THE SCIENTIFIC ARENA.

THE ORGAN OF THE SUBSTANTIAL PHILOSOPHY.

A MONTHLY MAGAZINE DEVOTED TO SCIENTIFIC AND PHILOSOPHICAL TEACHING.

From June, 1887 to January, 1888,

[Eight Numbers.]

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HALL & CO., Publishers,
No. 23 PARK ROW, NEW YORK.
1887–1888.

CONTENTS OF VOLUME II.

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.

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HUDSON & CO., Publishers,
POTTER BUILDING, 38 PARK ROW, N. Y.

Entered as second-class matter at the New York Post Office.

WHOLE SERIES, VOL. VII., NO. 1.
NEW SERIES, VOL. II., NO. 1.

NEW YORK, JUNE, 1887.

50 CENTS A YEAR.
SINGLE COPY, 5 CTS.

SKETCH OF THE REV. DR. BATES.

BY REV. F. T. FAGG.

REV. LAURENCE WEBSTER BATES, D. D., was born in Burlington Co., N. J., November 10th, 1819. His parents were of Quaker origin, but a few years after his birth they were connected with the Methodist Episcopal Church. Here their children received their religious training. Laurence was converted at the early age of eleven years. At this time the questions of "Lay Representation" in the conferences, the utility of presiding elders, and the functions of the Episcopacy greatly agitated the Methodist Episcopal Church. The discussions were earnest everywhere; in many places bitter, and sometimes angry. The impressions they made upon the mind of Mr. Bates were deep and lasting. Many of the Reformers (or Radicals, as they were reproachfully termed) were expelled from the Church for their advocacy of the principles which they regarded as just and right, and necessary to the best government of the Church, while many others withdrew, and boldly allied themselves with the Reformers. The organization of the Methodist Protestant Church speedily followed. In this Church laymen were admitted as delegates to the conferences, while the offices of Presiding Elder and Bishop were altogether dispensed with.

With this church Mr. Bates connected himself without hesitation. He knew it was an experiment, the result of which was involved in perplexing uncertainty, but this did not for a moment deter him. He would yield to his convictions of right without regard to consequences, a trait which has always been prominent in his character. In 1840 he was licensed to preach, and in April of the same year he offered himself as a candidate, and was cordially received into the itinerancy of the Maryland Conference of the Methodist Protestant Church.

His educational advantages were moderate. He entered the ministry with little of that mental training and discipline which is generally regarded as the necessary prerequisite to a successful career in that profession. Educational deficiency was, however, very general in the Methodist pulpits of that day. His zeal and enthusiasm more than compensated for his lack of literary attainment. Indeed, a consuming zeal for the salvation of souls was regarded as the first condition of success in a Methodist preacher.

When he entered the ministry, the circuits extended over a wide stretch of territory, the preaching places were numerous and the services frequent. Such labor he pursued with a flaming zeal, sometimes holding daily services which were always characterized by impassioned pulpit effort. His health suffered in consequence, and to such an extent as to threaten to bring his labors, and even his life, to a premature close. His judgment dictated prudence and caution, and above all such a cultivation of the voice, as would make pulpit effort less laborious and exhausting. He was so successful in the cultivation of his voice that he regained his health, and made himself one of the most pleasing and agreeable speakers in the conference. Ordination in his church always depended upon a degree of proficiency in certain books, which are the standards of the faith, doctrine, and goverment of the church. These a good student can master in four years. If the examinations (which occur annually) are deemed satisfactory he will be ordained a Deacon in two years, and an Elder in four. Mr. Bates, notwithstanding the condition of his health and the almost superhuman work in which he was engaged, mastered his studies and was ordained Deacon in 1842 and Elder in 1844.

REV. DR. BATES.

It was not long before his strong common sense, his intellectual vigor and attainments, his logical acumen, and his skill and ability in debate began to assert themselves, and gain for him a respectful recognition in his conference. Nor could his character and attainments be confined to his own conference. His unselfish devotion to principle, his uprightness of character, the sincerity and attachment of his friendship, coupled with his ability as a preacher, attracted the attention of leading men in other denominations. He was frequently honored with conspicuous positions, and became prominent in benevolent institutions. Pennsylvania College at Gettysburg conferred on him the title of Doctor of Divinity in 1868, which, by common consent, was regarded as just and fitting. Only once before had this old institution honored his church with this degree, and that was in response to one of the most classical productions of that day.

In 1860 he was elected President of the Conference, and continued in the office for two years. He declined a re-election for the third time. Such, however, was his popularity and success in this position, that many brethren annually cast their ballots for him to this day.

In 1862 and 1863, as also in 1872 and 1873, he, with two others, were elected joint editors of the *Methodist Protestant*—then the only official organ of the Methodist-Protestant Church. He discharged these duties in connection with a large pastorate. Nevertheless, he exhibited in this work that superior judgment and ability that has made him one of the most prominent and useful men in his church.

The general conference is composed of delegates elected by the annual conferences, and meets once in four years, unless exigencies arise that make more frequent meetings necessary. It is the law-making body of the church. Membership in it has always been regarded as a most honorable distinction. Dr. Bates had the singular honor of membership in every general conference and convention of the church from 1854 to the present time, except that of 1858, and was elected President of the Conference in 1874. In 1880 he was elected a delegate to the Ecumenical Conference of Methodism, held in London, Eng., but could not attend, and a messenger in 1884 to the Centennial Conference of the Methodist Episcopal Church, which met in Baltimore, Md., in the same year. In every position he acquitted himself with credit and honor to the church.

A controversy growing out of the question of slavery, caused a division in the Church in 1857. This controversy was practically settled by the civil war, and led to proposals of union between the two branches of the Church. A commission was appointed by each branch to formulate the terms of union. When the commission met, Dr. Bates was chosen its chairman. After the terms were agreed upon, they were submitted to a general convention of each church for ratification. Dr. Bates was made the President of the Convention of his church; and when the two bodies became one, he was chosen as the President of what is now known to history as the "Union Convention." He is a charter member of the Board of Trustees of Western Maryland College, President of the Board of Governors of Westminster Theological Seminary, and a member of the Board of Foreign Missions at Springfield, Ohio.

He is the author of a popular tract, published by the American Tract Society. This tract is entitled "Old Moses," and is based upon the character of a reputable old colored man, who once lived on the eastern shore of Maryland. It has been frequently printed, and passed through many editions.

He also published a work on "Church Government," and one on "Baptism," which gained for him a wide circle of readers. He is the author of that part of the larger catechism of his church relating to church government, and of several published sermons. One of these is on "Sanctification," and another on "Purgatory; or, A Second Probation." These sermons are considered logically impregnable and unanswerable.

As a pastor, he has been connected with all the prominent churches in his conference, and is now serving the Congress Street Church, W. Washington, for a second term.

As a man, he is cultured, generous, and affable. His counsel is sought, and his friendship is coveted by all who know him. His contemporaries seek his judgment and advice with unfaltering confidence, while his juniors look up to him with reverent affection and esteem.

Tall and commanding in his appearance, broad and generous in his sympathies, quick and apposite in his repartee, and with all a quiet humor, which always appears at the most opportune moment, he is one of the most practical and conspicuous men, one of the most logical and effective debaters, and one of the most interesting and eloquent preachers in the Methodist Protestant Church.

All this is the result of a steady and continuous growth. Others who began with him have reached their meridian and are declining, but Dr. Bates has done some of his best work in a very recent period. His mental faculties were never more vigorous than they are now, and his ability as a preacher was never greater than it is to-day. He is an eminent example of what steady work, faithfulness to conviction, and fidelity to principle, to duty and to God will do for a man. "*Fideli certa merces.*"

And now the editor of THE ARENA would take pleasure in adding a word of his own high appreciation of Dr. Bates, though never as yet having enjoyed the pleasure of seeing his face or of taking him by the hand. Eight or nine years ago, after first issuing the "Problem of Human Life," and placing it in a little room for sale at 234 Broadway in this city, we well remember with what thrilling interest we received the very first order for a copy of that book. We did not then know that we should ever sell a single copy to anybody, considering the discouraging rebuffs we had received while trying to get some one to print the work. At all events we had succeeded in issuing an edition ourself, and in having a few copies bound. A friend who had read the manuscript, volunteered to write and publish a favorable notice of the book, which had chanced to strike the eye of Dr. Bates. The notice impressed him, and without waiting on the order of his going, he sent for the work through Lippincott & Co., of Philadelphia. We can truly say that the sale of this initial copy made a more exciting impression on our mind than have the sales of the 60,000 copies since, put them all together. That sale brought about a correspondence and an acquaintance between the Doctor and ourself that are among the dearest and most cherished memories of our life. No friendship has been truer or more unwavering for the cause to which we have been devoting our life than that shown by Dr. Bates, and we prize the brief notice he gave of the "Problem," after first reading it, in the *Methodist Protestant*, of Baltimore, Md., as the strongest and most concisely worded indorsement we have ever yet received in the hundreds of favorable press notices the book has called forth. Although the Doctor has not written much for our publications, what he has contributed have been words fitly spoken. From memories of the past we do not hesitate to aver that we love no man with a warmer affection than we now feel for Dr. Bates, and expect to feel while life shall last.

THE DRIFT OF MODERN CULTURE.

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

IN a recent number of the New York *Herald*, a report was given of the meeting of the Psi Upsilon fraternity. Nineteen colleges were represented. After their dinner of costly viands and rich wines, the speech-making was opened by Mr. Charles Dudley Warner. In the course of his remarks he said, "the young men of our colleges are, he feared, the danger, yet nevertheless, the hope of our country." He characterized Henry George and his school of thinkers as "half-educated," and, therefore, "his theories as false and dangerous."

