life, namely, that either the soul, life, mind, and spirit were mere molecular phenomena, and consisted of the motions of brain and nerve-particles, as claimed by Haeckel and Huxley, precisely as sound consists of the motions of air-particles, and heat and light of the motions of ether-particles: or else that the whole range of physical science, as taught in our colleges, must be wrong from beginning to end, and therefore that it ought to be revolutionized and reconstructed at once.

Viewing the premises thus, what was the position to which we were driven? We saw at a glance that no middle ground could exist in any kind of force between mere *motion* and real *substance*, difficult as it seemed to be to make such phenomena-producing causes as sound, light, and heat, rank as substantial entities according to any definition of substance we had yet seen. Hence, as all the dictionaries of our language had been compiled and revised under the same materialistic influences of the colleges which now tolerate the teaching of the vibratory theories of sound, light, and heat, implying that there was nothing substantial in existence, except matter in some degree of attenuation, we were compelled at the very start to revise the definition of many scientific words, especially that of *substance*, and to assume that not only were material bodies substantial, but that every form of natural force, by which an observed effect can be produced, is also a real substantial though immaterial entity. Either this view must be adopted, or else that all the forces, including life, mind, soul, and spirit, must be regarded as but the phenomena of matter under molecular vibration, and therefore as mere motion, must, as the materialist urges, cease to exist whenever the vibrating particles come to rest.

There being thus no intermediate standing ground possible, it did not take us long to decide between the claims of materialism on the one hand, and the basic principles of Substantialism on the other, which, if builded at all, must be builded upon the ruins of the former. Having pitched our tent in the very center of this scientific arena, we by no means shut our eyes to the possibly bitter struggle that lay before us; nor did we fail to see in the distance the hosts of scientific and philosophical combatants, who would be only too glad, in defense of the old theory, to break a lance with the self-constituted champion of a claimed new philosophy, who should thus ruthlessly, if not recklessly, attempt to overturn, in a single monograph, a system of physical science which had taken the combined wisdom of the ages to formulate.

We therefore resolved to hasten leisurely, and to weigh well every cardinal position involved in the premises of the new departure before determining upon its invincibility, as well as upon its best methods of defense. We recognized the fact that if one single form of force, or if any one single sensation-producing cause in nature, could not be maintained successfully in this crusade against modern science as a substantial entity, and thereby be demonstrated as in no sense a mode of motion, we might as well surrender the struggle at the start, since one single acknowledged exception to the substantial category, such as *sound*, would virtually be equivalent to the loss of all, because this exception to the absolute substantial nature of force, *per se*, would be all that Haeckel and Huxley would ask as the coveted natural analogy, based on admitted scientific truth, to seize upon as their stronghold, and from which to hurl their materialistic thunderbolts to shatter the hope of immortality by the analogical proof thus established, namely, that life, mind, and spirit might just as rationally be regarded as different modes or manifestations of material phenomena, and in no sense substantial or objective entities, as could sound phenomena be thus regarded.

It was thus *all* or *none* with Substantialism. How, then, in the name of congruity, could we consistently have left *sound* out of our substantial category of the natural forces, as we were advised to do by some prominent physicists, in order to avoid opposition, thereby making Substantialism more easy to accept? And how could we still have maintained the slightest show of logical consistency in trying to build up a universal system of Substantial Philosophy in the physical realm as the analogical basis for the substantial nature of life-force, mind-force, and spirit-force in the higher realm, thereby to break down the materialistic philosophy of the schools? We were therefore compelled by logic, and out of sheer necessity, to make our chief attack upon the wave-theory of sound as the battle-ground *par excellence* on which mode-of-motion theorists dared to risk the campaign, with the tacit understanding all round that if the current theory of acoustics, as the champion mode of motion in physical science, should break down, and sound should turn out to be a substantial force, it was wholly useless for physicists to lift a finger or utter a word further against the truth and universality of the claims of Substantialism.

[TO BE CONTINUED NEXT MONTH.]

DIFFICULTIES ON THE NATURE OF LIGHT.

BY PROF. ZERBE, OF HEIDELBERG COLLEGE.

Tiffin, Ohio, Feb. 19th, 1887.

Rev. J. I. Swander, D.D.

DEAR SIR AND BRO.,—During the time allowed by my work here I have re-read the more strictly scientific parts of your book, *i. e*, the parts on Sound, Light etc., and have compared the results with the commonly received theories. In many instances I find that what has been proved by the laws of mathematics as true, will remain unaffected on the basis of the new theory as well as on that of the old. So far then as these points are concerned the facts can be explained on the basis of Substantialism, as well as on any other. There are, however, a few points which give me difficulty.

1. How would you explain *refraction*? Under the old theory it has been well established *that the sines of the angles of incidence and refraction have a constant value for all inclinations.* With my present knowledge of Substantialism, I am not able to see that it explains the phenomena, whereas the old views offers an elucidation.

2. How would you account for the *colors of striated surfaces?* Thus, if a surface be ruled with fine parallel grooves, several thousand to the inch, it reflects bright colors, in fact, as we know, nearly all the colors of the spectrum are produced. How can this be explained?

3. How would you account for the colors exhibited by very thin lamina of transparent substances? For example, the colors formed in ice or glass, or the interstices between the layers of mica. Other familiar examples in physics are soap-bubbles blown very thin, and *Newton's rings.* I mention these points because if it can be shown that they can be explained on the basis of Substantialism, some great objections will be overcome. It cannot be denied, I think, that the commonly received theory furnishes an explanation. But it is possible that they can be explained with equal satisfaction on the other theory.

4. The most difficult subject of all is the polarization of light. I am aware from the difficulty which I always experienced in having my students grasp the subject, that it may be susceptible of explanation on the new theory as well as on the old, and yet that I may not fully understand the teachings of Substantialism on this point. Hence I ask for more *light* on this question of *light.* * * *

REPLY BY DR. SWANDER.

Prof. A. S. Zerbe, Ph. D., of Heidleberg College, Tiffin, Ohio, is ranked among the finest linguists in this country. For the purpose of perfecting his knowledge of the ancient languages by using them in conversation, he recently completed an extended tour through the Continent of Europe and the British Islands. After his return he wrote one of the most interesting books—"Europe Through American Eyes"—that it has ever been our privilege to read. Dr. Zerbe is also an earnest student of philosophy. He has read our book, "The Substantial Philosophy," and is now engaged in giving it a careful and thorough examination. To say that he is a Substantialist would be, at least, a premature assertion. He is, however, open-minded, and willing to give the claims of Substantialism a fair and earnest investigation. For this purpose he is now passing our book under a most searching and critical review. He reports favorably upon some points and submits some questions, as above, growing out of difficulties met with in other portions of the work. Let us now briefly notice these difficulties.

If Prof. Zerbe will accept and carefully keep in view the fundamental fact of Substantialism on this subject, as originally set forth by Dr. Hall in his "Problem of Human Life," that *light itself*, as an *immaterial* substance, is radiated from the luminous body in rapidly succeeding *pulses*, he will have no more difficulty in explaining the phenomena of *color*, *refraction*, *polarization*, etc., by means of such substantial pulses, than if he assume substantial pulses of another substance called *ether*.

Surely a pulse of substantial light itself ought to produce at least an equal and similar effect with that of a wave of substantial ether; and if the number of substantial ether-waves entering the eye in a given time determines or constitutes the *color* of such ray of light, we fail to see why an equal number of pulses of substantial light itself should not effect a similar color in the same ray.

Dr. Hall shows that in sound the *pitch* of tone (corresponding to *color* in light) results from a given number of substantial sound-pulses per second entering the ear, agreeing exactly with the number of vibrations of the

sounding instrument, and which is as readily grasped as if, instead of substantial sonorous pulses, or discharges of sound-force, we should substitute substantial air-waves, as the mode-of-motion theory inculcates. He also shows that these substantial *sound-pulses* likewise explain sympathetic vibration between two unison instruments just as well as if we supposed a corresponding number of air-waves to be sent off from one sounding instrument to start another into motion; while he points out in the same connection several facts which favor the idea of the pulses of sound itself as a substantial force as altogether more satisfactorily than the commonly supposed waves of air.

Now if Substantial *sound itself* radiating in pulses, will explain every sound-phenomenon even better than can air-waves (see Chap. X. of my book, Q. 21 and 22, with footnote) why should we need to resort to ether-waves for a solution of light-phenomena when we rationally have an equal number of Substantial light-pulses at hand to take their places?

We believe matter to be homogeneous throughout, minus *pores*, and that it is divisible into small particles or portions, but not at all composed of molecules and atoms widely separated from each other and continually in motion. And this being so, we see no objection to applying the same law to substantial light, sound, magnetism, &c. If *ether* is composed of molecules and atoms which vibrate in certain other directions as the light-waves move forward, in order to aid us in explaining polarization or any other light-phenomenon, it is just as easy to suppose the substantial light-pulse subject to the same conditions.

We verily belive, as the founder of Substantialism has repeatedly urged, that had Huygens caught the first glimpse of the Substantial Philosophy, by which *immaterial substance* is recognized as an entity, as real and objective as is matter itself, his fabricated ether would never have been heard of since, as there would have been not the slightest use for ether-waves in solving light-phenomena, when pulses of substantial but immaterial light-force itself would have accomplished the same result as well, to say the least, and thus have saved a good deal of unnecessary circumlocution.

It was only on account of Newton's irrational and impracticable theory of *material* light-corpuscles, that Huygens was led to invent ether-waves. But now, since both of those material theories have been superseded by the more perfect discovery of physical substances that are *immaterial*, let professors of physics at once renounce the old doctrine of force as but the vibratory motion of material molecules, and proceed to reconstruct their solutions of these physical phenomena on the more rational, harmonious, and consistent principles of Substantialism.

If Prof. Zerbe will take the *prism*, for example, as the simplest of all tests by which refraction of light is claimed to be explained on the principle of ether-waves, and instead of a pulse of ether substitute a pulse of immaterial light substance itself, we venture to predict that he will find the very same bending of the ray, and its reasons for so doing, as if it were a pulse of ether. If for any reason the problem cannot be solved and refraction explained as well by one as by the other, we shall be glad to know it after the experiment shall have been carefully made.

ROBERT G. INGERSOLL.

Continued from page 168.

to our senses, and reason halts at the very *beginning* of our investigations, we shall find that a *material* God, whether mono, dual, or triune, is as incomprehensible as is an immaterial one. Whatever there may be in a state of gestation in the womb of the great future for man to know above what he can now know, no prophetic vision or mathematical power can reach; but *we do* know from the plainest dictates of reason, that man will never transcend in knowledge the limits of his capacity. From the foregoing we see that in our investigation of matter in its *constitutional* being, we are found to be utterly unable to reach it! It is, in its ultimates and will *forever* be beyond us, as too closely allied to the great *infinitude* for our possible approach!

But what are the *functions* of matter? This inquiry is now in order. *Function* implies a *capability* of the functionary to perform from *its or his own capacity* certain duties, and such a functionary must of necessity have *intelligence;* otherwise the work done ostensibly *by*, would only be automatically done *through*, it or him, *as a medium* of another and *competent* power. *Is matter* endowed with this intelligence? *Will Mr. Ingersoll assume* that it is? But he must make out such a case to maintain the *integrity* or identity of his matter-and-force God. Up to this stage of our examination of matter, we have found no form of matter that we can, in its constitutional being, comprehend; nor have we found any use for matter as *within itself*, being capable of performing *any* function. Then we next inquire: What are the *possibilities* of matter? Has it any, *within itself?* If what we have shown of it as disconnected from powers working *on*, *by* or *through* it, is true (and *who* can *controvert* it?) the deduction is clear that, abstractly viewed, *it has none.* But we shall have occasion before we are through with this discussion to show the true sphere which matter occupies in universal creation. In the series of our inquiries we are now brought to the subject of force, as the *immaterial* principle, or element, of Mr. Ingersoll's God. But *what is* force? Is it an entity? The distinguished Dr. A. Wilford Hall avows that it is. But the question of force being purely a metaphysical one, we may not be able as yet to come to a common conclusion on this point. If it has a well-defined, constitutional being, as yet (*if ever* we will) we cannot approach it. But whether it has or not (and we do not say that *it has* not), it must be conceded that force is an occult power or property inherent in all physical, mental, and moral being. Force and its *effects* or manifestations, however, are very generally confounded—the effects or manifestations being taken for the cause. Force has no rest. It is ever manipulating the objects of its power in the degree—in normal conditions—exactly proportionate to their demands. By its active cohesive power it holds matter together. By the same power, differently and conversely manifested, it *disintegrates* it.

Its phenomena are as manifest in the mental and moral world as in the physical. It is the projector of thought from the mind and of love, and hate, and all the manifestations of the passions of the soul. But force is *not* a *co-ordinate* power of the mind, but a *subordinate* one, from which relation it never varies except in abnormal conditions of the body or mind, or both. Force *per se*, is not a functionary. It is controlled by a power *superior* to it, of which it is a faithful servant. Its functions then are, strictly speaking, *automatic.* It is—to use a figure of speech—the *manipulating* hand of soul-intelligence. In the flexion or extension of a muscle, there is force manifested; but this manifestation is due, firstly, to the intelligent *determination of the mind;* secondly, to the *will* formed *by* the mind; and lastly, to the power or force projected to the muscle by the will as the *proximate* cause. The *power* then peculiar to force is a *subordinate* one. The *possibilities* of force, then, live in its *higher* cause—the intelligent soul or mind.

So far, then, we see no *qualification* in either matter or force to exercise the functions of a great designer and creator. We find no evidence whatever that either matter or force are endowed with intelligence. And I need not insult common reason by stating—as though the information were *needed*—that creation is replete and *overwhelming* with evidence of supreme and infinite intelligence in its *designer and creator. Would Mr. Ingersoll* call upon an *idiot* to project and skillfully carry out any grand scheme? But he could attribute such capacity to the idiot as reasonably as he can to blind matter and force abstracted from the intelligence and power that moves and controls them. We find, then, that there is not a vestige of reason to support Mr. Ingersoll's theory on the matter and force, God or creator theory. The hypercritical investigator that requires *full* and *complete* evidence of the truth of every fact that is claimed to exist will find that he can *believe nothing!* And to reject the truth of the existence of God and of man's immortality because mystery may enshroud it, is puerile.

We have seen that matter *per se* can accomplish nothing—that, being passive, its sphere is not to *lead* and control, but to *be* led and *controlled*, or to be *used* as a necessary and noble servant of a superior existence, that of intelligence and force. We have seen also, that force, though possessed of (shall I say *delegated?*) powers to control matter, is also under a *superior* and *directing* power, the soul, or soul-intelligence—and that, *ergo*, it is a *subordinate* of a still higher power, and the whole question from the premises, resolves itself into the fact as a legitimate deduction, that matter and force instead of being the *creators* Mr. Ingersoll claims they are, are elements of being and of power which the INFINITE I AM or a SUPREME INTELLIGENCE has *used* in bringing into being the myriads of suns, worlds, systems of suns and worlds, with all their sublimity and grandeur, and the tenantry of all the inhabitable spheres that swim in Infinite Space. Who can—however veiled in mystery the fact—doubt the existence of a great infinitude, whom we call God? But we may further add that the existence of a supreme being above all matter and force is logically involved in the relation of cause and effect. And notwithstanding Mr. Ingersoll denies this (upon the assumption that there is an "endless chain of causes and effects," each effect becoming in its turn a cause *ad infinitum*, and that there can therefore be no one in the endless series that is supreme), in true logic it must be conceded that there must of *necessity* be a cause above the *highest* known or *conceivable* cause; and this cause we call God. Can any man reflect, and reason profoundly from the premises established in *necessity*, and come to any other conclusion? It is well that the fact of the existence of a God does not rest upon human reason to fathom it; for if it did, the fact could not exist. There are many facts existing in nature whose mysteries mock all our attempts at their comprehension, and *still they are* facts all the same. Who can grasp or comprehend the fact of the existence of infinite space? And yet who can *deny* its existence as a *necessity?*

If there were not a God or supreme and infinitely wise and Omnipotent Intelligence to preside over and control the universe, order could not exist, and nature, oppressed by its uncontrolled elements, would utter an expiring groan, and habilitate itself in the folds of an eternal oblivion! But now, we come to consider the question of man's future existence. Mr. Ingersoll's negation of this fact is clearly involved in the statement that we cannot conceive of thought except as produced within a brain. And if Mr. Ingersoll's views are correct, it follows, that when man dies, his conscious being is at once at an end; nor is the difficulty relieved in the *admission*

that "matter and force are eternal," for the brain which *was* the medium through which thought found expression—in its disintegration, and reduction to *other* forms, and for *other uses*—would attract and use forces suited to its *new relation;* and thought, if really dependent upon the brain for existence—and this thought be force—would no longer exist—the force which *had* been thought, being *necessarily* employed for *other* purposes. Thus man would become a *nonentity!* Mr. Ingersoll knows, as all do, that mind acts, and thought is put forth through the medium of a material brain; *but he does not know that it does not act in another life, independent* of a material brain. All to the contrary is mere assumption.

Mr. Ingersoll *does not know* all the *possibilities* of the mind or human soul, so mysterious in its constitution and occult forces; *and he does not know* that it cannot put forth its powers in a future and higher state of existence. We can no more comprehend the *ulterior* forces of the mind or soul in *this* than we can comprehend its possibilities in an immaterial or spiritual future existence. Because, therefore, we cannot *comprehend how* we can exist after earth-life ceases, is no sufficient reason for its denial. Let it be *remembered*, that nothing that *exists* can be destroyed; and while aggregated forms or compositions of matter change into new forms, or are resolved into their ultimates, we have no evidence that they ever have or ever *can* be destroyed. *Why*, then, should man's *conscious thinking* soul be an exception? *Why* should it be considered *inferior* to the monad? What evidence have we, in fact, that it *is* so? Any position that involves this, shows its fallacy upon the face of it. *But perhaps matter, when it got ready to make man, had just waked up from a nap, and had given to Force the wrong instruction*, which (force), going by its sleepy master's charge, put *the cart before the horse*, giving thereby the *body pre-eminence!* But to stop at this little bit of irony, which is the full measure of Mr. Ingersoll's positions, I must be permitted to urge that Mr. Ingersoll will have to draw from his clear intellect less of his fine rhetoric and more of substantial, inductive reasoning before he can impress his conclusions upon the more deeply thinking mind. Mr. Ingersoll has done his reasoning capacity injustice in his treatment of this subject. Certainly he has failed to establish his positions. *And why* a man so richly endowed with philanthropy and noble sentiments should deem it his duty to *unsettle* the mind on the questions of the existence of a God and of man's future life, is a *problem* yet to be solved. *Cui bono?* As an iconoclast Mr. Ingersoll is doing a good service to humanity, but not so in any effort that would mantle the soul in the gloom of doubt as to the existence of an Infinitude we call God, and of the future life of man. A God of *human* manufacture, who is ignorant, impotent, capricious, and revengeful, should so be disposed of as no longer to enslave the mind. But while Mr. Ingersoll is destroying mythical ideas, he is leaving us without *any* God, save that of blind and unintelligent *matter and force!* And while, in his benevolence, he is quenching the fires of a burning hell, he is substituting an iceberg of an oblivion, at which the soul revolts, and instinctively shrinks with utter horror!

To contemplate an endless, dreamless sleep, where silence becomes a terror to itself, and nature shrinks from her own void and nothingness, is to invite a blighting mildew to the soul, whose pulseless ghost of negations in its eliminations would freeze the heart of stone, and turn the "cheek of darkness" pale forever! It would destroy all incentives to activity in efforts for good. It would check every impulse of love in the soul, and yield in despair the brightness of a cherished hope to that oblivion which would so soon assert its supremacy, and proclaim life an eternal mockery! But hope has courage, and her flag is still unfurled, and around it are the millions yet whose sun will ne'er go down behind a cloud, but smile as it sets below a gilded sky.