Men who have passed through a regular college curriculum, are, almost without exception, biased in regard to the influence of scholastic education upon the moral, social, and intellectual progress of the world. The prevailing idea among college graduates, and in fact among the major part of the people, is that the mental gymnastics necessary to evolve a college graduate, have *generated* brains: and therefore those who do not go through this process can never be essential factors in molding public opinion, or lifting the world to higher levels. Only a college discipline can so develop the powers of mind as to enable the individual to have clear conceptions of logical principles, of the constitutional laws of society, government, or of physics.

What is the regular discipline of our colleges to-day? Is it of such a nature as to start the mental powers into original inquiry, to search out those principles which inhere in the moral and social constitution of man, and which form the true basis of society and goverment—to discover those primary forces which find their expression in the phenomena of the material world, or of those which govern vitalized manifestation? Not by any means. The purport of the present scholastic drill is not to start the instinct of originality into action, to stimulate inquiry as to whether the principles laid down in all the speculative sciences of the text-books are founded upon truth. No, the whole tendency of collegiate training is to store the mind with text-book knowledge—to make the individual a mere appropriator, instead of generator of thought. Years of such drill tend to deaden the imaginative power, through which initiative force all truth in every department of philosophy and science is evolved. And such bent does this discipline give to the mind, such habitudes of thought does it form, that the "hope of the country" is henceforth satisfied to go through life living upon intellectual food produced by other men's brains.

The men who have lifted the world to higher planes, the men whose souls developed power to soar into the empyrean and catch the divinest harmonies of the universe, the men who have dug down into the deeps of nature and wrested her most profound secrets, the men who have overturned false theories, the men possessed with power to thrill the moral pulse of humanity, and nerve it to tread the fiery paths of martyrdom, to scale the incommunicable heights of heroism, are those who have never been inside college walls.

It does, indeed, require a powerful genius, an overmastering individuality, to pass through a regular college course without having the fires of progression and originality stifled, and the lines of thought deflected into a mental canyon.

The very fact that Mr. Warner calls such men as Henry George "half-educated," clearly evinces that he has yet to learn what is true education. A scientific knowledge of the laws of mental growth teaches that education is the development or calling out of every faculty, sentiment, and propensity of the whole mentality to the fullest normal capacity—is such a strengthening and symmetrical rounding out of the soul's being as will fit it for the highest purpose of existence. And whatever condition, environment, power, or combination of forces can do this, is a kinetic educational discipline in its truest and broadest significance.

Some of the most thoroughly educated men the world has ever known have never been inside college walls, and very often their scholastic training was exceedingly limited. But the elemental faculties of mind were educated through more effective means, and their powers of originality had not been crippled or kept in a state of chronic dejection through the gyves of scholastic conventionalism. Their education not only developed and strengthened the elements of mind, but also stimulated the spirit of original inquiry; and thus, through years of true educational drill they were enabled to evolve those eternal truths of moral, social, and political philosophy which lie folded deep in man's loftiest dreams, to delve into the storehouse of nature's unsmelted ore, and bring to light her treasures of scientific truth, and treasures indispensable for the world's advance to a higher and grander civilization.

The present system of scholastic discipline in our colleges, academies and common schools most signally fails to answer the requirements of a thorough education. Memory is the principal factor of mind which is called into requisition. Only to a very limited extent is there a demand made upon the reflective faculties; while the imaginative faculty—that prehensile power of soul which reaches out for fresh, vitalized ideas and principles, which stimulates the reflectives into action, which fires the moral energies and impels the individual to deeds of justice and self-sacrifice, which quickens the philanthropic impulse and leads to unselfish devotion to human weal—is never called into action.

No inspiration is given to the æsthetic or spiritual powers, no discipline is given to the propensities—those motor forces which so influence and mold the life, while the education of the moral nature is merely incidental. An education which is thus limited to the exercise of three or four faculties, and these not the arbiters of the mind's activities, is not true and thorough—not one which fits man for fulfilling the grand desideratum of life.

If to store the mind with historical lore, to solve mathematical problems, to memorize and apply the principles of philosophy already developed, to discipline the mind to comprehend and assimilate the elements of logic—to be a compendium of the product of other men's brains—be education, then the present system of scholastic training fulfills the requirement. But if education be that which fits the individual for right living, which brings out those powers which enable him to master self, to prepare him to successfully cope with any and every condition of life, then our present system most signally fails.

The fact that a man possessing no more mental caliber and no broader culture than Mr. Warner should pronounce such a man as Henry George "half educated," declares the conceit that is born of—or at least developed through—a college education. Whether or no we agree with Mr. George in his ideas does not militate against the fact that he is an intellectual Titan, and that his mental powers have had a discipline which have educated them in the broadest sense.

Well it is for Mr. George and the world, that he did not pass through college and have the wings of his genius clipped by its disciplinary pruning. His genetic powers, unrestrained by set channels of thought, have penetrated to the deep, underlying principles of political economy, and the product evolved through his mental efforts has started the greatest intellects of the world to

thinking, and has aroused a universal interest in the social status of the laboring classes, such as no college-bred thinker has ever done.

We would not for a moment be understood as denouncing a systematic scholastic training, but we would have it on a much broader basis than it is now. It should be one that will encourage and stimulate the imaginative faculty into its fullest intensity of normal action, and thus inspire the mind to search for nuggets of golden philosophical truth in unexplored regions; one that will arouse all the elements of mind into a vigorous activity, and by a judicious discipline give such a bent to the mentality that the moral powers will be the directing, molding, and governing force of life.

With such an education the young men *and women* of our colleges will then indeed be "the hope of our country." For the hope of our country rests not simply upon intellectual culture, but upon the morals which should direct that culture.

Intellectual culture stimulated by uneducated propensities, and without the guidance and controlling power of a well-developed moral sense, is incomparably more dangerous to the country than the most profound ignorance.

NEWBURGH, N. Y.

HERBERT SPENCER AS AN INVOLUTIONIST.

BY ROBERT WALTER, M. D.

IT is a pet notion of Mr. Herbert Spencer, that we cannot take even a first step in philosophy without making assumptions, in which respect we are pleased to be able to agree with him. We are, indeed, disposed to go further, and assert that the errors of the times, both scientific and theologic, are the result not so much of *false processes* as of *false premises*. We even feel pretty sure that the triumphs of research in the future will, as in the past, be in the direction of overturning positions based upon assumptions and postulates as baseless as "the airy fabric of a dream." An important criticism upon Mr. Spencer's system lies in this direction. He *assumes* that he is teaching a system of evolution, when in reality the opposite term exactly describes it.

Such a statement as this will naturally be received with incredulity, and will require ample proof to establish it. But, though the proof is abundant enough, we have space only to offer some suggestions that will, at least, indicate the direction in which we are to seek it. Let us commence by noting Mr. Spencer's suppositions with regard to the origin of the universe. He says, "First Principles," page 30: "Respecting the origin of the universe, three verbally intelligible suppositions may be made. We may assert that it is self-existent, or that it is self-created, or that it is created by an external agency." And he very properly proceeds to show that neither one of these suppositions "is even conceivable in the true sense of the word." A fourth supposition he fails to make, because it describes the very process which he pretends, but utterly fails to teach. Why not suppose that creation may be *the outworking* of an internal power, and not *the inworking* of an external power, and if, as Mr. Spencer seems to admit, that the self-existent, and self-created theories cannot be wholly wrong, for he adopts both of them, why not combine the third, and allow us to conceive of the universe self-existent in part, but created and developed by a power working within, as a living, energizing principle of existence. This would in reality be evolution, the outworking of a power which is obvious to even the careless observer, but the exact opposite of that which Mr. Spencer seeks to establish.

But Mr. Spencer will claim that his system is based upon the idea of a persistent force existing in matter, which is forever pushing it onward into new states. But this is still *involution*, inasmuch as it is the *matter* which is developed according to his idea, and not the internal principle of life which simply uses the matter as a garment or medium of expression. Mr. Spencer's system teaches development in the absence of any seed or germ to be developed; or he *involves* the seed from the matter, which latter he recognizes as the first, instead of *evolving* the seed into visible form because of its use of the matter as food which it appropriates to its needs. Wherever a seed develops into a plant we have a process of evolution, but if it were possible for the matter to organize itself, independently of any seed, as Mr. Spencer teaches, we would have the very opposite process.

But our article is to be suggestive rather than exhaustive. A better knowledge of the real character of Mr. Spencer's system will be obtained by an investigation of his central positions and definitions. The significance of his system is involved in the origin and development of living things. The real question at issue between the opposing philosophies is, whether life is involved in, and results from organization, or organization is the outworking or product of an interior principle of life. If life results from organization, and organization is due to an inherent tendency of matter to organize itself, Mr. Spencer's position is the true one. But if, on the contrary, living organisms are everywhere due to the existence of an internal living principle, which is continuously unrolling or developing itself in myriad ways, his system is false. We have exactly opposite statements here, which are as exactly described by the terms involution and evolution. One is the inworking of material agencies, and the other the outworking of immaterial principles of existence. Which position does Mr. Spencer occupy? After discussing the nature of life through more than twenty pages, he arrives at the eminently sage conclusion that, "The broadest and most complete definition of life will be *a continuous adjustment of internal relations to external relations.*" In this definition we have not only the fact that environment exercises a modifying influence upon the internal organism, but the claim that it produces it. Life is adjustment, in other words, "a mode of motion, due to external causes, the process being backward and inward, from the external to the internal, a process which the word involution precisely describes, in that it is a rolling in, or infolding, and not an evoluion or rolling out, an unfolding."

This great system of philosophy, therefore, which was intended to overturn all other systems of thought, is no more one of evolution than the method of study which it employs and exalts is one of deduction or pure reason. Evolution and deduction illustrate the outward and forward process, the only process which the human mind can logically follow. Knowledge is an unfolding of truth, in perfect sympathy with creation, which is equally an unfolding of a central principle or power. Mr. Spencer, both in his "Process of Study," which is inductive, and *in its product*, which illustrates the same thought, and is, therefore, *involution*, repeatedly admits that his system is the inward and backward process, and if properly described by the term induction as the process, it must be correspondingly adjudged to be involution in its results.

We do Mr. Spencer no injustice in insisting upon the truth of these conclusions. He continues chapter after chapter to show how external conditions have produced and continue to produce all internal states. On page 88, PRINCIPLES OF BIOLOGY, he says, "Increase of correspondence *involves* increased definiteness of combination; so that throughout a correspondence of the internal relations with the external ones is the essential thing, and all the special characteristics of the internal relations are but the collateral results of this correspondence." Language could hardly be more emphatic than this. The internal is involved from the external, which is "the essential thing," the very sum and substance, indeed, of this miscalled evolution.

But not only are we taught by this system that internal changes are the product of those which are external, but it is declared that "the degree of life varies as the degree of correspondence" between external and internal, a whole chapter being devoted to proving the truth of this absurdity. "Perfect correspondence," he says, "would be perfect life," "increase of correspondence involves increased definiteness of combination," and still further, "to this may be added the suplementary fact that the increasing fulfillment of those other distinctions, which we found to accompany increasing life, is involved in the increasing fulfillment of this last distinction;" and still again he says, "the maintenance of a correspondence between inner and outer relations, which we have here found to constitute life, and the perfection of which is the perfection of life, answers completely to that state of organic, moving equilibrium, which we saw arises in the course of evolution, and tends ever to become more complete;" still further he says, "in the course of their progress, have been adding to their physical environment a social environment that has been growing even more *involved*."

We note the frequent use of the word *involve*, because the opposite term, *evolve*, is not applicable. In describing the process, Mr. Spencer cannot say that internal relations are evolved from the external, but he repeatedly applies the term involve in this connection. *External* conditions may be evolved from *internal* states, but the contrary process is impossible by the very composition and definition of the term. Evolution describes the *outworking* of an *internal* principle; must we not use the opposite term when we undertake to describe the opposite process, just as we employ the term induction to describe a process of thought, the opposite of deduction. If deduction is the outward process of thinking, and evolution the outward process of working, and induction is admitted to be the inward process of thought, upon what grounds can we reject the term involution to describe a process of inward working.

Mr. Spencer must be willing to abide by the terms which exactly and precisely describe his system, no matter how completely these terms disclose the error of his positions. The process of evolution, which is going on everywhere around us, is altogether different from anything which Mr. Spencer seeks to describe. It is the development of the plant from the seed, of the oak from the acorn, the chick from the egg, the human organism from a microscopic germ; and so of every product of the natural world, it is a development or unfolding of a seed, germ, interior principle, and not the contrary, the infolding of the interior from the exterior.

But let us seek a more exact knowledge of this process which is everywhere going on around, and discover more clearly, if possible, whether it is really unfolding or an infolding, whether it is evolution or involution. When a seed so small as to be almost invisible becomes a plant, there is a development of something; but what is developed? The inductive scientist, who refuses to admit anything that he cannot see, asserts that it is a development of matter, in which he declares is "the promise and potency of all things."

That the visible structure is composed of matter no one disputes, but the real question at issue is, whence the plan? or, more

properly, why the peculiar form of development? Why does a rose-bush produce roses, while a lily, subject to the same environment, growing in the same soil, sharing the same light, heat, rain, and storm, produces an entirely different flower and seed, and reproduces *itself* rather than develops a rose-bush? Why does a duck's egg, when warmed under a hen, develop into a duckling instead of a chick, while the other eggs by its side become chickens?

Facts like these are alone sufficient to overturn Spencerian involution. It is the evolution of a living principle that is here manifested, and not the involution of the matter of the egg; it is the *within* working outward, and not the contrary. What explanation does Mr. Spencer give to facts like these? The same which he repeatedly employs when his positions are successfully controverted: he admits simply that no explanation is possible. He says, "Principles of Biology," vol. I., page 253, "A positive explanation of heredity is not to be expected in the present state of biology. We can look for nothing beyond a simplification of the problem, and a reduction of it to the same category with certain other problems which also admit of hypothetical solution only." The other problems are numerous enough, and constitute the very ones which his philosophy must explain, if it ever shall be established. When a great philosopher undertakes to prove that white is black—that involution is evolution, he quite properly becomes dumb in the presence of the truth.

But an equally important truth suggests itself. When two eggs of the same appearance, origin and apparent structure, are placed under precisely the same environment, why does one produce a chick while the other develops only explosive gases? If life is "the continuous adjustment of internal to external relations," why does not the internal of both eggs adjust themselves exactly alike. The answer, of course, is, that the one egg had life, and the other had not. Is it possible that this thing, called life, which produces results so different, from what environment can, has yet no real or substantial existence; or, as Mr. Spencer would teach us, is a simple relationship between two things, being a part of neither of them? Is it conceivable that life is only "a mode of motion?"

Mr. Spencer evidently mistakes the effect for the cause. The adjustment between the external and the internal is clear enough, but is the *process* of adjustment the *cause* of the adjustment? Or, if the external relations is the cause, why do they not produce exactly the same results under precisely the same conditions? Of course, the present state of Mr. Spencer's biology will not admit of an answer.

SUBSTANTIAL CREATION.

BY REV. A. D. POTTS, A. M.

ONE of the most difficult things in the matter of settling vexed and profound questions, is the correct use of language.

Language has been called the medium of communicating thought, and it has been learned that unless the terms of language employed are carefully and justly chosen, much evil may result.

We talk about the *real* and the *imaginary*, the *visible* and the *invisible*, the *substance* and the *shadow*, the *material* and the *immaterial*, and about *entity* and *non-entity*. And when we endeavor to draw the correct dividing line between these terms in their application to certain matters, we find the task somewhat difficult.

We experience no difficulty in understanding, to a great extent, how far the material of a thing extends, but to clearly and satisfactorily define the true and mysterious nature of the immaterial is more of a gigantic undertaking.

It must, however, be admitted that with the advent of the Substantial Philosophy, and with the clear and incontrovertible explanation of the grand system, much needed help and light have come to our aid.

In the past, when grappling with some of the abstruse and profound phases of scientific philosophy, we were not a little vexed over our solutions and even conclusions. But now Substantialism has given us an anchor by which we are enabled to hold fast to some of the grandest scientific truths of which the world ever heard.

In a word, it has equipped us for going into the very secrets of nature, and then giving us some proof why we believe certain things to be true. It has done more than this. It has driven away much of the shadow that came between us and the real thing in question.

It is not, however, my intention to take up the whole of the Substantial Philosophy, and endeavor to show how reasonable, consistent and noteworthy it is when dealing with *sound*, *heat*, *electricity*, *odor*, etc., but more particularly to apply the system, in its correct bearing, to one of the profoundest subjects upon which mortals are permitted to exercise calm judgment, prudent foresight, and reverential reasoning. I mean, having said thus, the study of God's great and marvelous creation of the heavens and the earth.

For ages past the world has generally entertained the notion that God created all things *visible* and *invisible* out of *nothing*. And thus have we believed and taught, never having thought far enough, nor profoundly enough about the matter until Dr. Hall, the founder of the Substantial Philosophy, touched our more careful thinking with the power and influence of his thoroughly trained and religio-scientific mind in the wonderful synopsis called "The Substantialist's Creed."

In the seventeenth section of that creed its author very guardedly and respectfully defines the view of Creation in the light of Substantialism. He does so without in the least detracting from the *omnipotence* and *omniscience* of the Almighty.

Dr. Hall says, and I think rightly, too, when we get down seriously and prayerfully to the core and real spirit of God's creative power, that "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 essential being, and out of which all mind, and life, and spirit of the animate universe were originally transformed." He further declares: "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." Now, when we analyze the fundamental thought in the foregoing creed, we naturally and rightly come to the conclusion that the creed of Substantialism teaches as a self-evident truth that *creation out of something* is more in accordance with the Scriptures than the advocates of the old theory of *something out of nothing* are willing to admit.

It must not be thought that I ignore the Bible or Mosaic account of creation, as I, in no sense, or under any circumstance, repudiate that sublime and inspired teaching. I verily believe that the Mosaic account of creation implies the truth that God did create the heavens and the earth out of something real, something, though immaterial, nevertheless substantial, that existed from eternity. But right here, he who feels like criticising or is stirred up to cry out *unclean* must stop, and first decide between *material something* and *immaterial something*. It is not contended that God created the heavens and the earth out of gross, material and tangible something, but, on the other hand, it is held that God did cause the stupendous work of which we are now conscious, and which now exists in a *material* form, out of an *immaterial*, *incorporeal*, and *real something* that not only took its start, or had its origin, when God gave forth the sublime fiat, but a *veritable something* which took its start with God Himself.

Such a statement in no way favors materialism or pantheism; no, it in no way teaches that gross, or even refined matter, as such may now compose our visible universe, existed from eternity. Keeping this thought in mind, it must also be admitted that of nothing, nothing can be formed. Indeed it cannot be thought of in any other light, then, but that the world, as we term it, is the grand product of the almighty will of God; and being such, it certainly follows that this will needed no self-existent, or pre-existent, or eternal matter out of which to create, but was of itself and in itself capable of creating the requisite matter. Whatever has been made, presupposes a maker, and something out of which to make it. And the expression, *ex nihilo nihil fit*, in this sense, can only be applied to the realm of the finite. Such a law in no way interferes with the unlimited scope of the Divine Will. But, as all formed things point to a something out of which they were produced, it naturally follows that the architect was before the building.