WASHINGTON, D. C.

"THE DISCIPLE" versus SUBSTANTIALISM.

IS THE SUBSTANTIAL PHILOSOPHY "AN OLD AND LONG SINCE EXPLODED DOCTRINE"?

BY THE EDITOR.

"WHY do the heathen rage and the people imagine a vain thing?"—David.

A friend has sent us the February number of the *Disciple*, an ably-conducted magazine, published at Cincinnati, Ohio, under the patronage of the Christian denomination. In this number a writer, signing himself "Clarence," begins a series of articles directed against the *Substantial Philosophy*, with a view of damaging the scientific reputation and thus weakening the prestige of its claimed founder, under the broad charge and attempted proof that Substantialism, instead of being a new philosophy, as supposed, is an old and long since exploded doctrine. "Clarence," allow us to intimate with all due respect, made this serious charge under a total misapprehension of what Substantialism really is, as well as what it teaches. Indeed we could not have believed it possible had we been told it, that there existed an intelligent man who had seen even one volume of our scientific and philosophical writings, who could have been so totally oblivious to what Substantialism signifies or sets forth, as this same "Clarence" has proved himself to be. We regret, therefore, for his sake, a thousand times more than for our own, that he has so excuselessly misrepresented both us and the cause we plead. Allow us therefore, in a spirit of the utmost kindness, to point out wherein "Clarence" is totally at sea, not having come within a thousand miles, scientifically speaking, of touching the Substantial Philosophy in any single quotation he makes as proof that it is an old and exploded doctrine.

In the first place, what are the fundamental principles of the Substantial Philosophy which "Clarence" asserts in the most positive and even bitter language have long since been anticipated and abandoned as erroneous? Those principles are, as repeated scores of times all through our writings, from the first chapter of the "Problem of Human Life" to the last number of THE SCIENTIFIC ARENA, that the physical forces or phenomena-producing causes in nature, such as light, heat, sound, gravitation, electricity, cohesion, magnetism, etc., are *immaterial* but *substantial entities*, and that this basic view of the physical forces furnishes the strongest possible analogical proof of the *substantial* though *immaterial* nature of the vital, mental, and spiritual forces of human beings, as a scientific basis for a possible future life. From the very inception of this discussion in the "Problem" we have been careful to distinguish between *material* and *immaterial* substances, classifying *force* in all its forms, from the cohesion which holds a grain of sand intact to the spirit-force of the Deity himself, as representing in a special manner the *immaterial* side of universal *substance;* while we have been equally careful to classify ponderable and inert bodies, however dense or tenuous they might be, as representing the *material* side of the substantial universe. If there is one feature of Substialism which we have impressed upon our readers to excessive reiteration, it has been this very distinction between *material* and *immaterial* substances throughout the realm of nature, and in which we have repudiated over and over the possibility that sound, light, heat, electricity, magnetism, etc., could involve the slightest approach toward *materiality.*

Yet "Clarence," totally oblivious to all we have said touching this very central idea of the Substantial Philosophy, proceeds with all imaginable assurance to represent us as teaching that sound, light, heat, magnetism, electricity, etc., are *matter*, or are constituted of *material substance!* Then, in order to show that Substantialism as thus falsely represented, is an old and long since exploded fallacy of science, he proceeds to make quotations from various authors to prove that sound, light, heat, electricity, etc., had once been held to be constituted of *material particles!* Not only is all this (of course unintentional) misrepresentation indulged in with an air of learned nonchalance simply refreshing to a college graduate, but these very references (of the different authors quoted) to the preposterous idea of early investigators, that the physical forces are constituted of finely attenuated *particles of matter*, are coolly set forth by "Clarence" as the exact doctrines which Substantialism teaches as claimed by Dr. Hall and his friends!

Now we ask the candid readers of the *Disciple*, who may chance to see this rejoinder, if such treatment is a fair and praiseworthy manner of opposing Substantialism, that is, should it deserve opposition at all? But to show that we have presented the teachings of Substantialism correctly we will here copy the second and third articles from the *creed of Substantialism*, acknowledged as such by all its adherents, as follows:

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

"3. *Substance* in its *immaterial* classification includes every *force* of Nature or in Nature, physical, vital, mental, or spiritual, and includes every form of energy which in any way can produce a manifestation or motion of a sensuous body. Hence the physical forces which manifest themselves to our sensuous observation, such as gravity, light, heat, sound, electricity, magnetism, etc., are as really *substantial* or entitative as is the air we breathe, the water we drink, or the food we eat." MICROCOSM, Vol. IV., page 22.

Ignoring this plain "formula and ground of belief" as accepted by all Substantialists throughout the world, "Clarence" proceeds to muster proofs, as follows: From Prof. Tyndall that *heat* had once been considered as a refined form of *matter*; from Prof. Olmsted that he regarded *electricity* and *magnetism* as *material fluids*; from Sir Isaac Newton that he held *light* to consist of *material corpuscles* shot from the sun into our eyes at the velocity 180,000 miles a second; and finally from Prof. Rossiter that certain superficial thinkers had held the notion that *sound* consisted of the *material particles* of the vibrating instrument sent off through space, etc., etc. But not one syllable does he find or quote from any author ancient or

modern who even intimated such a novel and original doctrine as that sound, light, heat, electricity, etc., were *immaterial* but *substantial entities*—the very foundation on which the whole Substantial Philosophy rests!!!

Now let us assure "Clarence" and all concerned that, since we first went into this investigation of the nature of the physical forces, we have well understood and frequently set forth that certain superficial investigators in early times had entertained the ridiculous notion that sound, light, heat, etc., consisted of finely attenuated particles of *matter* dislodged and propagated through the air from these respective sources of natural phenomena. We have more than once referred to the puerile view of Lucretius that the human voice consisted of the *material* particles of the vocal organs sent off in speaking, and to which he attributed hoarseness, sore throat, bronchitis, consumption, etc., and, as all our readers well know, we have more than a score of times, in our various writings, had occasion to refer to the absurd view of Sir Isaac Newton that light consisted of fine *material corpuscles* shot from the luminous body into our eyes, at the known velocity of light, he not having been able at that early age of science to conceive of the pulses of *substantial* but *immaterial light-force* which Substantialism was the first to announce, and which met every physical objection to *material* corpuscles of light, as well as obviated every necessity for the invention of a *material ether*, by which Huygens sought to convert light into a wave-motion analogous to that of sound, as taught in the wave-theory. If there is one thing in the teachings of that great discoverer of the law of gravitation which we have ridiculed and repudiated to redundancy, it was his weakness for such a childish notion as that light could possibly consist of *material corpuscles*, when the incorporeal corpuscles of *light-force* as an *immaterial substance* would have answered so much better, and would have led both him and Huygens out of their materialistic wilderness, including their equally absurd material air-waves of sound.

Yet "Clarence," with all these explicit exposures of Newton's *material* corpuscular theory of light right before his eyes (for he refers to our arguments), deliberately pens the following:

"The corpuscular theory of light is so well known that *Dr. Hall and his admirers admit that they, in this case, did not originate their own theory, but that it is an abandoned theory revived*" *!!!* (page 149).

Can it be possible that "Clarence" did not know that instead of reviving and adopting Newton's material corpuscular theory, we had always opposed and repudiated it? At all events charity, which thinketh no evil, prompts us to take this view of the case. Here is a single passage out of more than twenty to the same effect scattered all through our writings:

"It is a matter of history that the undulatory theory of light originated in the fact that *Huygens* became dissatisfied with the *material particles* in Newton's Emission Theory of light; and well he might become dissatisfied at so unreasonable and impracticable a supposition. Such a gross idea as that any *material particles*, however diminutive, could enter the eye at the enormous velocity of light, as Newton's theory taught, without injury to that delicate organ, is too absurd for patient consideration" (MICROCOSM, Vol. III., p. 341).

But all we have written on the subject seems to do no good with such writers as "Clarence." Notwithstanding we have published pages upon pages advocating *light* as neither *material substance* nor *undulatory motion*, but as constituted of *substantial pulses* of *immaterial light-force*, yet we have to be thus publicly represented as *admitting* that in this case we "*did not originate*" our own theory, "*but that it is an abandoned theory revived!*" We ask the candid readers of the *Disciple* if this is fair?

But this is not the end of these unintentional misrepresentations of our views. His article is made up of them. Take as an example his long quotation from Prof. Olmsted of Yale College, to which we before alluded, and which was intended to prove that even this professor once advocated the view that heat, light, electricity and magnetism were *material fluids*, though too attenuated to be recognized by our senses as matter. But throughout this entire quotation not one syllable occurs favoring such an idea as that these forces had ever been regarded as *immaterial substances*, or *incorporeal entities*, as Substantialism has always taught at every reference to the subject. And when "Clarence" concludes the quotation, true to the unintentional animus of his attack, he adds:

"*This article anticipates almost everything that has been said by Dr. Hall on the nature of electricity.* If read to a Substantialist *he would endorse it* until he found it was written almost half a century ago. Prof. Olmsted's book is still widely used in colleges, but all these views as to the nature of heat, light, electricity, and magnetism (as *material substance*) are abandoned in the later editions. They would not stand the test of experiment. *But Dr. Hall and his friends have taken up and vehemently advocate these views so discarded*, and do not trouble themselves about experiments" !!! Page 148.

These sentences of "Clarence" seem incredible in a well-informed writer. That they were published in a Christian magazine of high repute for fair dealing, is only explicable on the assumption that its editors had not taken the trouble to inform themselves on the real teachings of the Substantial Philosophy, but had taken it for granted that the writer had unquestionably informed himself before presenting his paper for publication. We feel sure, however, when Elders Radford and Brown shall find that their magazine has been imposed upon, possibly unintentionally, as we still wish to believe, they will lose no time in so informing their readers.

But here is another case even more startling in the bald character of its misrepresentation, and still more difficult to explain on the charitable supposition of total ignorance of what Substantialism teaches. At page 152 he commences an extract of between two and three pages of fine type, from a work written by Prof. Rossiter on the "Nature of Sound." The chief aim of the professor in this extract was, while advocating the wave-theory, to combat the absurd notion, as held by some early investigators, that sound must either consist of the *material* particles of the *bell*, for example, dislodged and driven off through space, or else of the *material* air-particles shot away from the bell through an atmosphere equally dense with themselves. If such a preposterous theory had been worth exploding, it must be confessed that Prof. Rossiter did it most effectually. But now comes the usual *denouement*. On completing this long extract, "Clarence" proceeds:

"In reading the above, one can scarcely resist the impression *that it was written in direct reply to Dr. Hall; it meets his arguments so perfectly(!)* But this cannot be; it was published several years before Dr. Hall's book appeared!" Page 154.

We only beg of the fair-minded reader to characterize this treatment as in his leniency he may think it deserves. Is it possible that this contributor to the *Disciple* has no correct knowledge of the teaching of Substantialism, which he attempts to disparage—a system of philosophical and scientific doctrine so widely circulated and elaborately discussed during the last seven or eight years? During all these years, it has been well known to every intelligent thinker on the subject that Substantialism utterly repudiates all possible *material* theories of the physical forces, as well as all modes of motion of *material* molecules, as constituting force; substituting, therefor, as it does, *incorporeal* or *immaterial substantial entities*, thus placing all the natural forces, including life, mind, soul, and spirit, on the same general plane of *incorporeal substance*, by which alone can the analogies of nature be coerced to render aid and comfort to the cause of religion. If "Clarence" has not the education or ability to distinguish between gross *matter* and *immaterial substance*, we pray him for his own sake in the future that he buy or borrow a set of our books on the subject at once, and study them before attempting to write another word about Substantialism—*pro* or *con*. Had he fortunately owned a copy of the "Text-Book on Sound," advertised in this journal, he would have saved himself from the humiliation of having written such a paragraph for publication as quoted above, charging us with believing the stupid notion combated by Prof. Rossiter, that sound consists of the *material particles of the bell*. Here are the 82d and 83d questions and answers of this "Text-Book," verbatim:

"Q. 82. Would not a bell thus rung continuously in vacuo be reduced in its material substance, and finally be entirely dissipated in the form of sound-force?

"A. No. Herein lies the superficial mistake of those who oppose the Substantial Philosophy. They do not grasp the broad distinction between *material* and *immaterial substances*. A ringing bell gives off none of its *material* substance in the production of sound, and is only the material instrument by which the force-element of nature is reached and this peculiar form of force developed and manifested to our senses through proper conducting media. Lucretius vaguely caught the same idea of sound that Newton taught for light in his emission theory, namely, that by exercising our vocal organs, *material sound-particles* were emitted, thus in time wearing out the voice, causing hoarseness, consumption, etc. It was impossible for any investigator to grasp the true nature of light and sound, as in no way constituted of the *material particles* of the luminous and sonorous bodies, until the Substantial Philosophy had classified the substances of nature into *material* and *immaterial entities*.

"Q. 83. But would not a bell continuously rung, finally be worn out?

"A. Yes. Any body which requires its own vibratory action or tremor in order to generate or liberate a given form of natural force, must, in the nature of things, disintegrate or reduce itself by continuous wear in such process of liberating force. But surely a student of science should be able to see that such wear and deterioration of the instrument is no more a part of the *immaterial force* thus liberated, than are the particles of the mill-stones worn off and dissipated in the process of grinding wheat a part of the flour thus produced. A bell may be worn and partly dissipated to dust in the process of vibrating and sounding, but every part of that dust still remains in existence as metallic matter, and if collected would again produce the same bell intact by remelting." (See also Answers 84, 85, 86, etc.)

So, also, with every other form of force in nature, including light, heat, electricity, magnetism, gravitation etc. Here is an extract from an article written nearly five years ago which would have been better than a gold mine to the reputation of "Clarence" had he chanced to discover it before writing. The article from which we quote is headed

"Substantialism Evolved," at pages 116, 117, MICROCOSM, Vol. 3:

"Starting here with the action of *magnetism* in forcibly drawing a piece of iron from a distance, equally well through a vacuum or through sheets of impervious glass, we knew intuitively and positively that the magnetic something called *force* which could do this, however invisible or otherwise intangible to our physical senses, must be *substantial*; and being *substance*, it must be *immaterial* or *incorporeal substance*, since by passing through sheets of glass, the same as if nothing intervened, it manifestly acts in defiance of all *material conditions*, though it emanates from a material body.

* * * * * *

"Having full assurance already that one force, magnetism, was and must of necessity be a real substance, we could not read Nature's great book any other way than to believe, on the laws of consistency and harmony, that all its forces, including light, heat, sound, electricity and gravitation, were equally substantial, and that all we needed was just a little patient research in culling aid from the analogies of science, to enable us to unravel every mystery involved, and answer every objection that might be raised to the new philosophy. Of course we could see that gravity must plainly be substantial if magnetism was, and so must be electricity since it produces magnetism as one of its substantial effects. Then it was but a short and easy mental step to take in heat, as another *incorporeal substance*, and a still easier one to pass from heat to light, and thus reestablish the old emission theory of Sir Isaac Newton on the new and rational basis of *incorporeality*, and not as he held it on the manifestly untenable basis of almost infinitely attenuated *material light-particles*. With this broad and fundamental distinction thus ratified between *material* and *immaterial* entities, which many minds even yet find such difficulty in grasping, and with this dual classification covering the whole realm of Nature from the Spirit of God down to the adamantine rock, our work was more than half done when fairly begun.

"But still *sound* seemed to be the most difficult to reduce to a substantial basis, and in this way to wrench it from the grasp of materialistic science which necessarily makes the imponderable forces of Nature but modes of molecular vibration. Instead of holding sound to be but the vibratory motion of the conducting medium, Substantialism required it to be a real *incorporeal substance* conveyed by such medium somewhat as electricity is conducted along a wire," etc., etc.

In view of these plain and unequivocal teachings of the Substantial Philosophy, widely circulated and read for the last half dozen or more years, repudiating, as it does, every phase of *material substance* as constituting force, and advocating *immaterial substance* in the strongest language we could command, we cannot suppress a feeling of pity for "Clarence," whoever he may be, in the mortifying and humiliating attitude he now occupies before the thinking world, in thus bitterly representing Substantialism as an old and long-exploded doctrine, and without knowing apparently one word of what this philosophy teaches, or without quoting one syllable directly or indirectly bearing on the subject.

Our sympathy for him is all the more intense in that he evinces in his writing a degree of ability which might have proved a blessing to the world in advocating Substantialism, had his mind chanced to see this philosophy in its true light, and had he not been misled by circumstances.

And while we sympathize with "Clarence," we must not neglect to share our pity for those journals which took up his mistaken charge with such avidity and proclaimed to the world with apparent gratification that the Substantial Philosophy had, after all the ado about it, been exploded as an old and long repudiated notion. Here is an illustration from the *Christian Standard*, of Cincinnati, Ohio, a paper circulating 30,000 copies. On the appearance of this article in the *Disciple*, it prints the following:

"It will be interesting and amusing, after all the ado about this *new* departure in the philosophical world, if Substantialism proves to be an old and long exploded theory brought to light and exhibited as an original discovery in this enlightened nineteenth century!"

We only add, that "it will be interesting" as well as instructive to see what the *Standard's* high sense of journalistic honor will prompt it to say to its readers, now that this *amusing exhibition*, so widely advertised, has suddenly been converted into a funeral.

P. S.—Since the foregoing was written, we have received the March number of the *Disciple*, containing the second installment from the pen of "Clarence," but to which no reply is necessary. The most prominent feature of it noticeable is the fact that no kind friend has yet come to his rescue and informed the young man (as such we take him to be) that he knows absolutely nothing about the teachings of the Substantial Philosophy. As proof, this is what he says in the March number:

"Indeed the velocity of sound in various substances appears so unreasonable as to cast grave doubts on his [Dr. Hall's] theory. *Is it not astonishing that a vibrating bell can throw particles of itself sixteen times as fast through iron as through air?*" (page 336).

Yes, it is very "astonishing," but not any more so than that an educated student of science could have lived during the last seven or eight years anywhere in the United States and not have received one correct idea concerning a philosophy so widely discussed as has been that of Substantialism.

In conclusion we remark that the attack which this Balaam of the "*Disciple*" had intended as a curse to the Substantial Philosophy, has been turned providentially into the greatest blessing which the cause has ever experienced since the "Problem of Human Life" first saw the light, by this very circumstance of opening the way for an overwhelming reply. We have been praying for this opportunity for the past five years, and at last our prayer has been answered, but without any thanks to the good intentions of "Clarence." Instead of quoting and applying to us the honest Scotch prayer of Burns:

> "O wad some power the giftie gie us
> To see ourse's as ithers see us;"

he would now be soliloquizing:

> O wad there'd been some friendly ass
> To spy the angel in the pass,
> And then, with human words and voice,
> To give a fellow time for choice;
> Had warned me of the threat'ning sword
> Before I'd penned a single word;
> The curse which I designed should fall
> Upon the head of Wilford Hall
> Would not, like boomerang, O fate!
> Have fallen on this reckless pate.

Our Book Shelf.

THE name of any publication given in this column, with size, price, and publisher, will be our sufficient acknowledgment for its receipt. Merit and our space must determine any further mention.

"THE MISSIONARY REVIEW" for March contains an admirable paper on "The Theology of Missions," that may well arrest the attention of all devout students of the Scriptures, even if it is not potent to stay the ruthless speculation of would-be-patentees of plans of salvation. In these days of "theological" substitution for the silence of the Spirit of God, it is refreshing to read an article from a "student" in the most powerful missionary journal of the century, turning us to "the law and the testimony" in the calm and dignified assurance that "if they speak not according to these it is because *there is no light in them.*" Don't fail to read that article. Surely "the entrance of *Thy Word* giveth light."

DR. WILLIAM A. HAMMOND, than whom there is no better authority, will open the April *Popular Science Monthly* with an able article entitled "Brain-Forcing in Childhood." The paper gives a vivid picture of the evils of the book-cramming process, now so common in both public and private schools, and also contains a strong plea for fewer studies, more direct contacts with Nature, and less of the intervention of books.