In other words, it must be believed that something existed before matter, out of which matter was produced, and admitting this irrefutable conclusion, we find ourselves thinking about something—a something not corporeal, material, but nevertheless real, true—the Will of God.

Now let him who is ready to cavil say that the Will of God is not something!

Let him deny the fact, and prove that it *is not* as I have said, and I will say farewell to a Supreme, Holy Being, called the Triune God!

Because you cannot understand the full scope of that Divine Will, because you cannot touch it even with the finger of reason, because you cannot locate it as to time and space, you dare not say that it is *not*, that it is not *real*, that it is not *something*. It is *something*, it is *real*, it is the very *thing*, immaterial, of course, out of which, or from which, our creation came. It is what we call, with the light of Substantialism shining upon us, an *immaterial something*, an *immaterial entity*. As to the origin of the Will of God I have no solution.

My reason cannot go that far back; hence, in a certain sense, forsaking reason, I mount upward on the pinions of faith and understand that the Divine Will has ever existed, and that it will ever continue to exist.

Indeed, what I have said in the way of creation out of something is plainly proven by the Bible. "Now, faith is the substance of things hoped for, the evidence of things not seen. Through faith we understand that the worlds were framed by the word of God, so that the things which are seen were not made of things which do appear." And in this noble conception of the high and holy matter, "sense" and reason are forgotten, and pure, ever-increasing faith holds full sway. While I hold that the world, as we are wont to speak of it, was created out of something, it must not be inferred that I mean that the world is an emanation simply from the Will of God, or that it is a metamorphosis of God. No such theory can be held by the Christian. Neither is it taught

that we are speaking of the arranged world —as it existed after the six days' work, but rather of the world as a great product, *extra sex dies*. The first verse of Genesis induces us to think and speak of God as the infinite Creator, as the Originator of matter. Here I would like to add the words of one who speaks thus: "He who made one world in space, made all worlds in space. He who made one world in time, made all worlds in time. He who gave matter its form, gave it its origination, or that which is the ground of all its forms."

Such thoughts are supported by the Scriptures, when they say: "By the word of the Lord were the heavens made: and all the host of them by the breath of his mouth. For he spake, and it was done; he commanded, and it stood fast."

More passages might be quoted to the same effect. It is not so much with God as the Divine Arranger in the work of six days that we have to do in the present article, as with him as the prime Originator of all matter.

The Gospel by St. John says: "All things were made by him; and without him was not anything made that was made." Such is our belief in the day of Substantialism. The same faith holds good and is operative in our religious exercises. We believe in a real God—a veritable, active Being, a Divine, personal Something, and not an imaginary producer.

PLEASANT UNITY, PA.

THE PLATONIC PHILOSOPHY AND CHRISTIANITY.—No. 4.

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

PLATO taught that justice and equity are founded in the very nature of God, and hence eternal. The true, the beautiful and the good were never created, but are inherent in the nature of things. The object of revelation is to make known to man the true, the beautiful and the good. Right existed from eternity, and philosophy and religion have for their object the influencing of man in conformity to the right. Plato taught that no man willingly does evil; that is, that no man does evil for evil's sake. He is very careful to guard this point against misunderstanding. While a man may choose evil voluntarily as a means, he does not choose it as an end. How then do men become evil? Plato answers that man is restless, and seeks change; he indulges his desires and passions to excess. He gets tired of the good, and tries the bad.

Plato taught that every man has in him the power of changing his moral character. He was a believer in the freedom of the will. Man was made in the image of God, and as God is a free, moral agent, man must be free. Man has the ability to choose the right or wrong. Plato gives the following reasons why men choose the wrong: 1st. The soul is connected to the sensible world by a material body, and is influenced to sin. 2d. The passions prevail over the soul, and disorder it. 3d. Society is corrupted by bad forms of civil government, and bad education effects the ruin of the soul. Thus the soul is changed and fallen from what it was when it came from the hand of its Creator. The object of life is to purify it, and prepare it for restoration to its original sinlessness.

The Platonic philosophy certainly did much to prepare the world for Christianity. Clemens, of Alexandria, claims that Greek philosophy was to the Greeks what the law was to the Jews, a schoolmaster to bring them to Christ. The Greeks were endowed with faculties of a superior order, for the special purpose of solving to the extent of human ingenuity the great problems of existence, of knowledge, and of duty. As man was fashioned after the Divine nature, we must suppose that the pure reason of man will have some connection with the Divine reason. There is in the conscience of man a sense of obligation to a supreme power. The reason of man has sympathy with the law of God. It delights in the law, and consents that it is good, but it is overborne by passion. Man wills to do good, but how to perform the good he finds not, and in agony cries out, "Oh, wretched man that I am, who shall deliver me from the power of this death!" (Rom. vii. 24.) The Author of man's nature is also the Author of the Bible. There must be some relation between Christianity and human reason; for without reason, all religion would be useless.

While Christianity is above reason, it harmonizes with reason, and develops it. The greater the development of reason, the better it is prepared for Christianity, provided it has not been warped, and turned into a wrong channel. Christianity did not come to destroy, but to fulfill, and it did recognize and fulfill the truths belonging to the Greeks, as well as those specially pertaining to the Jews. Had it entirely ignored the past, it would have defeated its own ends, and, practically, would have been no revelation at all.

Greek philosophy was a preparation for Christianity in the development of a scientific and universal language exactly adapted to the purposes of Christianity. No student of the philosophy of history can fail to perceive the Providence of God in the preparation of a civilization and of a language so well adapted to the religion of Jesus Christ. The Platonic philosophy did much toward perfecting the Greek language; for no Greek ever wrote or spoke purer Attic than did the celebrated Plato. The Greek tongue became to the Christian more than it was to either the Roman or the Jew. In Alexandria, the Old Testament was translated into Greek; there the writings of Plato were diligently studied, and Philo endeavored to unite the Platonic philosophy with Judaism. From this union there arose a class of Jews, who, when converted to Christianity, were very beneficial in allaying the prejudice of the Jewish Christians against the Gentiles. Stephen, the first martyr, belonged to this class.

The Platonic philosophy did much toward releasing the popular mind from Polytheistic notions, which was certainly a very important preparation for Christianity. By the study of nature and from tradition, Plato had reached the conclusion that there existed one Supreme Being. His reasoning had a tendency to undermine, and cause the people to disbelieve, the Polytheism of his day. He so shaped the Theistic argument as to make it beneficial even to Christians. Plato developed the conscience of his countrymen, and purified their idea of morals. This was also an important preparation for Christianity. The philosophy of Plato also made man conscious of a distance from God, and the need of a mediator. When Jesus came there was a longing in the human heart for the personal presence of the Supreme Being. Jesus, who was God manifested in the flesh, met this demand of man's nature. We must regard the Platonic philosophy as a preparation for Christianity, and not, in any sense, a substitute for the Gospel.

OUR CRITICS.

BY J. I. SWANDER, D. D.

IT is now five months since our book—"The Substantial Philosophy"—was taken from the press and introduced to the public. Although there has not been sufficient time to give it a general circulation among the many thousand students and teachers of science, even in our own country, it has already found a welcome reception into many libraries, schools, and homes. Its author had no brilliant reputation, either as a scientific investigator or popular writer. The introduction of the book to the public was therefore largely dependent upon its association with the name and work of Dr. Hall—the founder of the philosophy of which it is an attempted formulation. Aside from the recommendation which it fortunately had in such association, it was obliged to work its way into a measure of public favor by whatever intrinsic merit it was found upon first examination to possess. Though humble in its claims, it entered the arena of scientific conflict with no apology for its appearance among the spurred and mounted knights of the disputed field. And now after a few months of examination by many earnest, searching scholars who have purchased and read the little volume from different points of view, it is gratifying to the author to learn that its first edition is being exhausted with encouraging rapidity.

For this promising outlook we acknowledge ourself indebted, first to a kind Providence, and secondly to our critics. In our limited acquaintance with scholarly and candid men, we have long since been led to know the value of thorough and merciless criticism upon some things which we have spoken to and written for the public; and frequently the most adverse criticisms have been for us the most beneficial. As anticipated, we have received a great variety of expressed opinion concerning the contents of our book. Some of these expressions have appeared in the public press, and others in private correspondence. With a few exceptions we have been gratified with the treatment received at the hands of our friends, and we are proud of the impartial and unprejudiced Christian manhood shown by those who have been kind enough to examine "The Substantial Philosophy," and to pass their opinion concerning its merits.

Some of them seem to think that we have taken improper liberty in quoting from Scripture for the purpose of strengthening our positions in science. To all such we wish to say that our fundamental position, as announced in our introductory, is that science and the inspired Scriptures teach the same thing in the substratum of sound philosophy which underlies all beings and pervades every fiber of the universe. We have never been taught to believe that the Scriptures are more sacred than the truth, of which they are a record of revelation. Bible worship is no better than any other form of idolatry. We are glad that intelligent critics have seen this point, and kept it in view in all their reviews of the book. Indeed, the volume is spoken of as strong, in the fact that so many of the positions taken therein are confirmed and enforced by Scriptural quotations, showing that the God of Revelation and the God of Nature is our one God.

There is another mistake quite common among some of our most respectable and worthy critics, to which we wish to call attention with a view of preparing the way for a much-needed corrective. They seem to have the impression that the mission of the Substantial Philosophy is merely to supply some minor defects in the current theories of physical science as now generally held and taught in the books and schools of the world. They write to us that they are ready to announce themselves as avowed Substantialists as soon as we explain certain holdings in our book so as to harmonize our views with some doctrines in the text-books which they proceed to point out, with the tacit assumption that their moss-covered tenets have been settled in truth for all eternity.

One man wishes to know how Substantialism can be reconciled with the inherent motion of molecules in matter. A learned Professor in a popular American college asks to be informed how Chap. VII. of our book on

electricity can be true, since it is out of harmony with the theory that electricity is a "mere *condition* of ether." Another physicist wishes us to revise the work so as to make it teach that heat is generated by contact between different bodies—that motion *per se*, or the mere stoppage of motion can produce heat.

A special, open-minded friend of ours does not see how light can be reflected from the face of a mirror if it be really a substance, as the new philosophy teaches. Another case is that of a professed acoustician, who is in trouble over Chapter X. of the book, which treats of *Sound*, because Dr. Hall had taught us to interfere with the supposed law of sound interference, viz., that two systems of sound waves may travel in such relation to each other as to extinguish both sounds and produce total silence.

Now right here we wish to say to all such dearly-beloved correspondents and critics, that their several supposed laws in physics are entirely without foundation in scientific truth, and that they can never become good Substantialists until they renounce those truthless theories of unscientific darkness. It is not the mission of our philosophy to compromise with radical error. Materialism is wrong in the essentials of the system. It can never be saved by patchwork. No, gentlemen, Substantialism is so radically different in its fundamental principle, and so consistent in its work of applying that principle, as never to attempt to pour its new wine into your old goatskin bottles.

The nature and mission of the new philosophy may be illustrated by a proper reference to two very important and significant chapters of history. Christianity, upon its proper advent into the world, involved elements radically different from anything then incorporated in the traditions of Judaism. The ceremonial law gave way as the shadow of better things to come. Even some of the apostles could not at first adapt themselves to the radical transition and the veritable reality of the glorious dispensation which was ushered in by the incarnation to make all things new. The Galatian converts wanted Paul's gospel grafted on to the old system of Mosaic observances. For this reason the great apostolic Substantialist had occasion to write them an epistle upon the subject, and even to withstand Peter, who "was to be blamed." So now with the thousands of men who are dissatisfied with the old order of things in physical philosophy as something unable to make the corners thereunto perfect. They wish a more rational and consistent system, but are wofully wanting in that decisive element of character and heroism of stalwart individuality so essential to the emancipation of men who wish to rank themselves with the law-abiding sons of scientific liberty.

Another chapter of history may be cited as furnishing an authoritative and instructive example. When the great reformers of the sixteenth century began to shake the continent of Europe with the thunders that had originated in the upper clouds, the mitered authorities began to propose a compromise by inviting the mighty movement into the dormitory of ecclesiastical scholasticism with an intention of stealing both the lightning and the thunder which it had no power to generate. Even the reformers themselves were at first under the impression that the new order of things was to be originated, wholly, in the system which was effete and radically evil. In the discussions which followed, the legates of ecclesiastical authority wished to convince the reformers that they were wrong, because their doctrines were at variance with the mandates of tradition. The reformers immortalized themselves by replying that tradition was wrong whenever it was found in conflict with God's Word. At Augsburg, at Worms, and at Zurich the reformers announced an authority which had either been lost to sight or chained in the monasteries of spiritual ignorance. The Bible was opened anew and proclaimed as supreme in all disputes concerning religious faith and life.

So now in philosophy. Substantialists accept of tradition, in questions of fact and law, until they find it at variance with the obvious meaning of God's demonstrated word, as he constantly utters it from the holy tabernacle of nature. The Reformation proclaimed spiritual justification by faith, according to the teaching of the Bible; Substantialism announces scientific justification by reason and common sense, according to what God says in the manifest facts, forces, and rightly-understood phenomena of the universe. Until the correctness of this position is conceded, it is the mission of the Substantial Philosophy to make peace with a sword.

FREMONT, O.

AN ADDRESS ON EDUCATION.*

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

MR. PRESIDENT, Ladies and Gentlemen,—It was Herbert Spencer who said, "The essential question for us is, how to live completely," and that "to prepare us for complete living is the function of education." So far he speaks truthfully and safely. But when he limits life to time, and brands all religions as superstition, and insists that in the last analysis "all questions concerning individual, social, and civil life must be settled by science," we must call a halt, for there may be in this world a rational faith, and the human soul may raise vital questions to which science can give no answer. In an age when great social problems are pressing upon us for solution when the Christian Church itself is beset by a gross materialism on the one hand, and by a tenuous idealism on the other, no more important theme can be presented for the consideration of a thoughtful audience than that to which I call attention this evening, namely, "The Culture demanded by the Times."

In such culture (1) WE MUST DISTINGUISH BETWEEN THEORY AND FACT IN SCIENCE. *All honor to the men who seek for truth in the field of created entities;* who, though perhaps unconsciously yet none the less really, feel after God in and through his handiwork. Such men bring fertility to the earth, food for flocks, and angel songs for weary shepherds. They give truth wing, that, poising above us, she may pour forth such tones of sweet melody as will take captive every ear; or finding her as a hidden stream in the earth, they open her way that the waters may swell, until "as a great river, it fertilizes by its exudations or terrifies by its cataract."

We can but admire the boldness of such men. They essay to weigh stars, to shiver sunbeams of their secrets, to twine serpentine lightning about their scepters, fathom the mysteries of subtle forces, and present the results both in nature and method as a pure gem of truth, which gleams and scintillates before human eyes like a stone in the heavenly foundation.

Nor must we forget that *in studying nature men may come near to God.* Thus, his natural attributes are more fully apprehended, "the invisible things of him from the foundation of the world are clearly seen, being understood by the things which he has made, even his eternal power and Godhead." All truth is God's truth, however it may be revealed; whether it smiles from an Arimathean sepulcher, or sparkles in the facet of a diamond; whether it shimmers in the bright form of a transfigured Christ, or gleams from the electric spark evoked and utilized by a Faraday. Be the truth directly revealed by God, or discovered by man, into our barrel the solid grain all falls at last. And, Herbert Spencer to the contrary notwithstanding, nature thus known is God (not in his essence), but in his intelligence and power, so far known. As in studying the productions of an Angelo, or a Da Vinci we are studying, and knowing, and coming nearer to men; so Copernicus, Gerson, Palissy, Bacon and Kepler were drawn nearer to the God of Grace, by their study of the God of Nature. We say, then, all honor to the men, who, with unfaltering tread, and with reason's torch in hand, explore the darkest vaults of nature's archives, who climb on chains of universal law to distant worlds, and weigh vast systems, or chain the vanquished forces of nature to the car of human progress.

2. *We must remember that the tendency of scientific thought which, previous to* 1830, *was intensely ideal, has since that time been grossly materialistic in its inspiration and tendency, and this is very largely the result either of the expressed or hidden disbelief in, or hatred of, Bible truth by some leading scientific writers.*

(a). *Chas. Darwin can be shown to have been grossly atheistic in his belief.*

It is clear to every unprejudiced reader that Darwin's reference at the end of his vol. on the "Origin of Species" to "life in a few forms being originated by the Creator," was inserted simply and solely to gain the ear and the patronage of the Christian world.

Haeckel apologizes for Darwin's attempt to conceal his atheism by saying ("History of Creation," vol. I., p. 7), "The courageous but *cautious* naturalist, was at the time (1859) *purposely* silent on the subject, for he anticipated that this most important of conclusions of the theory of descent, was at that time the greatest *obstacle* to its being generally accepted, and acknowledged." And Prof. Henderson ("Evolution and Christianity," p. 18) makes substantially the same charge.

Darwin's most ardent admirers admit that the rest of his work antagonizes the passage in question, and Prof. Schmidt speaking of it says: "On this occasion Darwin has certainly been untrue to himself. It is certainly incompatible with the doctrine of descent." Zolner declares that "to hold the beginning of life an arbitrary act of creation, is to break with the whole theory." Indeed, Darwin's theory as set forth in the "Origin of Species" so emphatically antagonizes the Mosaic idea (of supernatural origin of species), that even Carlyle read his work with sorrow and disgust, and said: "I have known three generations of the Darwins—grandfather, father, and son—atheists all"!!! And in his latter days, Darwin writing to a German friend, who had asked for a statement of his religious views, said: "I am an old man and in delicate health; as far as I am concerned, I do not believe that any revelation has ever been made. With regard to a future life, every one must draw his own conclusions from vague and contradictory probabilities"!!! This letter dated Downes, June 5, 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 aim of his life was to blot out all of these important truths.

No wonder that Dr. Robert Ellis Thompson of the University of Pennsylvania declares (in the "Britannica") that Darwin's evidence as to the importance and all-sufficiency of environment in development of species have contributed to atheistic tendencies more than any other single cause. And permit me to note in passing, that he who advocates even theistic evolution to-day, must trample under foot, and utterly ignore all the philological evidence to the contrary

* Delivered at Kingston, N. Y., during the session of the New York M. E. Conference, on Sabbath evening, April 10th, 1887.

which appears in the Hebrew verbs of the first chapter of Genesis! Darwin is atheistic.

(b.) *Mr. Huxley is grossly materialistic in his beliefs, and malignant in his spirit toward Christianity.* While admitting that there are no facts to justify the theory of the spontaneous generation of life, yet he declares himself an evolutionist, and says, "it must be that life was some time thus produced," etc. His three lectures on "Man's Place in Nature," do much to unsettle theistic belief, and he glories in the alleged fact that in the struggle between science and religion, "extinguished theologians lie like strangled snakes beside the cradled Hercules," etc.