Publishers' Department.

Volume two of The Arena.—We take this early opportunity to call the attention of our readers to the near completion of *Vol. I.* of THE ARENA.

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Devoted to the Investigation of Current Philosophical Teaching, and its Bearing upon the Religious Thought of the Age.

A. WILFORD HALL, Ph.D., LL.D., Editor.

Founder of the "SUBSTANTIAL PHILOSOPHY," Author of "THE PROBLEM OF HUMAN LIFE," "UNIVERSALISM AGAINST ITSELF," Etc., Etc.

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SKETCH OF REV. J. J. SMITH, M. A., D. D.

WE take pleasure in presenting the following brief sketch of the life of our old and reliable contributor, Rev. Dr. Smith, which facts have been collected from different sources, partly by the aid of Dr. Smith himself, which information he reluctantly consented to furnish by our solicitation, so averse was he to newspaper notoriety. Men, however, who have achieved success in any walk of life, especially in any field of literary or intellectual pursuit, belong in a large degree to the public, as their true biography goes to help make up the current history of the times in which they live.

Dr. Smith was born in the State of New Jersey in 1817, and consequently is now about 70 years of age. He is to all appearance one of the best preserved men at that age, both mentally and physically, of our acquaintance, having all the elasticity of movement and vigor, as well as vivacity of mental make up, of one in the very prime of life. Indeed, the doctor is now in his prime, as he appeared the other day when he called at our office.

At the age of fifteen, being reared under religious influences, he was converted and became an active member of the Methodist Protestant Church, with which his whole life has since been identified.

At the early age of eighteen, he was licensed to preach, and a year later he entered the itinerancy as a regular preacher, and was ordained as a deacon when twenty-one, and was an elder when twenty-five.

When thirty-three years old he was elected a delegate to the General Conference which met at Baltimore, and four years later was also sent to the General Conference which met at Steubenville, Ohio, where he was elected trustee of Madison College.

When forty years old he was sent as delegate to the Convention which met at Cincinnati, Ohio, and was elected one of the delegates to the General Convention which met the next year at Springfield, Ohio.

When forty-three he became president of the New York Conference, which office he filled for several years, being re-elected a number of different times, and was sent regularly as delegate to the various general conferences and conventions of that growing denomination thereafter, in all thirteen times, or more than double as often as any other minister.

He was elected trustee of Adrian College, Mich., in 1866, and received the honorary degree of "M. A." from that institution in 1867, and "D. D." from the same college in 1870. He filled the chair of president of the Protestant Methodist Church of America for nine years, always acquitting himself with honor, and with satisfaction to the various conferences of the country.

Two years ago he was chosen to a professorship in the Florida State University, at Tallahassee, of which John Kost, M. D., LL. D., is Chancellor, but he decided that his life and energies were of more value to the world in his present field of labor. As is generally true of all men who command an influence over their fellows, Dr. Smith was a poor boy, and achieved much of his early educational advantages by dint of ambitious determination to win his way in life, though he generously gives due credit to many persons who aided and abetted his efforts to acquire an education which fortunately prepared him for the highly useful career sketched above. We find the following brief credit from his own pen in the *Methodist Recorder*, of Pittsburgh, Pa., which he proffered to those who aided him in his early efforts.

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

"In the first place, it is true that my early advantages were limited to a public school. But when I had finished all that was taught there, I went from home and took board with a minister, in view of preparing myself for the ministry, and studied English grammar, philosophy, and theology, under his personal instruction, for about one year, shortly after which I joined the Philadelphia Conference, as a licentiate, at the age of nineteen.

"A little over a year after this I commenced the study of Latin under Prof. Davis, of New Jersey, whose instructions I enjoyed for one year. A short time after this I added to my list of studies trigonometry, under the direction and help of another gentleman of the same State. I also studied Greek two years (namely, in 1842 and 1843), under the instruction of Prof. Whiting, of Brooklyn, who was a very reputable teacher of languages. He also gave me some instruction in the higher mathematics during the same time. I also had considerable of help, in studying astronomy, from Dr. Springer, of Connecticut, as he made that branch of literature a specialty.

"It will be seen from the above that, instead of my having secured what little I have attained in literature alone and unaided, I have had the help of private tuition, altogether, for nearly or quite five years. Therefore, while I feel that I am justly entitled to the credit of determining that I would have an education suitable to my calling, and have labored most assiduously to attain it, and have been a life-long student, and have availed myself of all the means within my reach for this purpose, I am not entitled to the credit of that part which I have obtained through the instruction of those to whom I have referred."

Dr. Smith is the author of two books, one the "Impending Conflict," and the other the "Wonders of the East," both of which we have had the pleasure of reading some twelve years ago. We distinctly remember the impression those works made on our mind at the time of their perusal, though having never seen their author, and without knowing anything about him except through these books. Our impression was that both works were masterpieces in their line, and that, instead of being limited to a denominational circulation, they should be known and read of all intelligent men and women.

The "Wonders of the East" is, without exception or exaggeration, the most interesting and exciting book of travels we have ever read; and, though not so spiced with fun and laughable incidents, holds strong competition with Mark Twain's "Innocents Abroad" for a vivid presentation of the facts by which the reader is put in absolute *rapport* with the very scenes the traveler himself witnessed. This book was the result of the doctor's travels during a vacation in the years 1871 and 1872, and we do not hesitate to believe that measures should be taken for its republication, as we understand it has been out of print for some time.

The other work, the "Impending Conflict," though every way as ably written, is not of such universal interest, being a controversial discussion of the great questions between Protestantism and Catholicism. Still, those of either side of that controversy, who wish to see the bottom facts in the premises as they have never before been shown up, should try to get a copy of that book if it can be found, though we learn that strong efforts have been made to suppress the work by certain interested parties.

When the "Problem of Human Life" first appeared, a copy, sent to the *Methodist Recorder*, by request of its editor and on the urgent advice of the Rev. Dr. L. W. Bates, was placed in the hands of Dr. Smith for a careful study and review in that paper. This,

was done in a series of articles the most searching, appreciative and comprehensive of any review of the book we have since seen. We then did not know the writer to be the author of the two books to which we have just referred, and which we had read with such absorbing interest a few years before.

The impression which the "Problem" had made upon Dr. Smith's mind during his examination led him to call at our office in this city, where the facts of his having written the "Wonders of the East" and the "Impending Conflict" leaked out in conversation, putting us completely *en rapport*, where we have remained ever since.

About this time we began the publication of THE MICROCOSM, a monthly magazine devoted to the advocacy of the Substantial Philosophy, and Dr. Smith, from his interest in the "Problem of Human Life," became an enthusiastic contributor to its columns, which position he has kept up ever since, some of his best papers having appeared in the present volume of THE SCIENTIFIC ARENA. One thing the readers of our publications are always sure of, that when they start into a contribution from the pen of Dr. Smith, the bottom principles of the subject under discussion are always certain to come to the surface, and in language which has no uncertain sound. We have always prized Dr. Smith as among our ablest contributors, and as one of our most reliable coadjutors, and we pray that his life may long be spared for the useful work to which it has, for so many years, been devoted.

THE ANATOMY AND PHYSIOLOGY OF VITAL ORGANISM, AND THE PHILOSOPHY OF PHYSIOLOGICAL AND PSYCHOLOGICAL DISSOLUTION.

EXEGESIS OF ECCLESIASTES, XII. 1-7.

BY PROF. G. R. HAND.

THE diagnosis of the varying conditions of that material and immaterial microcosm, called man, which is here given by the wise man who wrote on nearly all the sciences, would imply that his knowledge of physiology was in advance of the times in which he lived, as he seems to have understood the functions of the vital and circulatory organs, before the discovery of the circulation of the blood by Harvey.

I. PALMY DAYS.

"Remember now thy Creator in the days of thy youth."

This admonition points to the time when animal life and youthful aspirations are at their maximum. The recognition of "thy Creator," not merely a Creator of the world, but of man, looks to a personal relationship with deity. And this recognition in youth, in view of declining years, will shed a radiance of hope over the whole life of the Christian Philosopher.

II. PLEASURES FADING.

"While the evil days come not, nor the years draw nigh, when thou shalt say: I have no pleasure in them."

The vivacity of youth will fade, and with it the appreciation of the pleasures of life, and a remembrance of the Creator in the youthful days, will bring sources of enjoyment in those coming days.

III. DARK DAYS ADUMBRATED.

"While the sun, or the light, or the moon, or the stars, be not darkened, nor the clouds return after the rain."

Clouds usually pass away "after the rain," and leave a clear sky. But it is a dark day when the clouds return "after the rain," darkening the lights of heaven, and obscuring the transparent atmosphere. So when mental dimness obscures intellectual visions, the remembrance of the Creator will be a source of light within.

IV. PHYSICAL ORGANS FAILING.

(a). "In the day when the keepers of the house shall tremble." The hands are the house keepers, or workers, and in the dark days foreboded, they may tremble with palsey or feebleness.

(b). "And the strong men shall bow themselves." The lower extremities, the legs, that in youth carry the body so vigorously, will, in the coming dark days, bow themselves under their burden. "His footsteps are feeble, once fearless and bold."

(c). "And the grinders cease because they are few." Dental surgery is cognizant of the fact that the molar teeth, the "grinders," gradually cease their work as they decay and become few.

(d). "And those that look out of the windows be darkened." The eyes are the windows through which the soul, the "inner man," looks out upon the outside world. And those organs grow dim in the dark days coming.

(e). "And the doors shall be shut in the streets." The street door, or outer door, the mouth, closes when the teeth, the "grinders," are gone.

(f). "When the sound of the grinding is low." As the grinders disappear, the "sound," of grinding hard food, diminishes.

(g). "And he shall rise up at the voice of the bird, and all the daughters of music shall be brought low." The tympanum of the ear becomes less sensible to music, and the corda vocales, and vocal organs, becoming feeble, fail to send forth the sweet tones of song.

(h). "Also when they shall be afraid of that which is high." That is true to nature. The nerves of the old man tremble on the verge of the precipice, where in youth he walked fearlessly.

(i). "And fears shall be in the way." True again. Very old people fear many things along the way, and in different modes of travel, that would scarcely have arrested their attention when young.

(j). "And the almond tree shall flourish." The head, white with the frost of many winters, is well compared to the white blooming top of the almond tree.

(k). "And the grasshopper shall be a burden, and desire shall fail." The appetite no longer craves strong meat, and the feebleness of desire is even burdened with the delicate locust, or grasshopper.

V. NEARING THE END.

"Because man goeth to his long home, and the mourners go about the streets." According to Oriental custom, when the goal was reached, and the man gone to his long home, the professional mourners went about the streets, to the man's residence, and to his place of business, and among his friends, making loud lamentations.

VI. VITAL ORGANS BROKEN.

(a). "Or ever the silver cord be loosed." The spinal column, like a silver cord, extending through the vertebra, is protected in its bony canal, from abrasion or inpingement, by external objects. If, by any means, it sustains an injury, paralysis of the lower extremities may result. If it "be loosed," or severed from its connection with the brain, death supervenes.

(b). "Or the golden bowl be broken." The golden crown of man's physical organism, the cranium, or, by metonomy, the brain inclosed in that skull, is the "dome of thought." When that is "broken," death ensues.

(c). "Or the pitcher be broken at the fountain." As subterranean veins convey the water to the fountain, so the veins from different parts of the body converge and, through the vena cava, and right auricle, deliver the blood into the "fountain," the right ventricle of the heart. Then, the "pitcher" was the vessel used in drawing water from the fountain, and sometimes the water from the fountain was purified by filtration and passed into the cistern. So in the pulmonary artery, which draws the blood from the fountain, to be purified in the lungs and returned to the cistern, we may fairly recognize the "pitcher." If that be "broken at the fountain," the vitalization of the blood ceases, and man dies.

(d). "Or the wheel broken at the cistern." We have traced the water from the fountain to the cistern, purified and ready for use, from whence it is sometimes drawn by means of a rope over a pulley or "wheel." Now examine a physiological chart of the heart and lungs, and you will readily see the "wheel," the aorta, which draws the blood from the "cistern," the left ventricle of the heart, and delivers it for distribution to supply the wants of the entire body, to all parts of which it is conveyed by a system of arteries. Should this "wheel" be "broken at the cistern," the circulation of the life-sustaining vital fluid ceases, and "man goes to his long home." Then, before the "loosing" and "breaking" of these vital organs, is the time to heed the admonition: "Remember thy Creator in the days of thy youth,"

VII. THE FINAL DISSOLUTION.

(a). "Then shall the dust return to the earth as it was." The material substance of which the body was composed is powerless. The supplies being now cut off, the builders, the bioplasts, have no material with which to build up the various tissues of the material organism, under the supervision of the immaterial entity, the spirit, which now takes its final leave, and dust returns to dust.

(b). "And the spirit shall return to God who gave it." The struggle is now over. The immaterial has laid aside the material. The intelligent ego has put off its material clothing, and gone into the presence of the all-pervading Intelligence. The "inner man" has laid aside the "outer man," or as Peter expresses it, has "put off this my tabernacle." Probation ended.

SANTA ANA, CAL.

SPIRITUALISTIC EXPOSITION.

BY REV. W. H. SLINGERLAND, PH. M.

IN the March number of THE SCIENTIFIC ARENA is an article on "Philosophical Confusion," from which I extract the following: "The spiritualists occupy the extreme left wing in science, and are the direct opposites of materialists. The burden of their philosophy is, that there is no matter in existence, that the existence of matter is an optical delusion. . . . God and spirit are the only substances that exist in the universe. . . . There are no material substances in existence; what we call matter is only the phenomena of spirit."

The author speaks of Drossbach as "a prominent representative of this class of philosophers," and quotes a paragraph from his writings illustrating the spiritualistic idea.

Events that lately occurred in my own ministerial experience, make me desirous of adding new evidence of "Philosophical Confusion" among would-be leaders of thought, hence I call the attention of the readers of THE SCIENTIFIC ARENA to an "ism" that is none the less spiritualistic for bearing another name.

Mrs. Mary B. G. Eddy, of Boston, a "mind-cure" healer, is the authoress of a book entitled "Science and Health." The copy before me now, published in 1886, bears the imprint: "Twenty-first Edition, Revised." This is sufficient proof of its being extensively sold and read. In this book, Mrs. Eddy claims to explain and interpret the Bible, and show forth the true teachings of Christ, and the real character of Christianity,

The special object of "Science and Health" is to reveal the basis of Mrs. Eddy's system of mind-cure. As a matter of fact it is a restatement of theological science, to harmonize with metaphysical healing as taught and practiced by Mrs. Eddy and her disciples. For baseless assertions, disconnected vagaries, unblushing plagiarism of ancient ideas, and egregious egotism, Mrs. Eddy leads the world. If she is right, all other Christians of all ages have been utterly wrong. If her ideas of Christ are right, the world has been guilty of folly beyond words in its understanding, or rather misunderstanding, of his character, person, and mission. But lest I weary you, I will let Mrs. Eddy speak for herself. And I wish you to note that the few sentences definitive of spiritualism, to which in beginning this article I called your attention, are almost exactly duplicated from "Science and Health," the new system of "Christian Science," what may be called "*the Bible of Eddyism.*"

In her preface Mrs. Eddy says: "The time for thinkers has come. Truth, independent of doctrines and time-honored systems, knocks at the portal of humanity." Noble thoughts well expressed. Would that the volume that follows were truly scientific, and really "true to truth."

On page 12 she says: "No human tongue or pen has suggested the contents of 'Science and Health,' nor can tongue or pen overthrow it. My book may be distorted by shallow criticism or by inaccurate reporters, and its ideas forced temporarily into wrong channels; but its truths will remain for the Christ-inspired to discern and follow."

Note her declaration of originality; her defiance of other thinkers; her fling at critics and reporters who may fail to criticise or report favorably; her claim of inspiration—for if the "Christ-inspired" are to "discern and follow" the truths she has revealed, surely she impliedly claims to be "Christ-inspired" also.

Now to her teachings. From page 14 I quote: "The theories I combat, stated fairly, are these: (1) That all is matter; (2) that matter originates in mind, and is as real as mind, possessing intelligence and life. The first-named theory, that matter is everything, is quite as reasonable as the second, that mind and matter co-exist and co-operate. One only of the following statements can be true: (1) That everything is matter; or (2) that everything is mind. Which one is it?" A mind used to any amount of logical thought, will need no severe study to see the character of these statements. She affirms, and all others deny, that *necessarily* all must be matter or all must be mind. My denial, based on my whole life's experience and study, in my mental consciousness outweighs her affirmation. So does yours, reader, unless the clouds of Eddyism have obscured your sky. But I will not pause to analyze her expressions. My purpose is to lay her system fairly before you, so far as brief quotations may do so. I quote again: "Matter disappears under the microscope of spirit. A logical and scientific conclusion is reached only through the knowledge that there are not two bases of life—namely, matter and mind—but one, mind. Intelligence never produces non-intelligence, and matter is non-intelligent. The immortal never produced the mortal, and good cannot result in evil. God is good, and He is Spirit, and goodness and spirit are immortal. Their opposites, evil and matter, must therefore be mortal, and are not the outcome of God. The science of mind shows conclusively how it is that matter seemeth to be, but is not. Divine science, rising above physical theories, excludes matter, resolves things into *thoughts*, and replaces the objects of material sense with spiritual ideas." (Page 15.)

One more quotation on mind and matter: "Science says, All is mind and mind's idea. . . . The notion that mind and matter commingle, in the human illusion as to sin, sickness, and death, must eventually submit to the science of mind, which denies this proposition. *Everything is mind.* On this statement I stand. I stand ready to meet any profound thinker on this subject, and prove to him that this statement is scientific, and that its principle demonstrates harmony and immortality." (Page 424.)

Now for Mrs. Eddy's idea of *sin*, *disease* and *death*, for she classes them all together. On page 25 she says: "Sin, sickness, death—whatever indicates the opposite of God or His absence—*is a belief only*, and this belief is neither the mind nor body of man, for it is not begotten of the Father." Again, page 33: "Personal sense defines disease as a reality; but the Scriptures declares that spirit makes all." On page 425 she says: "I learned that sickness is an illusion, to be annihilated by science; that disease is a suffering of mortal mind. Disease is fear made manifest on the body, whether this fear take the form of cancer, consumption, smallpox, or an injured limb. . . . This human error, about physical wounds and colics, is part and parcel of the delusion that matter can feel and see, having sensation and substance."

I need not quote farther on this line. Synopsized, her teachings are:

1. All is mind; matter is an illusion. What we call the material body, she calls "a substratum of mortal mind."

2. Sin, disease, and death are not realities; they are illusions, or rather are simply notions of mortal mind. So-called sickness or disease is but a form of belief induced by fear, and "projected" on the substratum of mind which we call the body.

Next notice her theory of cure. I turn to page 341, and read: "Man is never sick; for mind is not sick, and matter cannot be. Illusion is both the tempter and the tempted, the sin and the sinner, the disease and its cause, death and the dying. It is well to be cheerful in sickness; to be hopeful is still better; but to understand that sickness is a delusion, and that Truth can destroy it, is best of all, for it is the universal and perfect remedy."

And on page 194–5: "Science reveals the origin of all disease as wholly mental. It declares that all disease is cured by mind, however much we trust the drug, or any other medium to which faith is directed. It is mind, not matter, that heals the sick. I am able to heal, because I act upon mortal mind through the spiritual element. The action of spirit restores harmony. Metaphysical healing enables one to heal the absent as well as the present."

I have quoted above her statement that *disease*, so-called, is the result of *fear*. In instructing her pupils in the method of healing, she says (page 299): "Commence your treatment always by allaying the fear of disease or danger. Silently reassure the patient. Watch the result of that simple rule of Christian science, and you will find that it alleviates the symptoms of every disease. If you succeed in removing the fear, your patient is healed." I cannot quote more. Her mode of healing, put in few words, is: First convince the patient that *all is mind;* second, that disease is not real—is but an illusory conception caused by fear; third, remove the fear by showing its folly, make the patient *believe himself well*, and he will be well.

So far my quotations have not touched very largely on the religious characteristics of the system. My limits will admit but a brief *resume* of a few salient points. According to Mrs. Eddy, Christ was the originator and great demonstrator of metaphysical healing. He healed as she now heals, he taught as she now teaches, and the system her "Science and Health" now more fully reveals to the world is outlined in the Gospels. Jesus is called "the great teacher of Christian science." His miracles are said to have been wrought by the power of mind. I will give one quotation: "Jesus triumphed over the belief that matter is anything in and of itself, or has any authority over man. His kingdom was not material, but spiritual. He understood soul and body. He conquered the 'flesh and the devil.' He was master of sense, sickness, sin, and death. He came teaching and fulfilling the law of being, so establishing the kingdom of heaven, the reign of harmony upon earth. * * * Jesus established his church, and maintained his mission on the basis of Christian healing. He taught his followers that his religion had a principle that could cast out error and heal both the sick and sinful. He claimed no intelligence, action, or life separate from God. Despite the persecution this brought upon him, he used his divine power to save men both bodily and spiritually."

Such is her idea of Jesus, his mission, his church, and his teaching. Now note what *should be* the Christianity of to-day: "It is infidelity to imagine that Jesus demonstrated the divine power to heal only for a select number, or a definite period of time; since to all mankind, and in every hour, Deity can supply all necessary aid to humanity, physically, morally and spiritually. . . . Our Master cast out devils and healed the sick. It should be said of his followers, that they cast evil out of themselves and others, and heal the sick. God will heal the sick through man, whenever man is governed by God."

We have no space to consider the results of the system thus outlined. It is spiritualism, pure and simple, in its essential basis, yet "joined to every heathen and Christian heresy of all the ages." In it are thoughts that may be duplicated in the works of Parker, Swedenborg, and many others, in spite of Mrs. Eddy's declaration. No human tongue or pen has suggested the contents of "Science and Health." And the idea of the non-existence of matter is as old as history. In my judgment there are two great dangers growing out of the wide promulgation of Eddyism: First, that many radically diseased or physically injured people will forsake medical treatment or surgical aid, and, trusting in the chimera of Eddyism, endure unnecessary suffering or go down to premature death; and, second, that as sin is an illusion, like so-called disease, and will disappear as disease does when mind is recognized as all in all, the logical outcome in the lives of all who adopt the theory will be a total disregard of all ordinary laws of morality, and the substitution of the "Christ-inspired" sense of approval in each individual conscience.

What will come of this I will not pretend to assert. But, for instance, if sin has no real existence, why should not sexual passion be sated as fancy may prompt? Possibly, however, this is "shallow criticism." Mrs. Eddy prates often in her book of purity, goodness, and truth. She speaks severely in censure of "free love." She denounces ordinary spiritualism in no measured terms. Yet the logical trend of the whole work is toward a denial of all human responsibility, and right beside the bright picture of purity is the teaching that sin has no real existence.

I do not fear that any of her pupils will accuse me of "inaccurate" reporting. I have certainly tried to be just and fair. Nor have I in this article endeavored to argumentatively combat her theories. I leave that for others, or at least another time. Here I have outlined the main parts of the system, feeling confident that to clearly see, would be to reject; and also hoping that others, once the ball was set rolling, would in THE ARENA and elsewhere expose the fallacies and nullify the teaching of unchristian Eddyism.

ELDORA, IOWA.

FORCE AND MATTER.

BY JOHN C. DUVAL.

THERE are two phases that express pretty much the sum total of Materialism—"the all-potency of matter" and the "molecular movements of atoms"—and both, in my opinion, are "tinkling cymbals and sounding brass," without a particle of meaning attached to them. Materialists assert that matter is all-potent, not because there is any reason for believing in this potency, but because a belief in it is essential to their doctrine. Matter, they say, must necessarily be all-potent, because there is nothing in the universe but matter—that without matter it would be but an infinite void. This certainly would be a just conclusion, if they could satisfactorily show that there was nothing in the universe but material substances, but unfortunately for their theory, the existence of immaterial substances is fully as apparent as the existence of matter itself. As far as we have been able to investigate the properties or qualities of matter, everything goes to prove that it is dead, inert and passive, and that it only acts or moves when *compelled* to do so by some power or force extraneous to itself, for I cannot see that there is a shadow of reason for supposing that such powers or forces are inherent in matter—or, in other words, that they are simply *qualities* of matter. The "molecular movements of atoms" may explain the matter satisfactorily to Materialists, but it does not suffice for me, because the explanation is just as difficult of comprehension as the "all-potency of matter." If Materialists can understand how this "molecular movement of atoms" (admitting there be such a thing) can affect the atoms of another substance with which it has *no connection*—without any substantiality intervening—it is more than I can; I can just as readily believe that *something* may be created out of *nothing*.

But, as I have said, all our investigation and examination of material substances, go to prove conclusively that all inorganic matter is dead, inert, and passive, and that it is not disposed to move or act in one way more than another, and consequently that it does move and act just as it is *compelled* to move and act by forces or powers outside of itself. Lift up, say a pound of iron in your hand, and, as long as your muscular power is exerted sufficiently, the iron remains there; but the moment it is freed from your grasp, the force of gravity becomes paramount, and it is drawn to the earth, where it would lie to all eternity, just in the position it is *compelled* to lie by the force of gravity, unless some other power or force temporarily greater should again compel it to move or change. It may be moved by many forces—an earthquake, the muscular power of man or animals—or it may slowly change its form and place, because its particles have a stronger attraction for the oxygen of the atmosphere than they have for each other—but, left to itself, it would never move or act in any way. Hold a strong magnet within a certain distance of a small piece of iron, lying quiescent upon the surface of the earth, and, presto! it throws off its allegiance to the force of gravity, and springs to the magnet. If such facts (and many others) prove anything at all, certainly they give no support to the idiotic theory that all the changes and movements of matter are due to the "molecular movements of its own atoms." On the contrary, if they prove anything, it is that the motions and changes of material substances are due to forces extraneous to them, and that of themselves they are wholly inert and passive. And yet the theory of the "molecular movement" *must* be maintained, because without it the "all-potency of matter," which is the foundation of the material doctrine, would fall to the ground—not because there is, or can be, any proof of its truth. On the contrary, all the facts observed are directly antagonistical to the theory. For instance, you take a pound of lead and melt it, and yet not the slightest change will ensue in the molecular movement of the atoms of the lead from its violent change to a fluid from a solid, for it *weighs* just as much, or rather the force of gravity operates upon it precisely as it did when it was in the solid state. Certainly the atoms of the lead are not in the same position they were to one another when it was in the solid state, and it is reasonable to suppose that a radical change in the condition of its atoms would have some effect upon their "molecular movements," and yet the fluid pound of lead weighs just as much as it did in the solid state.

I do not believe that materialists can cite a single fact sustaining this "molecular theory," except that it is essential to the doctrine they teach. It is a bare assumption, without any evidence whatever in its favor. There is nothing to show that any such thing as "molecular movement" is being carried on among the atoms of any substance, and even if it were possible to understand the movement of dead atoms, without some power to put them in motion, the *facts*, as far as we can comprehend them, all go to prove that matter is absolutely inert and changeless of itself, and that it passively obeys the greatest power, or force, to which it may be subjected.

Suppose a man holding a large iron plate before him should approach a magnet more powerful than the muscular strength of his arms—when within a certain distance of it the plate would be drawn by the magnet, in spite of all the resistance the man could make. Now I *can see* very plainly what constitutes the force on one side, but on the other side (that is, between the plate and magnet) I *cannot see* the force that overcomes the muscular energy of the man, and yet *I know* the force is there, because it does so. Therefore, when I am asked to believe that the invisible force on one side, although it *visibly* "outpulls" the visible one, is *nothing* (or what, in my opinion, amounts to the same thing), that it is merely the "molecular movements of the atoms" of the iron and magnet, I am compelled to "step down and out"—at least, until I can get more light on the subject. These molecules may wheel in circular, elliptical, or in orbits as eccentric as that of a comet—slowly or with every imaginable degree of velocity, and yet for the life of me, I cannot see why this turning and twisting of the atoms of one substance should produce a mechanical effect, and pull or drag another substance to it from a distance, any more than they could if they were at rest. Still, I am open to conviction, and as it has been said there are some highly-gifted individuals, who can hear the "music of the spheres," possibly one of them hereafter, by placing a conch shell, say to his ear, may be able to hear not only the "moaning of the sea," but the "music of its molecules," as they whirl and gyrate in their tiny orbits, and thus verify the truth of the "molecular theory." But I wish it distinctly understood, that such gifted individual will be expected to make an affidavit of the fact before some officer duly qualified for administering oaths, and that two credible witnesses shall testify as to the character of affiant for veracity, etc., otherwise I shall still have some *lingering doubts* as to the truth of the "molecular theory." As Falstaff said of honor: "Who hath it? He that died o' yesterday. Doth he see it, hear it, feel it, smell it, taste it? No. Then I'll none of it." And so I say to the materialist who wishes me to accept this theory of the "molecular motions of atoms." What is it? Where is it? Can you see it, feel it, hear it, smell it, taste it in any material substance? No. Then, as a materialist, you must admit I am right in saying I'll none of it.

DICHOTOMY versus TRICHOTOMY.

BY REV. J. CRAWFORD, D. D.

Does man possess a two-fold or a three-fold nature? Both on Scripture and on scientific grounds, I regard him as only two-fold, possessing but two distinct organic forms, one material, and the other immaterial; the material being but the outer covering, and the physical instrument, of the immaterial, sentient, rational and moral being, which we call the human soul, or spirit.

But, at the very threshold of the scriptural argument, I am reminded that an inspired writer divides man into spirit, soul and body. 1 Thess. v. 23. "I pray God your whole spirit, and soul, and body be preserved blameless, etc." Here the apostle only expresses, by a periphrasis, the whole man, with all his faculties, both mental and bodily; but he by no means intends to convey the idea that man is composed of three *distinct* entites.

Another passage has been frequently quoted to prove the trichotomy of man. Heb. iv. 12: "For the word of God is quick and powerful, sharper than any two-edged sword, piercing even to the dividing asunder of soul and spirit, and of the joints and marrow, and is a discerner of the thoughts and intents of the heart." The Word of God is, only, in a *figurative* sense, a sword, dividing, or distinguishing, between all the emotions and thoughts of the human soul, even as the literal sword can divide between the joints and marrow; but the emotions and thoughts, the soul and spirit, do not belong to different immaterial organisms, any more than the joints and marrow belong to different material organisms; nor do the "thoughts and intents of the heart" belong to different, but to the same, subject.

Again it has been argued that man was made in the image of God; and, as God is a triune being, man must also be triune. Why not go a step farther and say that, as God is omnipotent and omniscient, and man was made in his image, man must also be omnipotent and omniscient? Man was indeed made in the rational and moral image of God; but it is absurd to say that he was made, in any sense whatever, to resemble God in his trinity of persons!

Again it has been said that "God breathed into man's nostrils the breath of life;" and, as the Hebrew word here rendered life is in the plural number, there must, therefore, be a plurality in the immaterial, or spiritual, part of man's nature, in which this life inheres. There is here, however, no more than a peculiarity in the Hebrew idiom, which, in a few words of a *complex* nature, employs the plural form, where we would use the singular; but this by no means proves any real plurality in the object so named. It certainly implies a *complexity;* and what is more complex than the living soul of man? Yet the living thinking and rational soul is a unit, one substance only.

I might further observe that, as the Hebrew language possesses a dual number, we might reasonably expect that, if there was any allusion in the number of the noun to a duality of living substance in man, that number, and not the plural, would have been employed.

What makes it, if possible, still more apparent that there is here no allusion whatever to any duality, or plurality, in the human spirit is the fact that the Hebrew employs the same plural number when applied to the life of the brute. If it proves a duality in the human spirit, it establishes the same duality in the spirit of the brute!

The Word of God uniformly speaks of man as composed of soul, or spirit, and body; and in such a way as to leave the distinct impression that these two cover all that is in man. Consequently soul and spirit are com-

monly used interchangeably, when applied to the immaterial in man. In proof of this, I shall only qucte, as a mere specimen, a few passages. They require little or no comment.

"What shall it profit a man, if he should gain the whole world and lose his own soul?" Matt. viii. 36. Does not the word soul here stand for all that is immaterial in man, including his rational and responsible spirit?

"Fear him who can kill both soul and body," Matt. x. 28. Surely soul and body here also include the whole man.

"Thou wilt not leave my soul in hades," Acts ii. 27. Soul here includes the whole of our Lord's immaterial humanity.

"Believe to the saving of the soul," Heb. x. 39. Faith does not save the soul in contradistinction to the rational spirit.

"Yielded up the spirit," Matt. xxvii. 50. Spirit here must mean the entire human soul of Christ, as does the word soul in Acts ii. 27.

"That the spirit may be saved," 1 Cor. v. 5. The salvation of the *spirit* here is undoubtedly the same as the salvation of the *soul* in Heb. x. 39.

"Both in body and in spirit," 1 Cor. vii. 34. These two terms certainly include the whole man, just as body and soul do elsewhere. These examples must suffice.

If the Scriptures give no countenance to what is called the trichotomy of man, neither does science. There is absolutely no scientific proof for the duality of the soul, or spiritual part, in man. While there is a great variety of powers in the human spirit, yet we are led, by our own *consciousness*, to regard them as inhering in the one spiritual substance. Consciousness is, in this respect, a unit.

On this subject, one writer advocating trichotomy says: "We have the physical, intellectual and moral distinctly recognized." Unquestionably we have; but the intellectual and the moral powers inhere in one and the same spiritual substance, just as much as bones and muscles belong to one and the same material organism.

The same writer says: "It is further evident that the soma and the psyche are *material*," although the latter may be of a much higher order than the former." Instead of this being evident, to my mind, it seems an evident absurdity, for which there is not the shadow of proof! If it be true that both the body and soul are material, man possesses, not one, but two material bodies, one indeed more refined, or of a higher order than the other.

One of these writers, who contends for the trichotomy of man, says, "If man is dual only, if he has only body and soul, or physical powers and intellectual, which are identical with spiritual, then it seems impossible to show that he is in anywise superior to the brute, except in degree." If man possessed only intellectual, but not moral powers, with no sense of right and wrong, and no ability to discern spiritual and eternal things, and with no conceptions of the Divine Being, I freely admit that he would not differ essentially from the brute. But the question still remains, do the moral and spiritual powers of man inhere in any immaterial substance, distinct from that in which his intellectual, sentient, and emotional powers reside? We think not. These are all functions of one and the same spiritual substance. The spirit or soul in man has more varied and extensive powers than that of the brute; but this by no means implies that either has more than one substance!

These writers, to be consistent, should have a distinct immaterial substance for every separate faculty. They inform us that man "has a spirit, which the brute has not, *separate*, *distinct*, and *independent* of both body and soul, or mind." Now, I submit whether it would not be more correct to say that the soul, or spirit, in man has faculties distinct and superior to those possessed by the spirit of the brute. The man who can see has a faculty more than the man who was born blind: but he does not, on that account, possess an additional spiritual substance, in which this faculty inheres. In like manner, although man possesses a moral faculty, which the brute does not, it does not follow that he possesses an additional spiritual substance in which this moral faculty inheres. Because the brute lacks the moral faculty, it also lacks that portion of the brain which is the organ of this moral faculty. The upper portion of the cranium is wanting. The upper part is perfectly flat.

One of these writers says, "The spirit may *err*, but it is the soul that *sins*!" This is new theology and new philosophy to me; but I regard it as the legitimate outcome of what is called the trichotomy of man. If to this statement we add the assertion above quoted, that the psyche, or soul, is *matter*, only more refined, or of a higher order, than the soma, or body, we are left to regard sin as the product, not of what is spiritual, but material, in man; while his spiritual part has not sinned, but has only innocently erred! This sounds like the old gnostic heresy, that made all moral evil to reside in matter.

We find others of this class of writers speaking of "separable personality." One error never comes alone; but the one is made a stepping-stone to the other.

The more I examine this question the more am I convinced that man is a *dual* being, composed of but one material and one immaterial substance. Trichotomy has an air of profundity; but, in reality, it is shallow, confusing, and misleading.

It may be asked, however, Is there no distinction between the terms soul and spirit? or are they perfectly synonymous? These terms, as we have seen, are employed interchangeably by the inspired writers, to designate the entire immaterial part of man's nature, *where no regard is had to its distinct functions;* but where this immaterial substance is viewed as a sentient, emotional, living being, psyche, commonly rendered soul, is the term employed to designate it. On the other hand, when viewed as exercising reason and the moral powers, pneuma, or spirit, is the word used; nevertheless, soul and spirit are, *in substance*, identical.

The sanctification, therefore, of both "soul and spirit," as in 1 Thess. v. 23, means no more than the sanctification, or the "preserving blameless," of the entire faculties, or powers, of man's spiritual nature, without implying that these functions pertain to different substances in man. For convenience' sake, we may make a two-fold or a three-fold division of man's spiritual powers, such as moral, intellectual, and sentient; but we cannot, either in accordance with Scripture or science, divide man's spiritual nature into two or more distinct entities.

ST. THOMAS, DAKOTA.

REMARKS BY THE EDITOR.

The position taken by Dr. Crawford as to the *dual* nature of man is undoubtedly correct in its general application. This is just as we presented it, minus Scripture proofs, in the "Problem of Human Life," which represents not only man, but also every living animal as well as every tree or vegetable production, as a dual organism, composed of a material and immaterial entity, and that the immaterial structure, though invisible and incorporeal, is the exact counterpart in form of the material body, and for which it served as the guide and pattern by which the bioplasts were enabled to follow a predetermined design in weaving the complete external and material form.

But this general doctrine of duality as predicated of every animal organism, by no means contradicts the scientific and philosophical truth that this immaterial organic structure of man is constituted, when reduced to its proper analysis, of a number of substantial and distinct forms of force such as life, mind, soul and spirit, though these terms are frequently used almost interchangeably. Such analysis of this "inner man" of Paul, however, no more conflicts with the idea of the individual unity of this incorporeal organism than the fact of the distinct venal, arterial, muscular, osseous, and nervous systems in man's material body contradicts the fact that all these go to make up one organic and material unit. This controversy, therefore, over the dichotomy, trichotomy, or what not of man's organic being turns out to be a good deal of a logomachy, unless great discretion be employed in the use of provisos. See editorial in this number on "Material and Immaterial Substances."

REV. DR. M. STONE ON SUBSTANTIALISM.

A. Wilford Hall, LL.D.:

DEAR SIR,—I desire to keep step with all sound progressive thinkers, and have been able to agree with your philosphical disquisitions in the main, but find some insurmountable difficulties in the way of *Substantialism*, some of which I have referred you to in former communications.

I have no difficulty in supposing that some invisible, impalpable forces are substantial entities, and some of those subtle agents *may* be objective existences, as gravity, electricity, thought. I, of course, am with you in rejecting materialism, pantheism, deism, and atheism, but admitting your distinctive definitions of *matter* and *substance*, and your idea of the condensation of the exterior *substance* of the Deity into the solid world, and its furniture, which has somehow become *matter*, in an infinite number of kinds, I am in doubt. I have seen nothing in your writings that can account for the transmutation of immaterial substance into all the various materials of the universe.