(c.) *Mr. Tyndall is equally skeptical.* At Belfast he "abandons all disguise," expresses his belief in "material origin of life," and the "continuity of nature, eternity of matter," characterizes the Bible as an "interesting, pathetic attempt of the opening mind of *man* to appease its hunger for a cause." He is a living illustration of the truth that a soul cannot rest in mere negation or doubt. Faith of some kind is essential to human comfort: for, cut from the anchorage of God, his bark a plaything of the billows, the compass of his principle broken, and the rudder of his faith unshipped, he is an object of pity. Looking away from his father's faith, he seeks in "modes of motion," and in "prayer tests" to still the clamor of an immortal nature.

The rejection of theistic faith does not extinguish in man the perceptions which reach to the invisible world, for though he sleeps, the ladder rounds crowded with angels will ever and anon appear. Such men may, in their apparent contentment, be surrounded, like Joseph in Egypt, by all the comforts that fame and fortune can provide; but, like him, they mourn in loneliness, and in secret cry out, "Doth my Father yet live?"

Tyndall is feeling round in the darkness for a guiding hand which has no nail mark in it. Now when we remember that science, properly so called, is the result of facts being consciously grounded in some conception, and tending to educe some general principle, we may well inquire into the religious antecedents of scientific works, and demand especially from materialists that facts attest the truthfulness of, rather than be assimilated to, their theories. For it is only on the highway of fact that man can find the hub whence shoot out well-seasoned and resistive spokes of scientific truth.

3. *Much of the so-called science of the present day is mere hypothesis, having no basis in demonstrable fact, and among these are all so-called scientific demonstrations which presuppose that certain phenomena are mere "modes of motion."*

(a.) *It is assumed that all force is but "a mode of molecular vibration."* With Aristotle, heat was only "a condition of matter;" to Lord Bacon it was "motion, and nothing else;" and with them agree Davy, Locke, and Tyndall. It is claimed that heat, light, electricity, magnetism, sound, nerve force, and thought force, are only various "modes of motion." And what is the implication here? That heat, light, etc., are not new and real things, but merely terms descriptive of the properties of motion—that only the material is.

And what is motion, and what its relation to heat or any other force? It is but the act or process of changing place, and is evidently different from any force. It is the sequence, and not even the cause of force. As reasonably talk of heat as a mode of rest, as of a "mode of motion." Not being an entity, but rather an incident or result of force activity, how can any mode or manner of it produce effects upon the real, whether it be motion tardy, accelerated, compound, rectilinear, or helical? The shadow is the same in essence and potentiality, whether it moves in straight lines, or performs regular or irregular antics on the parlor walls.

Now the bearing of this theory on the doctrine of soul existence and immortality is vital. It posits in matter, and in motion the all of earth; assuming that no force is at work within the human body, which is not active without it. It discerns in matter the potency of every form of life, and as molecular vibration, and thought and mind can only continue while brain molecules exist, adieu to the idea of soul essence and immortality. We must not forget that that great worker in psychological science, and religious philosophy, Joseph Cooke, came directly upon this objection of Haeckel to the possible existence of the soul after death, and he found himself unexpectedly, but absolutely *balked*, for the analogical argument was entirely against him. But Mr. Cooke now accepts Substantialism, and the new doctrine of force as an entity, as the only possible method of overthrowing Haeckel's argument for materialism; and he declared recently at Cleveland that if the forces of nature are not substantial, 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.

We must draw the lines clearly between the seen and the unseen entities of the universe. We must distinguish between substance and matter, the former being a genuine, and the latter a specific term; the latter sustaining the same relation to the former, that gold does to metal. We must recognize the fact that there are invisible entities in the universe, and we shall ere long see that the forces of nature are such. If it requires substantial odor to produce the sensation of smell, surely substantial heat is necessary to produce the sensation of burning, and substantial light to originate a sensation of sight. These forms of nature are so many fingers pointing upward to other existences, subtle but real, in the realm of thought and worship. They are Bethlehem singers heralding the fact that the higher unseen is. They are Patmos angels parting the veil that interposes between the gross and the tenuous, between matter and spirit, until through nature man mounts shining ladder-rounds, and standing in the very presence of otherwise invisible entities, he exclaims, "Who are these, and whence came they?"

That forces are entities appears from the fact that they produce effects.

If the mode-of-motion theory is true, then the non-existent produces all the changes which take place in matter; and zero, unhelped, can produce results. The Duke of Argyle never spoke more truthfully than when he said, "All the realities of nature are in the region of the invisible;" "matter is only the phenomena of force;" and "life is something, for it builds up organization." And Huxley, as he gazed upon the exquisite shell of the foraminifera, and found in the organless jelly blob no adequate originator, was forced to admit that an "unseen real" was the builder.

Either electricity is an entity, or Edison has been studying a cipher for years, and Union Square is lighted to-night by the same commodity! If the hammer claw which lifts the nail is an entity, what is the magnetic current which lifts the same thing? Both produce effects upon the inert.

Sound is something more than sensation, for it sets the stretched wire into sympathetic vibration, though that wire has no ear or auditory nerve. Light affects the flower and the photographer's plate, though neither has an optic nerve. Heat melts and etherealizes even where there is no tactile nerve to be influenced. If Grant's work on the field and in the chair of state prove him to be something more than "a mode of motion," or "a property of matter," if he was an essence, an entity, so are all the forms of nature. When Gaal and the men of Shechem found themselves overthrown, wounded and pursued by the hosts of Abimelech, Gaal was fully persuaded that the foe was other than what Zebul had supposed them to be, mere shadows of the mountains.

No man, who accepts the mode-of-motion theory, can be blamed with inconsistency for believing with Strauss that Moses, or David, or Jesus were imaginary or mythical personages, for if red-hot metal, running like water, does not prove the substantial nature of heat, then the Mosaic Law, the psalms, and the Christian Church (that bush ever burning, but not consumed) may not prove the previous substantial existence of real men. What folly for John Tyndall, before the British Association, to say: "The Blocks of Egypt were laid down by a power external to themselves, but molecular blocks of salt are self-posited." In Sarnia as elsewhere a sound philosophy will ever insist that real effects are always the results of real causes. And surely Christianity must stand beside her in this, for if visible effects upon a metal may be produced by the substantial —a mode of motion—then scriptural science may reasonably declare that the same is true of the human body, and therefore the soul is not an entity. We must not confuse the force revealed with the material agent which it utilizes, or through which it reveals itself. Invisibility does not prove unsubstantiality, for odor is no less a substance because invisible. The ball is no less an entity, when flying so swiftly from the cannon's mouth that you cannot see it. Jesus is no less the substantial king because he is the king invisible. The young must be taught that the soul is not the only unseen real in this world. The man who comes to believe and know that hills are real things, will not be so likely to consider a great mountain as mere mist, even though its peak, because it reaches nearer heaven, is bathed with a sunlight more glorious.

Let us be careful, lest the rising generation "trust the soul upon the fancy that it is but mortal, thus freighting" (as Tupper says,) "a bubble with a diamond, and then launch the priceless gem on the boiling rapids of a cataract."

To declare all things properties of matter which do not always reveal themselves independent of the material, is to plunge into materialism at a single leap; while to establish the substantial nature of force, by appeal to its effects, is at once to render possible the scientific demonstration of the soul's entity, and if substantial, then indestructible, then personal immortality is reasonably established, since a substance involving feeling, self-consciousness, sensation, cannot as such cease to exist. We must distinguish between theory and fact in science.

(*Concluded next month.*)

NOT CHARGED WITH HERESY.

BY R. M. WALKER.

In the March number of THE ARENA Dr. Swander, in a review of my article of February, says: "In reading Dr. Walker's communication in the February number of THE ARENA we found our eyes so completely deluged with the floods of the solution of laughter that we concluded not to make any reply to the same." Of this conclusion the doctor, however, repents, and gives us two columns and a half in return for my article of a single column. We must not doubt the doctor's word that he did laugh; but his laughter must have been of the solemn kind, as his article does not indicate a temper that finds its expression in merriment; but, on the contrary, it indicates the fact that the writer felt that he was grievously wounded. The impulse of a wounded man is to hurl at his

assailant every ugly expression of contempt that he can command. So it is here.

The Doctor admits to be true all that was claimed in the article under review. The Andover Professors are, he admits, not on trial for heresy in form, and he retreats under the claim that underlying the trial, and the sole cause of its being prosecuted, is the belief, by the Board of Visitors and by the orthodox public, that the doctrine that these Professors are charged with teaching is heresy; and that this was his central idea in the former article. This may be difficult to see. But so let it be. It is certainly true that if the Board of Visitors had felt no concern for the will of those that founded and endowed the seminary, and felt no interest in what was taught in the institution that is under their care; and if, likewise, the orthodox churches had felt no concern to maintain what they claim to be divine truth; then there would have been no trial. It is, then, this interest in acting justly by the founders of the institution, and the interest of orthodox Christians in maintaining the truth, that the Doctor so vehemently condemns. Is this the kind of morality and religion that the Doctor advocates? a morality without justice, and a religion without a principle, or that has no concern to maintain by just means what is held to be true, and especially where justice to the living or dead demands it? It seems so.

He thinks that these professors ought to be left alone. He glories in their courage to sit firmly in their chairs and teach doctrines subversive of the system to which they had in the most solemn manner declared their adherence, and without which they never could have occupied a chair in the seminary or drawn a penny from its funds. But the Doctor makes his meaning more clear; he advocates the doctrine that a breach of trust, as the using of money to subvert the object for which it was explicitly set apart, is justifiable, provided the object to be gained is good. This he proves, as he supposes, by reference to Luther and others who remained in the church of Rome whilst they taught doctrines subversive of her creed.

It is true that all Protestant Christians honor the name of these men for what they did in bringing about the great reformation, a work which, no doubt, they would have accomplished more rapidly and effectually if they had at the beginning severed their connection with the church of Rome and abjured all partnership in her iniquities. There are few men, I think, and Dr. Swander seems to be of the number, who honor these men, not in spite of, but because of their violating their solemn oath and remaining in a church that they were using their utmost exertion to destroy. But these men were more excusable than some others, as they had been taught from their infancy by this same church that the end sanctified the means. But does Dr. Swander advocate this doctrine, and does he practice it, and do evil that good may come?

But the gist of the Doctor's article is sneer and a desperate attempt to belittle my knowledge and ability as a writer—things of which I never boasted—nor am I entitled to the honorable title of Doctor. The desperate struggle with words to show his contempt is seen in that wonderful sentence quoted at the beginning of this article, or in his pet illustration of a cackling hen. But being evidently conscious that he could not find material for his purpose in the article or subject in hand, he goes back and hunts up an article that I had written some time ago on the "Days of Creation," supposing, no doubt, that he could make capital out of the simple fact that the theory there presented differs widely from the one adopted by nearly all geological writers who attempt to harmonize geology with revelation. This being so, he would have it understood that I am an ignoramus, and destitute of all geological knowledge, and a fool for differing from these great men. The Doctof, however, does not point to a single sentence in that article that conflicts with any established fact of geology.

On the contrary, I referred to these facts to show that "the testimony of the rocks," in connection with the conception of a Creator, who works as he will, renders the theory very probable, and this again in connection with the simple statements of God's word, which is above all human theories, it is in the highest degree probable. The Doctor affects to ridicule the idea that the sun ruled the day before it was created. But, unfortunately for the ridicule, nobody ever said that it did. This whole matter is sufficiently explained in the article referred to. Can the Doctor make the matter any better by lengthening the days to indefinite periods of millions of years when the Bible still says, in connection with the work of the fourth day, that God made the sun and moon and stars? Will he discard the Bible? I am constrained to believe that the Doctor never read the article in question, or else that he carelessly misrepresented it for a purpose. But what has all this to do with the trial of the Andover Professors for heresy, or breach of trust? Is the Doctor desperate? He is, at all events, perfectly welcome to all the capital and all the reputation that he has made out of this matter.

ELK CITY, KANSAS.

NECESSITY FOR A DIVINE REVELATION.

A FIVE MINUTES' ADDRESS BEFORE THE ANNUAL MEETING OF THE JEFFERSON COUNTY, KANSAS, BIBLE SOCIETY, JANUARY 2, 1887.

BY REV. J. W. ROBERTS.

MR. PRESIDENT,—The difficult task assigned to me this evening is that of condensing into a five minutes' talk an epitome of that which would require five hours to do it even partial justice. I close this Book (the Bible lying open upon the pulpit desk), shut out its divine light, and step out into the arena of Nature, with all the intense emotions, aspirations and longings of my inner being crying out for recognition by an audience with some power or source of information which can satisfy its ceaseless demands and interrogations. I am confronted, at every point, with these momentous problems: "Whence am I? What am I? Whither go I?" I stand face to face with these profound enigmas. I cannot shut them out or bid them begone; nor can I flee from them; they are forever with me, and cease not, day or night, during my hours of conscious existence to demand an answer. I cast about me to discover some source of information which shall lead me out of the darkness about me into the light. I find three avenues of investigation open.

1. What Nature teaches. 2. What Reason demonstrates. 3. What Observation makes manifest.

Nature, like a mighty book in one great volume with many parts, lies open before me. I read the first page. It is a lesson-picture of beauty, joy, and peace. The bright sun, the green earth, the singing birds, the chirping insects, contented beasts, flowers, fruits, and harvests—all tell of life, hope, and gladness. Surely this world must be a paradise, designed and fitted up by an intelligent power somewhere for man's happiness—a beneficent power that has provided all things necessary for the welfare of a race of intelligent beings like man. I turn over the leaf, and the scene changes. The bright sky is overcast by black and angry clouds, out of whose depths the flashing thunderbolt leaps, and falls with destructive crash upon the habitation of innocence. The cyclone comes sweeping along with terrible force upon man and beast, houses and crops, and leaves desolation and death in its destructive path. The hurricane, the tornado, hail, frost, and snow do their work. Earthquakes swallow up hamlets, bury cities, ingulf islands, and run the plowshare of ruin over vast areas of country. On all sides, then, are forces of devastation and death as thickly blended in the great amphitheater before me as are the sunlight and blessings. With her smiles and tears, her joys and sorrows, her light and shade, her life and death, Nature allures, alarms, and bewilders, but utterly fails to aid me in solving the riddle of my being and myself.

I turn to Reason. Surely she can help me. I scan this magnificent universe around me, so full of grandeur, beauty and order, every part so admirably adapted and adjusted to every other part, that harmony and diversity are deftly woven together in one transcendent whole, without jar or discord; and I say: Here are such unmistakable evidences of design and execution in framework and motion, in construction and perpetuation, that certainly somewhere I shall find how and by whom or what this all originated. On some page of this work the Author's name must be legibly written. The search begins, but the mystery deepens. The great truth now so near eludes the grasp and disappears. Now I fancy I behold the name written clearly, but the next flow of reason wipes it out as the waves wash away footprints upon the sand. In the realm of dumb matter there is order and precision, all else is confusion, and out of tune with itself and the rest of Nature. Reason recoils upon herself in dismay, and my appeal to her is vain. The great hunger of my soul is unsatisfied. Soul? Have I a soul? Who can tell? Where the wisest have doubted, even Socrates at times, who can "resolve the doubt?"

I call to Observation. The response is quick, for the desire to obtain knowledge is insatiate and will not rest. I look out and behold a mother in the first joys of maternity. She clasps her babe to her bosom, covers it with kisses, and her whole being is radiant with love. Here is one Eden whose bowers are a perfect paradise. I look again. There is the same mother, the same babe. The same? Alas! the little hands no longer fondle the mother's face, the little arms no longer twine the mother's neck. Its velvet cheek no longer presses hers. Its answering eyes no more respond to her tender gaze. It is cold and still, and white as the snow. Its tiny hands are folded across its pulseless heart, and in the "narrow house of clay," from sight and caress and loving care it is laid away forever. Forever! Oh, what a word to that mother's heart! But there is no light, no cheer, no hope, shining out of that lonely cell. This is but an example of what I behold on every side. There are songs and sighs, smiles and tears, joys and griefs, hope and gloom, laughter and wailing, pleasure and sorrow, ease and pain, life and death. The night grows darker about me. The one crowning truth for which my whole being is intensely yearning glides farther and farther away.

With nature, reason, and observation combined, I continue the quest. Scanning the world as it passes in panoramic view before me, I see the strong oppress the weak, wrong usurps the place of right, error hides the truth, injustice often reigns. Wars, pestilence, and famine desolate the earth. Disorder, violence and death run riot. The opposites of these are also found when sought for, and the web and woof of terrestrial things are but an inextricable tangle, which cannot be unraveled. I gaze upward. There all is concord. I appeal to the heavenly orbs. Golden sun and silver moon give no answer back to my anxious breast, and I cry out, "Oh, ye 'glittering stars of light,' tell

(*Continued on page* 18.)

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

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

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ROBERT ROGERS, - - - OFFICE EDITOR.
D. K. ELMENDORF, - ADVERTISING MANAGER.

Whole Series, Vol. 7. New York, June, 1887. No. 1.

50 Cents a Year, Single Copies, 5 Cents.

For sale by American News Company and all leading newsdealers.

See Club Rates.

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All communications intended for the pages of THE ARENA to be sent to the Editor.

RATES OF ADVERTISING:

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Over one Column, 10 per cent. Discount.

Remit by express money order, draft, P. O. order, registered letter, or postal note addressed to

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THE SUBSTANTIAL PHILOSOPHY.*

BY THE EDITOR.

(*Concluded from last month, page* 185.)

BUT Newton, unfortunately, did not live to see the day when a system of physical philosophy should be inaugurated by which every form of natural force should be converted into a substantial entity, and upon which rational and consistent basis every problem known to science would be capable of solution. Had he caught even a glimmer of the doctrine which we have been here unfolding, the blows of Huygens would have fallen as harmlessly upon his emission theory as would his supposed waves of luminiferous ether have fallen upon the enameled surface of an elephant's tusk.

In fact, had Newton, at the time he was attacked by Huygens, suddenly become a Substantialist, the undulatory theory of light as urged by his opponent would never have been heard of since; for not only would there have been no necessity for the invention of *ether*, by which to get some material medium out of which to manufacture light-waves, in order to make them correspond and harmonize with the supposed sound-waves in air, but the great discoverer of the law of gravitation would instantly have applied this new revelation of Substantialism, concerning the proper classification of substance and the true nature of all force, to sound as well as to light, making them both substantial but immaterial forces. He would thus totally have destroyed all necessity for the invention of ether-waves in order, as Huygens urged, to reconcile the phenomena of light with those of sound by making both of them, as he supposed, modes of motion.

Surely subtantial pulses of light itself, as an immaterial entity, would have met every emergency in science, and explained every mystery encountered in the phenomena of light as well as would pulses of this supposed material substitute *ether*. Why, then, was the idea of an all-pervading material substance invented by Huygens? Simply because neither he nor Newton had formed the first conception of this new classification of nature's substances into *immaterial* as well as *material* entities, and consequently neither of them could have the remotest conception of the mystery-solving principles of Substantialism which, by recently touching sound and light, have transformed them both from meaningless modes of motion into their true status as substantial forces of nature. Newton and Huygens entertained at that day the same views which materialism still teaches, that whatever is substance must of necessity be matter. Hence they ought to have repudiated the existence of the soul as anything but a mode of molecular motion, as Haeckel now teaches. How, in fact, Newton was able to believe in a God, except on the material basis of pantheism, is a problem which even Substantialism is not capable of solving.