Before that which is not matter at all, shall be classed as aluminum, silex, iron, copper, silver, gold, mercury, platinum, tin, lead, zinc, etc., etc., we naturally inquire how that which was not matter has become such? How was it transmued into these? Was it a creation? I am not able to see how I can escape either materialism or pantheism if I admit this theory of creation as scientific. Substantial Philosophy seems to me to require the solution of these difficulties. I live in a material world, and am myself grossly material. If I am an emanation or condensation of the substance of Deity, I wonder how I became flesh, blood, and bones if neither of these are in His substance. I dare inquire into Substantialism, and believe it may reach beyond the range of our senses, but think we had better limit ourselves to such evidences as are within the sphere of our present powers.

Notions held as hypotheses are well enough, but when we assume what is wholly beyond the range of experiment and proof, we are in great danger of laying ourselves liable to the charge of presumption. When I assume to know the composition of Deity, or expound His methods beyond the revealed, the tangible, the visible, the experimental, I am venturing where angels should be timid.

Respectfully yours,

M. STONE.

LEBANON, O.

REMARKS ON THE FOREGOING BY THE EDITOR.

DR. STONE is an able thinker, and is noted as one of the best educated and most prominent ministers of the Baptist Church in the State of Ohio. Of course, as our old readers of THE MICROCOSM remember, he is an uncompromising believer in and advocate of the theory that God created the universe, both material and immaterial, out of *noth-*

ing. We have, on former occasions, had the opportunity of explaining the views of Substantialists on this question, and of answering Dr. Stone's other objections to the Substantial Philosophy. We had been in hopes before the present that the Doctor would have been able, with the hints we had suggested, to think out Substantialism for himself as the only legitimate solution of the problems of physical science by which analogically to harmonize the doctrine of a substantial personal immortality with the observed facts of nature.

The basic principle of Substantialism, namely, that every physical force in nature is a substantial though immaterial entity, must, we believe, drive every intelligent and unbiased mind to accept that philosophy as true, and as the only conceivable way of meeting materialism. To meet materialism on its own ground, which teaches that life, mind, and spirit are but the *vibratory motions* of brain and nerve particles and in no sense substantial entities, we have been compelled to begin with the analogies of science, and to demonstrate that the physical forces or phenomena-producing causes in nature, are real entities—actual, substantial, objective existences—and in no sense modes of motion of material molecules as modern science so distinctly teaches. To leave one of these forces, such as sound, light, or heat, out of this substantial category as but a mode of motion, would be to open the flood-gates of materialism by which such men as Haeckel and Huxley would be logically able to sweep the immortality of the soul out of existence. How ridiculous for a Christian philosopher, after admitting that the sensible phenomena of sound, light, and heat are all due to the vibrations of material molecules, to denounce Haeckel for logically insisting that vital, mental, and spiritual phenomena should be accounted for in the same way!

We challenge the clergy of the world, as we have repeatedly done in times past, and which we now repeat and emphasize in this closing number of the first volume of THE SCIENTIFIC ARENA, to make any rational reply to this appalling materialistic argument of the German atheists, except by an unreserved acceptance of Substantialism. Admit one force of nature as a mode of motion of material molecules, and you have to admit all. Admit sound-force to be but the motion of air-particles, and at once Haeckel, with his defiant sneer, challenges you to prove life-force and mind-force to be anything more than the motion of brain-particles. No man can stand a moment in the presence of the weakest materialist unless armed and equipped with the Substantial Philosophy.

But Dr. Stone, so far as this phase of the discussion goes, is almost persuaded to be a Substantialist. He says:

"I have no difficulty in supposing that *some* invisible forces are substantial entities . . . as gravity, electricity, thought."

Then if "gravity," why not all the other forces, and thus wipe out the very foundation principle of materialism? The Doctor says he would be with us "in rejecting materialism, pantheism," etc., except for our innocent suggestion that God may have made the material universe from his own self-existent substance, rather than out of *nothing!* When he comes to this phase of Substantialism (which, by the way, is a mere matter of individual opinion, and not at all an essential tenet of our great philosophy) he feels compelled to part company with the only system of philosophical and scientific teaching on earth which is capable of grappling with the prevailing materialistic theories.

Now why should so thorough a scientific reasoner as Dr. Stone, after swallowing the entire camel of Substantialism, strain at this insignificant *gnat* of "creation out of *nothing*?" But let us see, even from the Doctor's own standpoint of difficulty, if this gnat is worth straining at. He says:

"We naturally inquire how that which was not matter has become such?"

Of course we give it up, as one of the inscrutible mysteries of God's methods of working in the creation of the universe. Will the Doctor tell us how that (*nothing*) which was manifestly not matter at all, has become such? To use his own wording almost, was *nothing* transmuted into matter? Really, the Doctor does not seem to see that every difficulty he raises against the creation of matter out of immaterial substance applies with still greater force against its creation out of nothing. He ought to renounce his theology at once because he cannot understand how God could create matter out of nothing, on the same principle that he rejects Substantialism or charges that it involves pantheism, because, forsooth, he cannot explain how God could transmute his own immaterial essence into the visible world. Take this single sentence.

"I have seen nothing in your writings that can *account for the transmutation of immaterial substance into all the various materials of the universe.*"

We simply retort in all courtesy with a change of one word; we have seen nothing in your own writings which will "account for the transmutation of immaterial *nothing* into all the various materials of the universe!" We therefore demand of the Doctor that he reject his "nothing" theory because he cannot account for such a method of creation.

Instead of putting these puzzling qustions about the supposed transmutation of one kind of substance into another (a matter not apparently very difficult for infinite power), the Doctor might have queried thuswise: Would it not have been easier and more rational, humanly thinking, for God to have created matter out of *something* than out of *nothing*, even if that *something* had to be an immaterial substance, such as he has admitted gravity, electricity, etc., to be? Take one more example.

"If I am an emanation or condensation of the substance of Deity, I wonder how I became flesh, blood and bones, if neither of these are in His substance."

We answer, just as Christ's body became flesh, blood and bones. "The *Word*" (which was God), "*was made flesh.*"—John, ch. 1. That ought to be a satisfactory answer to such a profound biblical scholar as Dr. Stone. But let us turn these serious tables upon the inquisitive Doctor, by slightly varying the language of his difficulty. "If I am an emanation or condensation of *nothing*, I wonder how I became flesh, blood and bones *if neither of these are in nothing?*"

We beg of the doctor to read over carefully his last paragraph, and then ask himself if he is not "liable to the charge of *presumption*" in assuming to "expound His methods," when he claims, as he has so frequently done, that God created all things out of *nothing?* To assume such a conclusion, so far "beyond the *revealed*, the *tangible*, the *visible*, the *experimental*," surely ought to be enough to make angels timid.

MAGAZINE EXPLOSIONS.

WINCHESTER, Tenn., March 10, 1887.

A. Wilford Hall:

DEAR SIR,—I was at Fosterville a week ago. A storehouse had been burned a few nights before. There was a quantity of powder in the building. By its explosion the earth and buildings for a mile around were made to tremble. All whom I asked testified that they noticed the rocking of the house before they heard the sound. Does this have any bearing on the sound controversy? L. D. FLOYD.

REMARKS BY THE EDITOR.

Yes, it bears directly on the discussion which is now threatening to revolutionize physical science, especially that branch of it relating to acoustics. Previous to the publication of the "Problem of Human Life" it was universally believed and taught by physicists that the concussive shock from a magazine explosion was simply the sound report or noise produced by the burning powder and nothing else. The reason for this erroneous belief grew legitimately out of the fundamental principle of the wave-theory of sound—namely, that all sound, outside of our consciousness, *consists alone of condensations and rarefactions of the medium conducting it.* Hence, the shock or concussive jar from a magazine explosion being manifestly regarded as only a condensation of the air on a large scale, it was the easiest possible thing for superficial believers in the wave-theory to conclude that the sound and the concussion of such an explosion were identical.

Thus we find the greatest living physicists, such as Tyndall, Helmholtz, Mayer, Rood, etc., in describing the effects of magazine explosions, innocently attributing the destruction of buildings and the breaking of windows considerable distances away from the explosion, to the sound-pulse itself. Tyndall, as the "Problem of Human Life" was the first to point out, describes the destructive effects of this so-called "*sound-pulse*" upon the church and village windows of Erith, from an explosion which occurred miles away, never catching even a glimpse of the unquestionable fact that this tremendous condensation or air-wave was caused alone by the thousands of cubic yards of powder gas which was instantaneously generated and added to the air, thus compressing and driving the atmosphere away in all directions; and further, it never occurred to him that the sound of the explosion *per se*, had nothing whatever to do with the destructive effects observed.

Is it not passing strange that such scientists as we have named could have entertained the idea that this mighty addition of gas to the surrounding air played no possible part in this destructive work near an exploding magazine, but that they should really believe it was all due to the "noise," as the writer of the article on acoustics in the "Encyclopedia Britanica" declares to be the case! It is absolutely marvelous that these apparently careful investigators of physical phenomena never thought of *thunder*, and the utter absence of any concussive shock or condensed air-wave resulting from it right where the bolt strikes. Yet a thunder-crash standing within a few feet of the place where the lightning strikes, is without question the most deafening sound that ever addressed human ears.

Why did these great physical investigators never happen to inquire into this suggestive fact that such a deafening sound did not even crack a pane of glass in the very building struck by the lightning, even when believing, as they necessarily did, that all the effects of destruction witnessed at the powder explosion were due alone to a sound nothing like so loud? That this distinction has never been grappled with by any writer on physics, and the fact that not one hint has ever been recorded as to the generated powder-gas being the sole cause of the breaking of distant windows at the time of a magazine explosion, caps the climax of scientific oversight and want of the most ordinary observation.

Now the application of all this reasoning is logical and direct to the case as recorded by Mr. Floyd. We predicted in the "Problem of Human Life" at page 105, when first making these important criticisms upon the superficial investigations which had led to these oversights, that if the concussive shock and sound report of a powder explosion were properly timed it would be found that near to the explosion the concussion or jar would

be felt first and the sound would follow after a sensible interval of time; that at a greater distance the two events would occur simultaneously; but at a still greater distance that the sound would outstrip the air-wave, reaching the station possibly some seconds in advance of the concussive shock. We gave the reasons in detail for these various positions and predictions, and we now declare that every description of an explosion of which we have since heard during an interval of nearly ten years, where any reference has been made to this phase of the problem, has agreed exactly with our predictions.

The amount of the whole matter is, that the sound report and the condensed air-wave, which had always been looked upon as identical, are demonstrated by all such facts as that observed by Mr. Floyd to be two separate phenomena, or otherwise how could there be any difference observed in the arrival of the concussion and sound-report, however near to or far away from the exploding magazine? The fact of absolute simultaneity not being observed at all distances, is an overwhelming refutation of the wave-theory, and shows conclusively that the notion of sound consisting of condensations and rarefactions of the air, when the very largest of such condensed pulses had no sound whatever connected with it, proves sound to be something entirely different from air-waves.

Plainly, if sound were constituted of atmospheric condensations at all, the enormous and unparalleled intensity of a thunder-clap ought to shiver not only every pane of glass in the building where the bolt strikes, but ought to blow the house itself into fragments. But it does not stir a feather nor move anything else, unless it is some tensioned object tuned in unison to the pitch of the thunder-tone itself, on the law of sympathetic vibration. This argument against the wave-theory stands unanswered and unanswerable, and will so stand forever as one of the original and earliest triumphs which led to the Substantial Philosophy.

THE UNITY AND ORIGIN OF FORCE.

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

As force is the source of all motion and order, the soul of all life and utility, there is nothing, perhaps, in the whole range of science that deserves to be more carefully studied, for the purpose of arriving, if possible, at just conclusions with regard to its true nature and character. Indeed, this is the only way the great problem of the universe can ever be scientifically solved. Accordingly, for some years past scientists, as a class, have devoted less and less thought to *matter*, and more and more to *force*. And yet there are very few subjects upon which there has been more confusion of ideas than there has been upon this, both as it respects its nature and origin.

One of the strange things to me is to find that some scientists claim that force is a mode of motion. It would seem impossible that any one should fail to understand that force is not a mode of motion, but *power*; and that motion is the direct *result* of power. Force may be defined as an immaterial indestructible entity. It could not well be less, since it produces, and carries on unceasingly, all the motion in the universe. But *motion* is not an entity in any sense, for as soon as a body comes to a rest, as is frequently the case, its motion absolutely ceases to exist. Hence motion is often transitory, but force is abiding. It is true that in many cases force to us may seem to be lost, or dissipated, but it is only because we fail to trace it. A force may be so divided as to produce a thousand different results, yet no part of the original force has been annihilated. It may not only be seen in these manifestations, but these in turn may produce a thousand more. Force acts as a *cause*, and motion as the *effect*. Hence the speed of the cannon-ball is the direct result of the force set free by the ignited powder, that sends it on its mission of destruction. The inert ball could never have moved itself. To move, it must be moved upon by an independent outside force. Hence its velocity, other things being equal, is always in proportion to the amount of force applied. The force, as relates to the ball, is subjective, the ball itself is objective. Force, instead of being a mode of motion, is the exponent of motion.

Furthermore, inasmuch as force produces motion, as we have seen, and yet, according to this theory, force is a mode of motion, it is therefore evident that motion must necessarily be force. It therefore plainly follows that force can and does produce itself, which legitimate deduction is not only unphilosophical but absurd. Besides, force, instead of being motion, very often antagonizes, resists, and, in fact, destroys motion, as it does when applied to arresting the revolutions of the side-wheels of a steamer when running at the top of her speed; but if force be motion, as is claimed, then force can, and in such cases actually does, destroy itself, which is also an absurdity; and consequently is positive proof that force is not motion. How strange it seems, that any one should fail to perceive the difference between force and motion when they so clearly stand to each in the relation of cause and effect.

By others it has been claimed that force is a property of matter, and therefore material. But how this is possible, in view of the well-known fact that matter, *per se*, is absolutely inert, they have failed to tell us. That the *vis viva*, however, is not a property of matter, but that it is essentially different, is manifest in this, that at the moment of death, although the physical remains, and even organization for a time, the vital force having departed, *inertia* follows with the stillness and silence of the grave. It is unreasonable to suppose that matter could have originated force, as in that case the less would have produced the greater. For force, which is the great organizer of matter, must not only be superior to it, but also have been prior, as it must have existed before organization commenced. That force is not a property of matter is evident from the fact that gravitation will act on distant bodies even through a *vacuum*. The idea of gravitation being a property of matter appeared so absurd to Newton that, in his third letter to Bentley, he says: "It is inconceivable that inanimate brute matter should, without the mediation of something else, which is not material, operate on, and affect, other matter without mutual contact, as it must do, if gravitation, in the sense of Epicurus, be essential and inherent in it; and that is one reason why I desired you would not ascribe innate gravity to me. That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws."

That light, heat, electricity, magnetism, chemical affinities, etc., are equally immaterial, there can be no reasonable doubt. The correlation and conservation of forces are more and more establishing the unity of all the forces, and that they are merely different phases of one great original force. For instance, heat may be converted into light, into electricity, into magnetism, or chemical affinity; just as electricity can generate heat, light, magnetism, etc. In fact it is said that all these forces can be obtained from a single ray of sunlight.

The evidence of unity or oneness even between the physical, vital, mental, and spiritual, is seen in the light of this law of correlation. A great portion of our muscles contract and relax in obedience to our wills, thereby proving that the *mental* force can be, and is in every such instance, actually converted into the muscular or physical. This certainly proves that these two forces are not diverse in nature. Indeed, it seems to be well-nigh a philosophical necessity to regard force as a homogeneous, immaterial entity, and to refer all the manifestations of force back to some antecedent energy from which they emanate, and in which they inhere.

The truth is, all investigation of dynamics tends more and more to show that all forces are uncreated, indestructible, immaterial, and homogeneous entities; and consequently as necessarily, as it seems to me, having their origin and unity in one great intelligent personal will-force. Or in other words, *force* is the omnipotent and omnipresent energy of an all-wise Creator, who "upholdeth all things by the word of His power." The Duke of Argyll says:

"We know nothing of the ultimate seat of force. Science, in the modern doctrine of the conservation of energy, and the convertibility of forces, is already getting something like a firm hold of the idea that all kinds of forces are but forms or manifestations of some one central force issuing from some one fountain-head of power. And even if we cannot certainly identify force in all its forms with direct energies of one omnipotent and all-prevading Will, it is, at least, in the highest degree unphilosophical to assume the contrary—to speak or to think as if all the forces of nature were either independent of or even separate from the Creator's power."

Who knows but what Paul referred to *force* when he says: "The invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and God-head." Here the unseen things are designated as *eternal power*, and which is clearly seen by and through the material. It seems to me that I cannot be mistaken in supposing that reference here is directly made to the immaterial, intellectual, and omnipotent Will Force of the Almighty which upholds, guides, and governs not only our world, but the entire universe. This important truth is destined to shiver the tottering fabric of materialism into fragments at no distant day.

TOMKINS COVE, N. Y.

THE WAVE-THEORY OF SOUND CONSIDERED.

BY HENRY A. MOTT, PH. D., L. L. D.

Before presenting any of the numerous difficulties in the way of accepting the wave-theory of sound as correct, it will be best to briefly represent its teachings, so that the reader will see that the writer is perfectly familiar with the same.

The wave-theory of sound starts off with the assumption that the atmosphere is *composed of molecules*, and that these supposed molecules are free to vibrate, when acted on by a vibrating body. When a tuning-fork (for example) is caused to vibrate, it is *assumed* that the supposed molecules in front of the advancing fork are crowded closely together, thus forming a condensation, and on the retreat of the fork are separated more widely apart, thus forming a rarefaction.

On account of the crowding of the molecules together to form the condensation, the air is supposed to become more dense and of a higher temperature, while in the rarefaction the air is supposed to become less dense and of lower temperature—but the heat of the condensation is supposed to just satisfy the cold of the rarefaction, in consequence of which the average temperature of the air remains unchanged. The supposed increase of temperature in the condensation is supposed to facilitate the transference of the sound-pulse, in consequence of which sound is able to travel at the rate of 1095 feet a second at O° C, which it would not do if there was no heat generated. In other words, the supposed increase of temperature is supposed to add about 1-6 to the velocity of sound.

If the tuning-fork makes 256 full vibrations in one second, then there will be 256 sound-waves in one second, of a length of 1095-256, or 4.23 feet, so that at the end of a second of time from the commencement of the vibration. the foremost wave would have reached a distance of 1095 feet at O° C. The motion of a sound-wave must not, however, be confounded with the motion of the molecules which at any moment form the wave; for during its passage every molecule concerned in its transmission makes only a small excursion to and fro, the length of the excursion being the amplitude of vibration, on which the intensity of the sound depends.

Taking the same tuning-fork mentioned above, the molecule would take 1-256 of a second to make a full vibration, which is the length of time it takes for the pulse to travel the length of the sound-wave.

For different intensities the amplitude of vibration of the molecule is roughly given as 1-50 to 1-1,000,000 of an inch. That is to say, in the case of the same tuning-fork, the molecules it causes to vibrate must either travel a distance of 1-50 or 1-1,000,000 of an inch forward and back in the 1-256 of a second, or in one direction in the 1-512 of a second.

Having now clearly and correctly represented the wave-theory of sound without touching the physiological effect perceived by means of the ear, we will proceed to consider it. We must first consider the state in which the molecules exist in the air before making progress. The present science teaches that the diameter of the supposed molecules in the air is about 1-250,000,000 of an inch (Tait.) That the distance between the molecules is about 8-100,000 of an inch. That the velocity of the molecules is about 1512 feet a second at O° C in its free path. That the number of molecules in a cubic inch * at O° C is 3,505,519,800,000,000,000, or 35 followed by 17 cyphers $(35)^{17}$, and that the number of collisions per second that the molecules make is according to Boltzmann for hydrogen, 17,700,000.000—that is to say, a hydrogen molecule in one second has its course wholly changed over seventeen billion times a second. Assuming seventeen billion or million to be right for the supposed air molecules, we have a very interesting problem to consider.

The wave-theory of sound requires, if we expect to hear sound by means of a Koenig C^3 fork of 256 vibrations, that the molecules of the air composing the sound-wave, must not be interfered with in such a way so as to prevent them from traveling a distance of at least 1-50th to 1-1,000,000th of an inch forward and back in the 1-256th of a second.

The problem we have to explain is how a molecule traveling at the rate of 1512 feet a second through a mean path of 8-100,000th of an inch and colliding seventeen billion or million times a second can by the vibration of the C^3 fork be made to vibrate so as to have a pendulous motion for 1-256th of a second and vibrate through a distance of 1-50th to the 1-1,000,000th of an inch without being interrupted so as to change or mar its harmonic motion.

It is claimed that the range of sound lies between sixteen vibrations and 30,000 (about)—in such extreme cases the molecules would require 1-16 and 1-30,000 of a second to perform the same journey. It must not be forgotten that a mass moving through a given distance has the power of doing work, and the amount of energy it will exercise will depend on its velocity. Now, a molecule of oxygen or nitrogen, according to modern science, is a mass 1-250,000,000 of an inch in diameter. and an oxygen molecule has been calculated to possess an absolute weight of 0.0000000054044 *ounce*. Taking this weight, traveling with a velocity of 1512 feet a second through an average distance of 8-100,000 (1-12,500) of an inch, the battering power or momentum it would have can be shown to be, in round numbers, capable of moving 1-250,000 of an ounce, or capable to overcome the inertia of 1513 molecules of oxygen, if supposed at rest. Now, when the C^3 tuning-fork has been vibrating for some time, but still sounding audibly, Prof. Carter determined that its amplitude of stroke was only the 17-000 of an inch, or its velocity of motion was at the rate of 1-33 of an inch in one second, or eleven inches in one hour. Assuming one prong to weigh two ounces, we have a two-ounce mass moving 1-17,000 of an inch with a velocity of 1-33 of an inch in one second; the prong then has a momentum sufficient to move or overcome the inertia of 93,000 molecules from a state of rest.

The energy then exercised by the advancing prong is quite sufficient not only to overcome the momentum the molecules normally have, but is capable of directing the molecules and controlling their motion so that they can make their to and fro journey without being affected by the surrounding bombarding molecules; that is, assuming that the prong in its advancement imparts to the molecules it hits, sufficient energy to overcome the normal energy they possess. If it imparted all its energy, then naturally the prong would come to rest; if it only imparted at one stroke a little more energy than is necessary to overcome the normal energy the molecules contain, then naturally as the molecules thus set into a *forced* vibration have work to do, the energy thus imparted will be gradually utilized.

It would be difficult to discover not only where a locust manufactures sufficient energy to impart to a molecule so as to set it in a forced vibration and thus enable a pulse of the energy imparted to control the motion of the supposed molecules of the air for a mile in all directions, but it is difficult to estimate the amount of energy the locust must expend. Surely, if the total energy of the advancing prong was all applied at once and it was only able to overcome the inertia of 93,000 molecules (not supposed to possess any momentum of their own), then only the molecules in a space containing 93,000 would be affected, and if the normal momentum the molecules possess be taken into consideration a very much smaller space would be affected.

Some seem to imagine, without thinking, that the elasticity of the air can add additional energy. This is perfectly erroneous, for elasticity is a mere property, which permits a body to be compressed on the application of a force, and to be dilated by the exercise of the force stored up in it by the compression. No property of the air can impart any energy. If the momentum of a molecule, or a series of molecules extending in all directions for a mile, is to be overcome so as to control the character of the movements of the molecules, then sufficient *external* energy must be applied to accomplish the task; and when we think that one cubic inch of air contains 3,505,519,800,000,000,000 molecules, say nothing about the number in four cubic miles, which a locust can transmit sound through, we are naturally compelled to stop and think whether the vibration of supposed molecules has anything, or can have anything, to do with the transference of sound through the air.

If control was only had of the distance the vibrating molecule travels from its start to the end of its journey, then only the intensity of the sound would be under subjection, but if at every *infinitesimal instant* control was had of its amplitude of swing. then the character. timbre, or quality of the sound is under subjection.

It is evident, then, that the blows nominally given by one molecule to another in their supposed constant bombardment must not be sufficient to alter the character of vibration. A molecule set in oscillation by a sounding-body must be maintained to preserve the timbre or quality of the sound in process of transmission, for if any such alteration should take place then, naturally, while the pitch and, perhaps, intensity might be transmitted, the quality of the sound might be destroyed.

Again, it is certain that no molecule can perform two sets of vibrations, two separate movements, at the same time, any more than it can be in two places at the same time. When a band of music is playing, the molecule is supposed to make a complex vibration, a resultant motion of all acting influences, which the ear is supposed to analyze. It remains for the mathematician to show how a molecule influenced by twenty or more degrees of applied energy, and twenty or more required number of frequencies of vibration and *forms* of vibration, at the same time can establish a resultant motion which will transmit the required pitch, intensity, and timbre of each instrument.

When a molecule is acted on by various forces a resultant motion is unquestionably produced; but this would only tend to send the molecule forward and back in one direction, and, in fact, a direction it might have taken in the first place if hit properly. How any resultant can be established as regards the time necessary for the molecule to take so as to complete a full vibration for the note C_{11}, which requires 1-16 of a second, and for other notes up to C^{IIII}, which only require 1-4176 of a second, as when an orchestra is playing, is certainly beyond human comprehension, if it is not beyond the "transcendal mathematics" of the present day.

Unquestionably the able mathematicians, Lord Raleigh, Stokes, or Maxwell, if the problem were submitted to them, would start directly to work and deduce, by so-called higher mathematics, the required motion the molecules would have to undergo to accomplish this marvelous task—the same as they have established the diameter of the supposed molecules, their velocity, distance apart, and number of bombardments, without any shadow of *positive* proof that any such things as molecules exist. As S. Caunizzano has said, "some of the followers of the modern school push their faith to the borders of fanaticism—they often speak on molecular subjects with as much dogmatic assurance as though they had actually realized the ingenious fiction of Laplace, and had constructed a microscope by which they could detect the molecule and count the number of its constituent atoms."

Speaking of the "modern manufacturers of mathematical hypothesis," Mattieu Williams says: "It matters not to them how 'wild and visionary,' how utterly gratuitous any assumption may be, it is not unscientific provided it can be vested in formulæ and worked out mathematically. These transcendental mathematicians are struggling to carry philosophy back to the era of

Continued on page 191.

* 6,000,000,000,000,000,000,000 in 1 c. c.—Sir Wm Thompson.

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

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THE SUBSTANTIAL PHILOSOPHY.*

BY THE EDITOR.

(*Continued from last month, page* 171.)

AT this juncture in our preparatory investigations we were necessarily led to consider the essential nature as well as proper philosophical classification of the various *substances* of nature, embracing as they must, according to the new departure, not only all material things of whatever grade of density or tenuity, but also all classes of entities above the material or corporeal plan of existence, such as the imponderable forces, some of which had in times past by one or another investigator been looked upon as substantial though material entities in some sense of that word. The idea of *immaterial substances*, by which we defined such entities as could permeate or pass freely through solid bodies in defiance of material conditions, was one of the pecular and original features of Substantialism as well as one of the stumbling blocks of the regular scientist whose education and habits of thought had been such that he could not conceive of *substance* that was not *matter* in some degree of attenuation or refinement.

This common but circumscribed view of substance, as only a term synonymous with matter, forced us carefully to consider and point out the true scientific distinction which should be kept up between these two terms. We explained that while *substance* was the universal term denoting all entities, of whatever form or variety in the universe, *matter* was a specific or limited term embracing but one general department or classification of the universal entities included in the term substance.

This essential distinction is aptly illustrated by innumerable references to minor grades and classifications existing among material bodies all around us and well known to every observer. Those who have experienced a mental difficulty in conceiving of a difference between *substance* and *matter*, should reflect that while all *wood*, for example, is *matter*, it by no means follows that all *matter* is *wood*; matter, in this case, being the generic, or more general term, while wood is the specific term. While all *oak*, for example, is *wood*, no one would be so short-sighted, by education or habits of thought, as to conclude that all wood must therefore be oak. While all iron is metal, would any of my auditors insist therefrom that all metal, as a consequence, must be iron? While all horses are quadrupeds, it would be utterly false to assert that all quadrupeds must therefore be horses. And so on with thousands of equally pertinent illustrations existing everywhere in the system of nature. How plain, then, must it be to the thoughtful student of science that, while all matter is substance, it by no means follows that all substance is matter, the generic or more general term substance, including the minor or more specific term matter, but not *vice versa*.

Thus we labored to pave the way for Substantialism by first pointing out this universal classification of all the entities or objective existences in nature, dividing them into material and immaterial substances, and thereby showing in advance that light, heat, sound, gravity, magnetism, cohesion, electricity, life, mind, soul, spirit, including God himself, might be as really substantial, or as really entitative, as is the earth we inhabit, without such forces or entities in any degree being constituted of matter.

This initial point in the preliminary work of the substantial reconstruction of science having been made clear, we were abruptly met by the question—what definite proof is there that any one of the physical forces named, as a test case, is a real substance, by which rationally to infer the substantial nature of all? Can any single form of force be selected and specified as a guarantee for the general claim of Substantialism that force *per se* is an immaterial substance?

To meet this interrogatory fairly and decisively, as it had to be met in order to form a scientific basis for a new physical philosophy, we made our selection, and took from the list the force of *magnetic attraction* as the crucial substantial test of all the other forms of physical force or phenomena-producing causes. We could have selected other forms, but magnetism answered every purpose. Let us, then, most carefully present to the thinking ladies and gentlemen present the drift of our reasoning and experimental investigations with the force of magnetism, by which we were confirmed in this initial stage of the Substantial Philosophy.

No one needs to be informed in these enlightened times that a permanent steel magnet will lift a piece of iron even when separated from it at a considerable distance; while it is equally true, as a physical axiom, if not as well understood, that no body can thus act on another and distant body so as to move or displace it, thus overcoming its inertia, unless an actual moving substance of some kind, visible or invisible, tangible or intangible, connecting the two, is caused to act upon such displaced body. Hence, there must be, in the very necessity of the case, a substantial something—a real entity—reaching out from the magnet to seize upon and move the distant piece of inert iron, or else by every principle of rationality known to man that piece of iron would not move. This must be true in the very nature of physical law, or we have an effect without a cause—a manifest and self-evident impossibility.

We thus demonstrate as completely as any physical truth is susceptible of demonstration in nature, that the force which issues from the permanent magnet and causes the distant bar of iron to move, is a real, substantial entity; and being unrecognizable by any one or more of our senses, and not being subject to any chemical or mechanical test whatever, by which to prove its existence as a refined form of matter, and finally, acting, as it does, with precisely the same amount of moving power through the most impervious material bodies, such as intervening sheets of glass, and to the same distance exactly as if nothing but the air were interposed, we are irresistibly compelled to accept magnetic force not only as a *substance* but as an *immaterial substance*. So wholly unrecognizable by sense or by any physical test is this real substance which reaches out from the magnet to move the distant piece of iron, that but for our higher faculty of reason in judging of its substantial existence from observing its actual mechanical effects, we could not know of its existence at all. What better proof does the unbiased atheist want for the probable existence of a God, than the moving, working energy of this intangible, invisible, unrecognizable and incomprehensible substance called magnetism? as Joseph Cook asked of his Cleveland audience in his eloquent and powerful style in his late lecture in that city.

To teach that this force which moves the distant bar of iron is the rotary motion of the molecules of the steel magnet itself, as does Sir William Thomson, in his great lecture before the students of the Midland Institute, at Birmigham, England, is to trifle with our common sense, if not almost to insult our reason. Would that great physicist try to pull a boat to the shore by causing the molecules of the wharf to vibrate? Does it occur to any one of my auditors just here that possibly the vibration of the steel molecules and atoms of the magnet might communicate their tremor to the air, and thus cause the distant iron to move? If so, let him try to pull a boat from the middle of a stream by working up a powerful tremor of the bank, thereby exciting the intervening air or water into vibratory motion, and see how long it would take him to bring the boat to land.

Vibration or mere rotary tremor manifestly can neither pull, push nor lift any inert object, much less can it do so when such tremor exists only in the imagination, as in the case of Sir William Thomson, instead of in the molecules of the steel magnet themselves. Who told that physicist or any other physicist that the steel molecules and atoms of the magnet are in a state of rotation, thus constituting the force of magnetism? Nay, who gave him or any one else the information that any such things as molecules and atoms exist in any material body? Should any one in this audience suspect for a moment, from education or habits of thought, that molecules and atoms are necessary to, or have any rational existence in material bodies, we beg of him or her to read the masterly series of papers in the fifth volume of THE MICROCOSM on the constituion of matter, witten by that distinguished chemist and confirmed Substantialist, Dr. Henry A. Mott, of this city, whom I have the honor of numbering among my ablest coadjutors in working out and formulating the Substantial Philosophy.

But suppose molecules and atoms to exist in steel, as modern science assumes, and that they are in a state of vibration as Sir William Thomson teaches, in order to constitute the force of magnetism, what force is it which causes the molecules to vibrate? That's the question. Do these supposed inert particles of metal rotate or vibrate of themselves? or are they thrown into rotation by the magnetism? If the latter, are there two magnetisms, one back of the steel molecules to cause their rotation, and the other the rotary motion itself thus caused by which the distant piece of iron is displaced? If so, why can't the first magnetism, back of the molecules, and which causes them to vibrate take the place of the second magnetism—this so-called vibratory motion—and thus act direct upon the distant piece of iron? The truth is, this doctrine of the oscillation of the molecules of material bodies as all there is of the forces manifested in nature, when

* A paper read before the American Institute of Christian Philosophy, in this city, on the evening of Feb. 8, 1887.

such molecules can no more move without a substantial force behind them than can a cargo of cannon balls, is one of the most childish pieces of philosophical theorizing ever incorporated into a text-book.*

And in this very jumble of contradictory ideas about moving molecules and atoms, by which physicists are trying to avoid the acceptance of Substantialism, lies the wave-theory of sound, upon which have been cemented the undulatory theories of light and heat, with all the other mode-of-motion superstitions of physical science. In opposition to this inexplicable doctrine of the oscillation and continual bombardment of material molecules, we present the simple, beautiful, and consistent doctrine that this magnetic force itself is a substance as real, though immaterial, as the magnet from which it issues or as is the iron bar which it displaces, and which it will displace all the same if suspended in a Torricelian vacuum, thus proving that the rotation of material particles has nothing to do with it.

And here let me state a universal law which is very simple and very beautiful. No form of physical force except that of *cohesion* acts directly upon matter, or affects it in any way. *Cohesion*, according to substantialism, is the regnant or governing force in the physical realm, and every other form of force, such as heat, light, sound, electricity, magnetism, or gravitation can only affect or influence a material body by correlation with this reigning physical force of cohesion. If heat takes possession of a body and melts it, it acts alone upon the cohesive force within that body. If light passes through a body, it is alone because cohesion has so arranged the particles of that body as to permit light to pass. If electric force passes through one body with greater facility than through another, it is solely on account of the greater co-operation of cohesive force as it exists among the material particles constituting such body. This true principle of physical science, as so often illustrated by practical tests in THE MICROCOSM and THE ARENA, can be successfully applied to every physical problem that can be sprung, and will surprise the student at the ease with which the most occult mysteries of nature can be solved.

From all this, and from other considerations too numerous to mention, the conclusion is irresistible that this test force of magnetism is a real substantial but immaterial entity. And reverting again to the solid indorsement of Substantialism by the distinguished Boston lecturer, what a practical lesson is there in this wonderful magnetic substance to the materialist who has ever thought of doubting the possible existence of the soul after death, or even of the existence of a personal and intelligent First Cause. This demonstrated fact that an actual, intangible, and immaterial substance, defying recognition by any of our senses or by any physical tests as matter passes off to a distance, doing mechanical work, and at the same time a substance whose progress no intervening body can impede, is a demonstration to any mind that is capable of reasoning philosophically that a substantial, powerful, and intelligent God may exist, and that atheism is just as unreasonable as the Psalmist made it out to be when he declared that it was only the fool who could say even in his heart that there is no God.

To admit, as we are thus obliged to do, the existence of a substantial and immaterial entity that can act and do mechanical work, is to admit as much as the existence of an immaterial, invisible, intangible, and substantial entity that can think, see, hear, and plan the work it executes; and this is all there is in the admission of the existence of the God of the universe; since, when we have admitted an immaterial and unrecognizable entity or being capable of thinking and acting outside of all material conditions, who dares to set a limit to his ability to think and act this side of infinity? And as materialists at every turn are met with hundreds and thousands of ultimate mysteries, which the mind can never penetrate, and as impossible to solve as is the mechanical action of this magnet, or as is the intelligent action of God himself, as shown in his works of design and artistic taste all around us, is it not the part of finite wisdom to accept reverently the one great, final, and infinite mystery of a self-existent and intelligent Creator, merging all other mysteries into him, and thus, at a single stroke of logic, wiping out all the minor problems of the universe?

Let us now ask, with this demonstration of substantial magnetism before us, is there one person present who can rationally believe that any other form of physical force in nature, producing similar results, or causing analogous physical effects, such as those of electricity, heat, gravitation, etc., can do so only as substantial entities and by substantial contact with the bodies affected? Can electricity, for example, shiver a forest tree to splinters as some tremulous mode of motion of the molecules of a distant thunder cloud? Can gravital force pull a stone to the earth with crushing power, and this force be nothing but a mode of motion, or the molecular vibration of the earth's material substance, hundreds of miles, for that matter, away from the stone? Surely Sir William Thomson could just as reasonably teach his Midland students that gravity was nothing but the rotary motion of the molecules of the ground, as that magnetism was only the rotation of the metallic molecules of the magnet! Then again, does heat melt iron by the tremulous motion of its molecules? or does this substantial heat-force, by correlation with the substantial force of cohesion, partially overpower the latter, and thus reduce the mass to a molten state, by causing cohesion partially to let go of it, as Substantialism teaches? Does heat consume a mass of combustible material as a mode of oxygenous motion, by causing a tremor in the molecules of the wood? or does it do its work as Substantialism teaches, by this one form of force overpowering cohesive force, thus converting the latter, in both the wood and the oxygen of the air, into additional heat-force for keeping up and extending the conflagration?

In ordinary matters, no intelligent man would be so unwise as to suppose nature abruptly to depart from a concurrent and harmonious chain of proceeding to a perfectly incongruous process for accomplishing analogous ends, unless from the absolute necessities of the case such departure were sustained by unquestionable evidence. Yet, some modern physicists of our acquaintance, with the most conclusive and admitted evidence of the substantial character of several forms of force, such as heat, gravitation, electricity, and magnetism, right before their eyes, and without one good and sufficient reason for variation from the uniform plan, will assume an abrupt departure from such substantial basis of cause and effect to mere motion—an absolute nonentity—as all there is of sound and light!

Not so with the writer of this humble paper. When he had demonstrated beyond the possibility of doubt the entitative nature and character of one immaterial form of force (magnetism), his sense of logical propriety and necessity compelled him to regard every form of force in nature as equally a substantial entity, unless concurrent necessities to the contrary compelled a different conclusion. But he found no such necessities for inferring a departure from the uniform substantial nature of all force after having determined positively that one form of force was a substantial entity. On the contrary, he found by a critical examination of all the accessible phenomena of the different forces, that in each separate case the same substantial character of force *per se*, as a cause adequate to produce the physical effect observed, became a necessity. To tolerate any other inference for a moment he regarded as the extremity of weakness on the part of grave investigators of physical phenomena in their attempts to solve the problems of nature's harmonious processes and operations.

Besides, he reasoned from the systematic order and unity everywhere maintained under the reign of law throughout the physical domain, that no such abrupt want of consistency and continuity was admissible or supposable in this orderly system of things as a leap from physical forces acting as substantial phenomena - producing causes to sound, heat, and light—equally causes of physical phenomena and sensuous effects, but totally destitute of any substantial nature or character. What object could nature have had in so arranging her system of things that after constituing *magnetism*, for example, a substantial entity, it should constitute *heat* but the motion of ether waves—the one, as real substance, pulling a piece of iron, the other melting it as wave-motion?

So intrinsically absurd is this motion-theory of heat, as consisting of ether-waves, that Prof. Tyndall in his great volume on "Heat as a Mode of Motion," vaguely confines his undulatory doctrine to "radiant heat," as if there was one kind of heat that did not radiate, and thus half-conceding that this nondescript heat, not "radiant," might be substantial! A more prodigious and pitiable scientific tangle than this formidable attempt to make "radiant heat" mere motion, while virtually abandoning non-radiant heat to the realm of substantial entities, exists nowhere in print.

After thus comparing the phenomena of the various forces, the writer of this paper went into a critical analysis of the five senses, and made a careful examination of their relation to each other and the manner in which they are variously addressed and affected, from the lowest to the highest throughout nature's economy, in order to determine if the harmonious regularity there manifested and maintained did not justify and bear out his general conclusions concerning the harmonious order of the physical forces and their uniform substantial nature. The parallel was singularly maintained.

Take the fact that the sense of touch or tactility can only be addressed and affected by the actual contact of the body felt, whether it be material or immaterial; take the fact that the sense of taste can only be impressed by the substantial flavored particles themselves, as they come in contact with the palate or gustatory membrane; take the fact that the olfactory sense can only be affected and impressed by the actual contact of the substantial odorous particles as they emanate from the odorous body and strike the nasal membrane, and then we ask is it reasonable—is there a grain of scientific or philosophical rationality in the current assumption, that as soon as the sense of smell had been organized for receiving its impressions by the substantial contact of odorous particles themselves, nature took an abrupt leap from this substantial entity, odor, to nonentitative motion in sound for the sense of hearing? Would it not have been more in keeping with reason and the consistent harmony of nature's laws and processes to have kept right along on the substantial basis of contact as the physical cause of sensuous effects for all the avenues to animal perception than to have changed from substance to mere motion? Was there any necessity for such change according to all rational analogy?

Why might not sound as a substantial

* Those desiring to see this molecular theory more fully and elaborately disposed of, should read the leading editorial in the March number of this volume of THE SCIENTIFIC ARENA, on "Motion Matter, Force, Energy," beginning at page 153.

force, analogous to substantial electric currents, have addressed our auditory nerve in pulses, and thus have produced the complex sensations of sound, as readily as can substantial odor produce the equally complex sensations of smell, without any sort of undulatory motions or superpositions either of the air or of the nasal membrane? What reason or consistency was there in the system of nature for adopting two different and incongruous arrangements by which three of the five senses should receive their impressions by the substantial contact of the bodies adapted to their sensuous necessities, and that the remaining two senses should be addressed on an entirely different principle, namely, undulatory or wave-motion, when by a still more refined form of substance both the senses of hearing and seeing might have received their sensuous impressions by substantial contact almost exactly similar, or at least entirely analogous to the action of odor in the sense of smell?

Newton, during most of his life, advocated the emission or corpuscular theory of light, supposing that luminous rays consisted of very finely attenuated material particles shot through space at the enormous velocity of about 180,000 miles a second. How he could have entertained such an improbable idea that any material particles, however small, could enter the eye at such velocity without damage to so delicate an organ, is a matter of profound astonishment to modern physicists. The reason, however, is plain to the writer, and consists in the fact that it had never entered the mind of that great philosopher that a vast preponderance of natural substance does not consist of matter at all.

Had Newton caught a glimpse of the elementary principles of Substantialism, namely, that substances are divisible into material and immaterial entities, and that streams of real substantial magnetic force, that will lift bars of iron, may enter the eyes and circulate through the brain with intense currents without being felt or recognized by the most sensitive organism, he might easily have maintained his substantial theory of light without being forced to succumb to the invincible logic of Huygens, directed as it was against his untenable notion of material light-particles. Had Newton, when attacked by Huygens upon the absurdity of his little material balls shot into his eyes from the sun at the known velocity of light, been a Substantialist, he could quietly have stood his ground, folded his arms, and replied, that substances are of two kinds, immaterial as well as material, and that light, being an immaterial substance, no more produces a physical effect upon a human body except to cause its appropriate sensation, than can a substantial stream of magnetism put out the eyes by entering them, no more than can a stream of substantial odor be heard, than can a stream of substantial sound be smelt, or than can a stream of substantial light be tasted.

(Concluded next month.)

SOME MISTAKES OF INGERSOLL.

Does Stoppage of Motion Generate Heat? Joule's Unit, Etc.

BY THE EDITOR.

In the lecture of Robert G. Ingersoll, entitled "Some Mistakes of Moses," he picks out as one of these glaring mistakes the command of Joshua for the sun to stand still for a certain period, etc. He accepts for his criticism the common interpretation that Joshua simply meant for the earth to stop revolving on its axis, which would cause the sun in appearance to stand still. He remarks:

"I don't believe that Moses knew that the earth was turning on its axis at the rate of a thousand miles an hour; because, if he did, he would have understood the *immensity of heat that would have been generated by stopping the world.* It has been calculated by one of the best mathematicians and astronomers, that to stop the world would cause as much heat as it would take to burn a lump of coal three times as big as the globe." (See Tyndall's "Heat as a Mode of Motion," sixth edition, page 11, in which the same scientific views are set forth.)

We refer to this teaching of science, not only to correct a radical mistake of Ingersoll, but to place on record a new law of physics, which, if correct, overturns much that is taught in the books upon this subject of the supposed generation of heat by the sudden stoppage of a moving body. Up to the appearance of our second editorial in reply to Robert Rogers on the heat-problem (MICROCOSM, Vol. V., page 160), we assert that no correct view of the generation of heat by the conversion of mechanical force had appeared in print. We say this advisedly and without boasting, for up to that time it was universally supposed, as taught all through Prof. Tyndall's "Heat as a Mode of Motion," that the heat observed in compressed air was actually generated by the conversion of the mechanical energy which did the compression. Our universal law there laid down and elaborated, *that the heat observed in compressed air was already there before compression, only in less dense or intensified condition,* so completely overturned the old views on the subject, that candid scientists who have since examined it not only admit its unanswerable character, but acknowledge their surprise that a law of physics so plain and self-evident had not before been discovered and recognized.

The law thus referred to has irresistibly prepared the way for another law equally broad and revolutionary, and one just as new to science, namely, *that no heat whatever is generated by the stoppage of a moving body, however suddenly, or whatever its size or velocity of motion, and that any heat observed in a body thus instantly stopped is caused, not by the stoppage of motion per se, but by the friction of its substance in rubbing against itself through the process of indentation or becoming flattened.*

The law thus announced may be enlarged upon by another law in close relation to it, namely, *that the generation of heat, as the result of mechanical force, comes entirely from the conversion of cohesive force into heat-force by frictional disturbance.* As the mere arrest of motion, *per se*, in a moving body involves no friction, it follows that no disturbance of cohesive force takes place, and consequently no heat is generated. The rubbing of two bodies together causes heat just in proportion to the frictional disturbance of the cohesive force of such abrading surfaces which takes place; while such friction under given pressure, and the consequent disruption of cohesive force, becomes less in exact proportion to the lubrication which exists between such rubbing surfaces. If true anti-friction rollers, instead of lubricants, be employed between true surfaces moving in opposite directions, no disturbance of cohesive force takes place, since no friction occurs, and consequently no heat is generated.

In reaching the universally received conclusion which Ingersoll took advantage of to assail the intelligence of Moses and Joshua, scientific writers first take for granted the truth of the theory laid down in the books, that the sudden stoppage of a swiftly moving body must of necessity generate heat by the conversion of its motion into this form of energy, and to illustrate it, they then superficially select some instance of such stoppage of motion (such as a leaden bullet stopped and flattened against an iron target), and because they happen to observe heat, they shout *eureka* without the least rational inquiry into the true cause of such increase of temperature. Yet a proper degree of intelligent inquiry would have disclosed to them the fact that it was not the stoppage of the bullet's motion at all which warmed it, but the *friction* of its particles against one another in the process of its sudden flattening which caused all the heat observed.

With such intelligent and impartial investigation it would have been found by experiment that in a hardened *steel bullet* fired in the same way against a steel target, so as to allow of very little indentation or flattening, the heat generated would be proportionately reduced: and that if a body could be found which would not condense or distort its form at all by such instantaneous stoppage of motion, thereby causing no friction of its substance against itself, not the smallest degree of heat would be generated by such cessation of motion, notwithstanding the stoppage would be even quicker than in the leaden bullet to the exact extent of its flattening. The great scientists, however, who have experimented elaborately with *soft leaden bullets,* attributing all the heat observed to stoppage of motion, never thought of the trivial experiment of testing a hardened steel bullet *that would not flatten!* All they seemed to want was the leaden bullet which sustained their theory, even though the cause of the heat observed was entirely misunderstood and misrepresented.

Our new law, then, holds good, and challenges refutation by experiment, that, just in proportion as a bullet of lead or other metal will flatten out, or indent and regain its form by elasticity, will heat be generated, because just in that proportion will there be friction among its particles, which alone generates heat; while just in proportion to the incompressibility of the bullet and the target which stops it, will be the absence of such heat.

This being the true science on the subject, though in direct opposition to every text-book published, it is now easy to see the glaring mistake of Ingersoll in supposing, with modern physicists, that the mere stoppage of the earth's revolution on its axis would generate heat equal to that which would result from the combustion of a mass of coal three times the size of this planet! The truth is, if Almighty power should stop the rotation of this earth in open space in one second of time, and without causing *friction* by its indentation or change of form, it would not generate heat enough to ignite a lucifer match. But the great atheist did not know this, having obtained what little smattering of science he does possess from the mistakes of modern scientists. But for such mistakes there would not be half as much talk as there is among infidels about the mistakes of Moses.

In the light of this new law, how puerile is the supposition of astronomers, that the heat of the sun is kept up by the stoppage of the motion of ice-cold meteorites as they fall into that luminary! We once had the unpleasant experience of the sudden stoppage of a lightning express train, which jumped the track and ran into a bank of dirt; and though several persons around us were killed by the crash, we did not observe the slightest increase in the warmth of the cars as we helped to pull them to pieces to get out the wounded passengers. According to the mistake of Ingersoll, this sudden stoppage ought nearly to have set the train on fire.

But it may be asked, what about Joule's world-renowned "heat-unit," as the mechanical equivalent of work which a given falling weight will do? Nothing which we have said contradicts the principle upon which Joule's unit is based, which is not at all upon the mere stoppage of motion, but upon the frictional work which a given weight will

perform in falling a given distance, and the heat which such friction would generate were all the mechanical energy expended by the falling weight converted into heat. The formula of Joule's heat-equivalent is this: That the mechanical energy exerted by the falling of 772 pounds through one foot, if expended in friction, will generate heat sufficient to raise the temperature of one pound of water one degree F. The converse of this, by which the value of heat as the mechanical equivalent of work is claimed to be demonstrated is, *that one degree of heat, as distributed through a pound of water, if utilized to the best possible advantage, would lift 772 pounds one foot high, or one pound 772 feet high.* Upon this dynamic theory of heat as formulated by Joule's unit, are based all the calculations of modern times in determining the amount of mechanical work which ought to be obtained by the consumption of a ton of coal, if all its heat-units could be converted into steam-power and utilized by the engine.

Now, all this looks very well on paper, as mere theory, but we take the liberty of expressing our conviction that a more prodigious error than this same so-called heat-unit of Joule exists nowhere in science; and we further assert our belief that the whole formula on which it is based has fortunately been placed by Prof. Tyndall in the most congenial company of mechanical absurdities in his two formidable treatises on "Heat as a Mode of Motion," and the "Wave-Theory of Sound."

So far from one degree of heat in a pound of water being capable, however utilized, of raising a weight of 772 pounds one foot high, we do not believe that this trifling amount of heat can be made to raise the weight of a single pound one inch high. We believe the whole thing to be a monstrous exaggeration, based upon the erroneous assumption that all the energy exerted by a falling weight of 772 pounds through one foot, as measured by Joule and Meyer, was, or could possibly have been, converted into heat by friction in that pound of water upon which they experimented. We do not believe that even a one-thousandth part of the mechanical energy of that falling weight was converted into heat by friction in raising the temperature of the pound of water one degree F., as shown by Joule; and that by no frictional process known to mechanics could more than a very small fraction of such mechanical energy be thus transformed into heat.

If scientists would just reflect that the heat represented by the difference in the temperature of a pound of water raised from 60 deg. to 61 deg. F., could not be felt by the most sensitive cuticle, they would at once see the absurdity of that amount of heat ever doing the formidable work of raising a one-pound weight 772 feet high! Our tactile nerves will detect the mechanical effort of lifting a fraction of a grain a single inch.

Surely if one degree of heat, put properly to work, would lift a pound of lead 772 feet high and thus create that amount of *motion*, it ought thereby to generate several hundred degrees of heat in the lead, since, according to this very science based on Joule's unit, the mere stoppage of this much *motion* in such a mass of lead after falling that distance would raise its heat at least 300 deg. F.! Reason would tell us that the *generation* and the *stoppage* of 772 feet of *motion* should involve an equal amount of heat; and consequently, if a single degree of heat could thus multiply itself, what hinders the construction of any number of perpetual motions to do all the mechanical work of steam-engines?

Aside from this fact, that no frictional process which is possible to devise could convert even a hundredth part of the energy of this falling weight into heat, we assert that Joule's process for producing such conversion was about the most ineffectual test that could have been made. On examining the accounts of the various experiments of Joule and others, as recorded in the text-books, by which those distinguished scientists reached their final unit of one degree of heat in a pound of water as the equivalent of the fall of 772 pounds through one foot, we find, to our surprise, the friction or rubbing operation to have been uniformly produced *in the water*, with its lubricating quality utilized *as if to avoid the very friction and heat sought to be developed!* Yet such manifest and superficial defectiveness in scientific experimentation has been utterly overlooked by Tyndall, Helmholtz, Sir William Thomson, and other physicists who have recorded the achievements of Joule and Meyer with a flourish of praise scarcely ever awarded to any other discoverers.

Take, as one of their chief experiments, the gearing of the falling weight to a flutter-wheel revolving in the specified pound of water, thereby aiming to heat the water by the friction of the paddles against its particles. Could any plan have been devised to produce less friction and less heat than the passage of these paddles through such a mobile and lubricating substance as water? It is strange that Joule had not oiled his flutter-wheel in order to get more friction and thus to have generated a higher heat-unit in his pound of water! Still Joule, by this very experiment, is reported to have raised the temperature of the pound of water one degree by this 772 pounds' weight falling through one foot.

Instead of this lubricating process of paddling in the very water whose temperature it was designed to raise by friction, we claim to have originated the simple mechanical method of producing the friction and heat by dry surfaces rubbing together outside of the water to be heated, *and then permitting the radiation of such generated heat to take place through a thin partition to the pound of water to be tested.*

We reason that if it be true that a pound of water can be raised one degree F. by the falling of 772 pounds through one foot *by means of a flutter-wheel revolving in this very lubricating fluid*, a properly constructed frictional device, as just hinted, should be able to raise the temperature of the same quantity of water very much higher, to say the least, by a similar expenditure of power. Our principal reason for such belief is the fact that frictional heat, according to one of our laws named herein, results alone from the rupturing of cohesive force by the disintegration of the surfaces in rubbing-contact, a fact which does not occur to any extent in the disturbance of a mobile fluid like water, however violently agitated. Hence our prediction and belief that Joule and his collaborators obtained but a small portion of the heat, as shown in their pound of water, which a better frictional process would have entitled it to receive by the falling weight; while no possible frictional device would be able to convert more than a very minute fraction of the actual energy expended by such falling weight into heat.

We admit the hardihood of this prediction in the face of current science, but we fearlessly venture it nevertheless, subject to tests which we purpose making early in the coming volume of THE ARENA, the apparatus for which we are now preparing, and the experimentation by which to test it, we expect the distinguished Dr. Henry A. Mott to aid us in making.

Readers of this journal, therefore, may look during the coming volume for some revolutionary if not startling scientific developments on the various questions of heat, and which we have no hesitation in believing will wipe Joule's famed unit from the physical text-books as one of the weak conclusions reached during the recent dark ages of science.

P. S.—Since this article was written, we have received a communication from that indefatigable worker and investigator, Capt. R. Kelso Carter, of the Pennsylvania Military Academy at Chester, notifying us that he has carefully tested our claimed new law that no heat will be generated by the mere stoppage of a bullet where no flattening or frictional indentation of its substance takes place. We wrote to him some months ago requesting him to make this experiment for us, and suggested the plan of allowing the bullet on striking a target to drop directly into his hand by a funnel-shaped conductor, thus testing the difference in warmth between two bullets, one *lead* and the other *hardened steel.*

He sends us in a parcel the two bullets he used—the *leaden* one flattened by the compact, and the steel bullet unindented. The Captain improved upon our suggestion by so arranging the funnel device with the target that the bullets on striking would drop directly upon the bulb of a sensitive thermometer; and he reports that while the leaden bullet, thus flattened one-third its diameter by striking, raised the column of mercury a quarter of an inch, not the least perceptible change took place by means of the steel bullet fired in the same way but on whose surface no indentation was made.

We sincerely thank Capt. Carter for this conclusive demonstration of the correctness of the new law as herein set forth, and which has so clearly converted the so-called mistake of Moses into a blunder of Ingersoll, backed by numerous blunders of modern science. And we are glad also to intimate here, for the benefit of future readers of this journal, that Capt. Carter promises, as soon as convenient, to give attention to other laws of physical philosophy announced in these publications, such especially as that of sending a condensed pulse, by means of a piston, through a long tube, by which to determine its velocity as compared to that of sound. (See "Problem of Human Life," page 109, and onward.)

MATERIAL AND IMMATERIAL SUBSTANCE.

REPLIES TO NUMEROUS SUGGESTIONS.

BY THE EDITOR.

IF one idea more than another is peculiar to the Substantial Philosophy, that idea is embodied in the words placed at the head of this article. The entire philosophy of Substantialism rests on the grand and original classification as set forth in the substantialist's creed, that the entities or objective existences embraced in the universal system of nature are divisible into material and immaterial substances.

The difficulty experienced in the minds of average scientific thinkers in their attempts to grasp and comprehend Substantialism, lies in their inability to distinguish between substantial entities that are immaterial and those that are material. They also encounter a similar difficulty in distinguishing between the immaterial *forces* of nature, and the *properties, attributes*, or peculiar *characteristics*, of substantial entities. Let us try for a few moments to shed a ray of light on these special phases of Substantialism by pointing out certain self-manifest distinctions which should constantly be borne in mind during all investigations of physical science.

For example, sensation-producing causes in the natural realm may be both material and immaterial, but they can only affect our sensuous consciousness through the regnant life-force which pervades every animal organism (just as material bodies, *per se*, depend for their palpable and tangible existence on the regnant physical force of

cohesion), which force of vitality is correlated to the mental force of all organic beings, upon which alone consciousness of either pleasurable or painful sensations can be predicated.

If the mental force of the being is of a high order, its correlation to the vital force of this organism is proportionately strong, and the sensuous effects of either pain or pleasure are correspondingly acute and intense. But it is easy to grasp the conception, by a parity of reasoning, that an organic being may be so low in the scale of mental power, like the oyster, for example, that its sensations, either pleasurable or painful, are almost nil; while other living organisms, as in the case of vegetation, which are entirely destitute of mental power, must, in the nature of the correlation of the forces, lose all sensation, however severely the life-force be interfered with, simply for the want of mind to cognize it.

All force, physical, vital, and mental, exists primordially in God himself, the original and only self-existent and uncreated entity from whom, as the universe personified, all existences material and immaterial have evolved. All force comes from Him, and acts only by its inherent power and according to established laws which He has delegated and ordained. One force only, in the entire realm of nature, has, after receiving its delegated power to act, become unto itself an independent and responsible source of action, and that is the higher rational and intellectual force in man. God gave to that force the delegated power to act as much as He did to electricity, heat, light, sound, gravitation, vitality, or animal instinct, but having made man alone in his own moral and intellectual image, that rational form of force alone had delegated to it the independent power of becoming, like the fountain whence it was derived, responsible for its own actions.

Some writers have supposed, even among substantialists, that life or vitality, instead of being a *force*, and consequently an *immaterial substance*, is only a *property* or *attribute* of the living organism. How a bright substantialist could fall into such an error, or see any use in it, we fail to guess. Why not assume, while about it, that soul, mind, and spirit are also non-entitative properties or attributes of living creatures, and thus help Prof. Haeckel to brush from existence all possibility of a future state of being for humanity? We would conceive it more rational to assume *life* to be the basic *force* of all organic being, and mind an attribute or property of life, than to transpose these suppositions. Life, so far from being a mere property of mind, soul, or spirit, is the basic substantial power or force of every animal organism by which nature carries on its vital economy and functions, by which it appropriates the material elements and then assimilates them, whereby to build up and keep up the physical structure, and by which the higher grades of organic beings not only move their bodies, but by which also, in correlation with mental force, the same vital organism is enabled to design and perform intelligent work. This vital force is also the substantial messenger which carries every sensuous effect produced upon an organic being by external substance, either material or immaterial, to the mental laboratory, using the sense-nerves of the system as its tramways and telegraph wires for hurrying such physical impression to the seat of consciousness.

We have just said that sensation-producing causes may be both material and immaterial substances. Odor, as the finest or most attenuated conceivable form of material substance, may, by contact with the nasal membrane, produce an effect upon the organism which the immaterial life-force seizes upon and hurries off along the nerve tramway to the mental workshop where this odorous contact, though material, is translated into the sensation of smell. A hot iron may touch our flesh, and two sensations are the result, one of the material iron, *per se*, and the other of the immaterial heat-force emanating from it, both of which are carried together by the substantial but immaterial vital messenger to the seat of consciousness, where they are analyzed and resolved into their distinct sensations.

A piece of iron of the same temperature of our organism may touch our flesh, thus by its material substance alone producing a tactile effect, which the substantial life-force conveys to the mental seat where the sensation is decided to be mere contact or touch, neither pleasurable nor painful. To suppose, as several correspondents have done, that some immaterial substance, or force, must pass off from this material iron, in order to produce its sensuous effect of tactility, is no more logical than to insist that some immaterial force, besides that of heat, must pass off from the substantial heat-force, as it strikes against our flesh, in order to cause the contact which life-force carries to headquarters for analysis and translation into warmth.

Thus the flavored particles of matter, touching the palate, produce their appropriate effect upon the gustatory membrane, which effect substantial life-force picks up and conveys in like manner to the seat of consciousness to be resolved into a certain taste-sensation by the mental force of the organic being. Nothing but the material particles of the flavored body having peculiar properties, are needed in this contact, in order to produce their sensations, or in other words, no additional or immaterial force needs to go out from such variously flavored material particles to produce this flavor-contact which results in taste, any more than an additional force besides substantial light itself needs to go out from the luminous ray into the optic nerve to complete the effect of such luminous contact. The immaterial light substance itself, by its contact with the retinal nerve-membrane, does all the work of the sensuous impression for life-force to carry away to the mental seat and have translated, just as the contact of material odor completes its work when the particles strike the nasal membrane, where the substantial force of vitality takes up the impression and conveys it to the seat of consciousness for translation, precisely as in the case of taste, touch, seeing, hearing, etc.

One writer suggests that if a piece of gold and one of zinc be taken into the mouth and kept separate no taste will result; but if allowed to touch each other a peculiar *taste* will be noticed. This, however, is only a slight electric current which, by striking the gustatory nerve, seems to affect it as *taste* when in reality it is only *tactility*, the same as if electricity had touched the hand.

But here is where the *property* or *attribute* of a substance whether material or immaterial comes in for explanation, thus to avoid much of the confusion which prevents some minds from grasping the beautiful and consistent principles of Substantialism. If mere contact of material particles produces, for example, the sensation of taste after being conveyed to the seat of consciousness by life-force and there translated by mind-force, why, the objector asks, do not all such material particles of flavored substance taste alike if no force goes out from them to constitute that sensation? We answer that the difference in the qualities of taste as a sensation, is due to the peculiar properties of the flavored substance which impresses the gustatory nerve. Thus we have bitter, sweet, sour, acrid, and a hundred other peculiar properties due to the culinary art. But the contact is the same in every case, since it is manifest that no difference in the character or property of any substance touching the palate would be recognized at all unless life-force should convey such impression to the ganglionic center for translation.

Thus, also, odor, which simply consists of the infinitesimal material particles of the odorous body, may possess different properties, ranging from the most delicate perfumes emanating from flower-gardens, through a hundred gradations of fragrant quality, down to the disgusting effluvium of the sty; yet these diversified properties of odorous particles are only determined by conscious mentality, from precisely the same contacts of the material particles emanating from the different odorous bodies. Surely, those who believe that an immaterial force-substance goes off from matter itself to cause the sensation, would hardly admit that a hundred different kinds of force pass off from the different odors and flavors, to produce the various impressions they make on our consciousness. These sensations are all due to the different properties of the matter making the impressions as carried to our consciousness by the one single force of vitality.

The same is true of the immaterial force of sound whose property of *pitch* in our sensations is determined by the number of precisely similar external contacts, per second, of the immaterial sonorous force. So with light; its property of *color* is determined by the mind from the number of luminous contacts in a given time, all produced externally in precisely the same way—by the physical compact of substantial but immaterial light-force.

Thus, also, we may touch with our fingers the surface of a material body which may have the property of smoothness, roughness, hardness, or softness, yet the contact or touch of our fingers alone, precisely similar in the four cases, will convey to our consciousness when carried thither by this life-force messenger, four distinct mental impressions. This is the true solution of the difference between a force and a property of a given substance.

We have thus taken pains to place on record substantial answers to various phases of difficulty as suggested by our different correspondents touching the details of the new philosophy of Substantialism, that new converts in the future may have no trouble in arming themselves to meet every objection that may come up. All that such beginners will need is a thorough acquaintance with our various publications on this subject, in which for the past seven or eight years we have been gradually unfolding the fundamental elements and minute details of the Substantial Philosophy. During the progress of these numerous volumes we have often repeated our explanations in our various replies to correspondents, till now scarcely a single new difficulty can be suggested for solution. Almost every difficulty now ordinarily sprung would not have required an answer at all had the correspondent been familiar with the "Problem of Human Life," the different volumes of THE MICROCOSM, THE SCIENTIFIC ARENA, and the "Text-Book on Sound." We cannot be too thankful that we have been spared by a kind Providence to see this volume of THE ARENA now completed to round out, as it does, the detailed defense of the Substantial Philosophy.

GEOLOGICAL SURVEY OF FLORIDA.

WE have received the first report of the geological survey of Florida from the State Geologist, Chancellor John Kost, M. D., LL. D., of the Florida University at Tallahassee. We have read this report with an interest we never before gave to what we had always considered a very dry subject. But instead of dryness, the Doctor has given to his theme a luxuriant richness which makes the narrative of his peregrinations over that state and his observations of its soil, climate, productions, and especially of its geological for-

mations, read more like a romance from some fairy-land than a business-like report of two years' incessant labor to the governor of the state. For a man approaching seventy years of age, Dr. Kost shows powers of persistent roughing and delving beyond anything that has come under our observation in recent history. The report is so full of instructive facts and features bearing on the subject, and so racily given, that it would not form a bad addendum to a text-book on that branch of science for any college student who purposes making geology a part of his study.

THE CONSISTENCY OF SUBSTANTIALISM.

BY THE EDITOR.

No stronger collateral evidence of the truth of a scientific theory, or of a claimed system of philosophy, can be produced, than the absolute consistency of all parts of its teaching. On the other hand, no better proof can be required that a theory or system of doctrine is intrinsically false than the internal evidence of its inconsistency or self-contradiction.

The most uneducated person recognizes this law in the common affairs of life, even without grasping the philosophical and logical principles upon which it is founded. If he hears one narrating an adventure, or describing an occurrence to which he claims to have been a witness, and if the account given be not consistent with itself, that is, if it contain statements of facts which conflict with other statements of facts in the same narrative, the listener must of necessity at once doubt the truth of the whole story, unless it shall be confirmed in its details by other witnesses or other classes of evidence.

No better proof of the correctness of this general law can be asked than the records of court-trials constantly occurring all over the land. Observe carefully one of these trials of a complex character in which a number of witnesses on both sides of the case are examined and cross-examined by competent attorneys, and there will be an abundant reason for placing a true estimate upon the value of consistency or inconsistency, as the case may be, as determining the truth or falsity of any theory, statement of facts, or system of doctrine.

The witness who in such trial sets out with the unalterable determination to state only the truth and to guess at nothing, is sure not to contradict himself and will appear to any jury as an honest and reliable witness, even should he be of medium intellect and of less education. When such a witness has told his story, no amount of cross-examination by the cunningest counsel can either confuse him or weaken his testimony. In fact, the more searchingly such witness is cross-questioned and his statements sifted the more weight will his testimony have with the jury for the side upon which he was subpœnaed; and it is a well observed fact that the opposing counsel, after hearing such a candid witness in direct examination, is very apt to dismiss him with little questioning, knowing full well that, by the laws of evidence, the more such a diamond is polished the brighter it will shine.

But, on the other hand, let a witness be placed on the stand, who is interested, to make out a case for either side—one whose manifest aim is to fabricate a plausible story for the party calling him—and it only takes an average juror to detect an inconsistent and doubtful shading in that evidence, even before cross-examination has begun. If any juror lacks this ability, he has only to watch while the poor fellow shall pass through the picking-machine of the wily attorney's fingers for an hour's cross-questioning, and he will have the sorry satisfaction of seeing the inconsistent evidence not only go all to pieces, but its author subside into pitiable confusion.

This very same principle of evidence prevails in the statement, and elaboration of the facts and deductions involved in any theory or system of scientific teaching, whatever it may be. If a theory be intrinsically false, or contrary to the physical laws and natural order of things, no man, whatever may be his scientific attainments or pettifogging ingenuity, can carry out, amplify, and illustrate such theory to any detailed extent, without involving himself in essential contradictions, and the theory he is advocating in numerous incongruities.

It does not follow, however, from this that the writer who thus essays to explain and elaborate the theory, must of necessity know it to be false; or, like the too willing witness in court, that he seeks to fabricate a plausible story to sustain what he knows to be a false theory. He may firmly and conscientiously believe the theory to be true, because he knows of no other way of so well explaining the observed facts and phenomena involved. It is not, therefore, his fault that he contradicts himself in the detailed discussion of his subject, but the inherent fault of the theory itself. Such theory not being true, its various parts neither cohere with themselves, nor do they agree with analogous facts and phenomena in other departments of science, which are of necessity correlated with them as they prevail and operate in the adjacent laws of nature.

The harmonious blending of all truths with one another, from whatever departments of nature, science, and philosophy they may be selected and grouped, comes from the correlation of the moral, physical, and metaphysical forces of necessity, which innately shape all truthful averments on all subjects into symmetrical forms, just as cohesive force cooperates in correlation with its nearly-related allies of adhesion, chemism, etc., to form crystals of different materials into the most diverse shapes, but all of them arranged on principles of absolute uniformity and symmetry of design.

This general character of evidence, as well as of scientific and philosophical ratiocination and law, is amply illustrated by a casual examination of Prof. Tyndall's two great text-books on *Sound* and *Heat*. We have already, in previous publications, pointed out numerous self-contradictions and inconsistencies in these elaborate discussions, in which the most impossible experiments are claimed to have been made when nothing of the kind could possibly have occurred. In fact many of these very experiments so stated to have been carefully performed and recorded have since been repeated by other scientists with exactly the opposite results claimed for them. The reason for this seeming anomaly is plain: Prof. Tyndall, though an honest man, was so sure that those theories were correct, and so certain, if correct, that the experiments set forth ought to act and result exactly according to the theory as described, that he took them for granted as true, and even may possibly have imagined that he had, some time or other, tried them!

Take one single instance as illustrating a dozen we have investigated and pointed out: He distinctly states that two unison musical instruments sounded half a wave-length apart, so that the *condensed* part of the air-waves from one instrument will exactly fall into the *rarefied* part of the air-waves from the other, and *vice versa*, will produce absolute *silence*, because the two systems of waves in this relation will neutralize each other by "interference," just as two equal systems of water-waves will destroy each other by traveling half a wave-length apart, thus causing quiescence of the water. (See "Lectures on Sound," pages 284, 285.)

Yet, notwithstanding this experiment was distinctly represented in these lectures as having actually been performed, it is a fact, as we had the honor of first announcing to the world, that the entire representation in general and in all its details does not contain a word of truth. On the contrary, two such unison instruments, however they may be sounded in relation to each other, or whatever their distance apart, are heard in all directions with precisely the same intensity. (See "Problem of Human Life," page 283 and onward.) And to emphasize the force of this power of self-deception and unintentional fabrication, on the basis of a supposed infallibly true theory of science, we remember, when we had first exposed the fallacy of this claimed "law of interference" in sound, that the now quite eminent lecturer on acoustics, Prof. Robert Spice, of Brooklyn, N. Y., spent hours at our office honestly trying to make two sounds interfere and thus produce silence, so certain was he that his distinguished personal friend and teacher, Prof. Tyndall, would not have recorded such experiment as true, had he not actually made it and found the law on which it was based to be correct. *But Prof. Spice now knows better, however he may try to suppress the fact in his popular lectures.*

On the other hand, let a competent and candid physicist take in hand to set forth and elaborate the principles, and even the minutest details of any true theory of physical science, be it sound, light, heat, electricity, magnetism, gravitation, or cohesion, and not a single inconsistency or self-contradiction need occur, unless from the newness of the theory some of its parts have not yet been duly formulated, which, of course, cannot be claimed of the wave-theory of sound, nor of the undulatory theories of light and heat, now centuries old.

Here we reach the subject intimated in our heading—the *Consistency of Substantialism*. We request any one wishing light on this important matter to examine the principles and various discussions of the Substantial Philosophy as carried on for years, first in the "Problem of Human Life," then in the different volumes of THE MICROCOSM, and now in THE ARENA, and we aver our conviction that not one essential discrepancy or contradiction in its general teachings will be detected. This fact, if it shall bear the test of scrutiny, speaks volumes for the probable correctness of its religio-scientific and philosophical teachings, especially when we consider the complex ramifications of Substantialism through every department of nature, and considering also its recent origin as a system of philosophy, having been less than a decade of years before the world.

We confess the truth, that when we first set forth, in the "Problem of Human Life," the fundamental principles of this philosophy, we had no real conception of the vastness of its signification, or of the wide-reaching field for cultivation which it would necessarily open. We had, in fact, no more than completed that volume before we saw the expanse of this new field of research, opening into an ever-widening vista. Speaking literally, we at once saw that by every new position in science there taken, and every new principle of philosophy there unfolded, many new laws and correlated principles before unthought of had thus been brought to light, and that the whole realm of the natural forces, as well as every principle of philosophy belonging to the mental, vital, spiritual and metaphysical domain of the universe, was properly included within the legitimate scope of the Substantial Philosophy.

From that unfoldment of the broad meaning of this system of teaching, we began our researches into individual and particular examples of the harmonious consistency of the new philosophy with newly discovered facts and newly presented problems, and the more severely and searchingly were our ampli-

fication of its principles applied the more triumphantly consistent and symmetrical did the entire system appear. Up to the present writing we only concur with the opinion of some of the most careful thinkers of this country, who have enthusiastically embraced Substantialism, that among the strongest evidences in its favor are its absolute harmony and consistency with every fact, law and principle in nature at present known to science.

THE WAVE-THEORY OF SOUND CONSIDERED.

Continued from page 184.

Duns Scotus, when the greatest triumph of learning was to sophisticate so profoundly an obvious absurdity that no ordinary intellect could refute it." . . . "The close study of *pure* mathematics, by directing the mind to processes of calculation rather than to phenomena, induces that sublime indifference to facts which has characterized the purely mathematical intellect of all ages." Tyndall, however, states in all frankness, and without the aid of mathematical considerations—"that when we try to visualize the motions of the air having one thousand separate tones—to present to the eye of the mind the battling of the pulses, direct and reverberated—the imagination retires baffled at the attempt." And he might have added: The shallowness and fallacy of the wave theory of sound was made apparent.

He, however, does express himself as follows: "Assuredly no question of science ever stood so much in need of revision as this of the transmission of sound through the atmosphere. Slowly, but surely, we mastered the question, and the further we advance the more plainly it appeared that our reputed knowledge regarding it was erroneous from beginning to end."

Until physicists are willing to admit that the physical forces of nature are objective things, actual entities, not mere modes of motion, a full and clear comprehension of the phenomena of nature will never be revealed to them. The motion of all bodies, whether small or great, is due to the entitative force stored up in them, and the energy they exercise is in proportion to the stored-up force. The "motion" is incidental to the operation of the entitative force. Motion, like shadow, is not an entity; it is simply "position in space changing."

Matter and force are the two great entities of the universe—both being objective things.

Sound, heat, light, electricity, etc., are different forms of manifestation of an all-pervading force element—*substantial* yet not *material*.

Publishers' Department.

Let Every Subscriber Read This.—All subscribers or intending subscribers are hereby notified that on and after the first of July next the price of THE ARENA will invariably be $1.00 per year.

It will be observed that the change of the price will in no wise affect our present readers until the end of Vol. II., except through their failure to renew until after July 1st. Therefore let the renewals and new names be sent in at once, as in no case will a reduction be made from the new rate after the first day of July next.

We have found, by some months' experience, that the present elegant and attractive character of the paper costs more than we receive for it; and we believe that Substantialists are not made of such stuff as to wish us to continue bearing so great a burden when hundreds of them have written us that THE ARENA is worth "ten times its cost." The Substantial Philosophy is well worthy the most attractive dress in which it can be presented, while the character and standing of our contributors and the quality of our readers demand that THE SCIENTIFIC ARENA shall be as independent (financially) as it is original and solid in argument.

All parties who have paid one or more years in advance, will, of course, receive the paper for the time for which they may have paid; but no other long-time subscriptions will be received at the present price.

We also inclose in this issue a blank subscription form, for the convenience of those who desire either to renew or to send in a list of new names, or both. Send them back laden with the names of subscribers.

This number of THE ARENA completes the first volume of the new series.

Subscribers are hereby notified to renew at once, as THE ARENA stops with the expired subscription *in all cases*. We are more than gratified at the phenomenal success of the past year. There have been many trials, among them being a difficulty often experienced in getting the paper to our readers; but adopting the plan of sending a duplicate promptly in each case when notified of a failure to receive the copy, our thousands of readers all over the world have been well satisfied with the manner in which their favorite publication has appeared.

Shall we not have the hearty co-operation of each of our friends in bringing THE ARENA to the attention of their neighbors, and the securing of a large list of new subscribers for the second volume?

As an inducement for our friends to make the slight effort necessary to obtain a new name to send in with their own renewal, we make the following offer:

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By the time that our readers receive this number of THE ARENA, we will doubtless be comfortably settled in our new quarters in the beautiful Potter Building. Although but a few numbers removed from our present offices, we expect to be much more pleasantly located, and still be on Park Row. Our readers who may come to the city can readily find us by looking for THE SCIENTIFIC ARENA, in the well-known Potter Building, corner of Park Row and Beekman Street, and our latch-string pulls easily. Try it!

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