One of the strong arguments employed by Huygens against the probability of the existence of Newton's material light-corpuscles, was the improbability that nature should make a leap from sound as but the wave-motion of air, to light as corpuscular emissions of matter. Why, asked Huygens, to the utter confusion of Newton, should nature depart from the beautiful process of wave-motion for causing the sensation of hearing, to the contact of material corpuscles to cause the sensation of sight, when by the wave-motion of a still more refined medium than air a complete uniformity in the operation of the two senses might have been maintained?

* A paper read, by invitation, before the American Institute of Christian Philosophy, in this city, Feb. 3d, 1887.

Newton was confounded by the reasoning of his opponent; but how easily could he have turned the tables upon him had he been a Substantialist and had he retorted: that as nature had just made a leap from corpuscular emissions and substantial contact in *odor* and the sense of *smell* to wave-motions of the air in *sound* and the sense of *hearing*, would not nature most likely keep up the practice and leap back again to corpuscular emissions in *light* and the sense of *seeing*, since she had got so recently into the habit of leaping? Had Newton made this justifiable retort, the great Dutch physicist would have found his "leaping" argument turned into a veritable undulatory boomerang.

But how beautifully is all such leaping logic wiped out and swept away by the Substantial Philosophy, which so consistently and harmoniously continues the unbroken concatenation of substantial contacts from touch, the lowest sense, up to sight, the highest! Nature, however, in reaching sound, merely changed the refinement of the substance for sensuous contact to an immaterial entity, thus adapting it to the economy of that department of nature as odor, the next sensation producing cause below sound, was placed above flavor, and on the very borderland of materiality, so near to the immaterial line of substance that some Substantialists already question the fact whether or not odor does not somewhat partake both of an immaterial and material nature. This orderly, consistent, and harmonious gradation of refinement in substances for sensuous contact from touch the lowest to sight the highest, corresponds beautifully with the graduated scale of distances to which the various sensations are enabled to reach, thus adding to the uniformity and orderly gradation everywhere observed in nature.

Huygens, forgetting that there were three of the five senses below the sense of hearing which might form a guide to the proper understanding of the two higher senses, as well as throw light upon their sensation-producing causes, simply took for granted the fact that sound, as an external cause, was universally conceded to be the wave-motion of the air, without even asking the question if such a view of sound and of the sense of hearing was justified by the facts of nature. Having Newton also irrevocably committed to the wave-theory of sound, he had no difficulty in so pressing his new departure of ether-waves upon his opponent's mind, that the great philosopher at last succumbed, and surrendered his material light-corpuscles for the newly-invented material waves of ether. What real advantages, however, were gained by Newton in thus exchanging his material corpuscles for material waves, we have always been at a loss to divine. One would suppose that ordinary human eyes could endure the one about as well as the other, since both waves and corpuscles were admittedly constituted of *matter* and traveled at the same velocity.

Newton, we believe, did not pretend to form an estimate of the number of these little material balls which were supposed to enter the eye in a second of time; but the waves of material ether, which Prof. Tyndall and Sir William Thomson tell us have the property of a jelly and the rigidity of steel, have been accurately numbered, and they amount to the modest quantity 699,000,000,000,000, of these jelly undulations in each second of time while we are looking at a violet light! We presume that Newton made this change of scientific base with his eyes open, notwithstanding the danger one would think he encountered; but what advantage he could really have seen in these countless millions of rigid, material gelatinous waves per second over his own tiny and harmless material light balls which he had so long tested, he has never taken the trouble to inform us.

The sober truth is, one of those material theories of light was just as irrational and impossible as the other, and neither of them would have possessed the slightest claim to intelligent acceptance except for the entire absence of a knowledge of the true nature of force prevailing at that age, and which has continued, unfortunately, to prevail down to the present decade.

To catch an idea of the tyrannical power which the all-prevailing wave-theory of sound has held over the minds of physicists, in forcing the greatest of them to accept monstrous physical absurdities, and to teach them for science, we need only refer to the well-known fact that Newton himself demonstrated, by his formula of density and elasticity, the velocity of sound in air to be just 174 feet a second less than shown by actual observation. Now, this demonstration by Newton was fairly made, as admitted by Prof. Tyndall in his "Lectures on Sound," and according to the very formula on which the entire wave-theory rests, thus absolutely demonstrating the theory itself to be false. Yet Newton was so spell-bound to the undulatory tyrant that it never occurred to him as among the conceivabilities to abandon the wave-theory after proving it false, nor has it occurred to any physicist since, though this demonstrated overturn has stood on record absolutely unshaken all these years from Newton to the present time.

Newton saw and keenly felt the predicament in which he had unexpectedly placed the wave-theory of sound, and even tried to explain the discrepancy, thus shown to exist between formula and observation, by supposing about one-ninth of the air to be constituted of "solid particles" whose "crassitude" permitted the passage of sound instantaneously through them, thus recovering the 174 feet a second lost by the formula! But he was soon worried out of this weak suggestion by the ridicule of his compeers, thus leaving the theory broken down by common consent, though never abandoned, till at last Laplace, the eminent astronomer, struck the happy thought which brought scientific daylight out of this undulatory darkness.

This great discovery of Laplace, by which still to vindicate the so-called formula of "density and elasticity," and thus to rehabilitate the theory killed by Newton's mathematics, consisted of the astute guess that the supposed "condensations and rarefactions" which occur in sound-waves generate just enough heat and cold to add, by their augmentation of atmospheric elasticity, the missing link of 174 feet a second to the velocity of sound, and thus to account for Newton's demonstrated discrepancy.

The part of this sage solution of Laplace, however, which strikes the mind of the average scientific student as supremely amusing, is that no matter how loud or faint the sound may be, whether the tone of a mosquito's wing, with its almost infinitesimally small condensation of the air, or the report of a hundred-ton Krupp gun, which sometimes bursts the tympanic membranes of the gunner's ears, just enough heat and cold is always produced in these condensations and rarefactions to add the exact amount of elasticity to the air, and thus make up this precise deficiency of 174 feet a second—not a foot more nor a foot less! Plainly a powerful condensation in the air-wave, as in the case of a loud sound, ought to produce more heat and more elasticity than a very trifling condensation, as in a faint sound. But this very common-sense consideration never entered into the calculation of Laplace, and has never been considered worth considering by subsequent physicists, so delighted have they seemed to be over the great solution that has led them out of the scientific wilderness, and saved them from the staggering effects of Newton's fatal demonstration.

Preposterous as it may appear, we assert it to be a fact, and will proceed at once to prove it, that the wave-theory teaches that all sound-waves, whatever the intensity of their sounds, produce the same condensation of the air and consequently generate the same amount of heat by compression. Not one physicist from Newton down to the present has dared even to hint on paper and thus place on record the amount of condensation of the air and consequent heat a sound-wave generates in order to equalize this discrepancy of 174 feet, till at last Prof. A. M. Mayer, of the Stevens Institute, Hoboken, N. J., in his able article on Sound in *Appleton's American Encyclopedia*, comes out flatly and courageously, defying the consequences, and publishes to the world that the heat generated in a sound condensation is the equivalent of "1-679" greater density in the compressed half of the wave than the density of the normal air, not the slightest hint being given of any difference between a loud and a soft sound as to the amount of such condensation. Of course if there were any difference in the degree of condensation in loud and soft sounds, and consequent difference in degree of heat, Prof. Mayer, the only man on earth who had dared to refer to the subject at all, would have been the one to suggest it. All honor and credit to Prof. Mayer. He has shown, while the whole scientific world kept silent, that he dared to take this undulatory bull by the horns, throw his own precious self into the breach, and thus formulate for better or for worse the prodigious attempt of Laplace to save Newton from the effects of his demonstration, and thereby try to give a new lease of life to the wave-theory.

But Prof. Mayer's unfortunate figures have actually killed the wave-theory even deader, if possible, than did Newton's mathematics, for this very "1-679" increase of density in the compressed half of the sound-wave over that of the ordinary air, indicates the exact amount of mechanical pressure exerted upon one half of a given mass of air when filled with sound, and the same for all sounds, loud or faint. All this seemed harmless enough to the distinguished American physicist, until this pressure-calculation happened to be carried out for some particular sound, when, behold, it was discovered, to the consternation of physicists, that it gave the *locust* (which can be heard a mile in all directions) a mechanical squeezing power of more than 5,000,000,000 tons, or the working energy, by its act of stridulating, of more than a million locomotives, as we have shown by indisputable figures in the "Problem of Human Life," at page 134.

The foregoing, however, are only mere specimens of the arguments which, in defending the substantial nature of force, necessarily grew out of the controversy which has been raging for these more than eight years past. As sound was regarded by physicists the most unquestioned as well as unquestionable of all the modes of motion taught in physical science, as proved by the fact that the undulatory theories of light and heat, with the very *ether* on which they were based, were the legitimate offspring of the wave-theory of sound, it was natural and even unavoidable, in attempting to formulate a universal philosophy of Substantialism, that this theory of atmospheric sound-waves should be the field where the chief battles of the campaign would have to be fought, and where the final victory for the new departure should be won, if won at all.

Hence, in the necessities of the campaign this question of sound, as wave-motion or as a substantial force, became the seat of war and the scene of its hardest-fought battles. By common consent it was also understood if the mode-of-motion advocates could not maintain their ground here, it was worse than useless to attempt battle over theories whose chief argumentative strength grew out of the fact that they had originally descended from the wave-theory of sound; while by like tacit agreement it was understood that if the Substantial Philosophy could come off victorious on this battle-field of sound, its claims to all the legitimate spoils of victory must thereafter pass unquestioned. Hence, in order to vindicate the claims of Substantialism as a totality, including the substantial nature of every other form of force as well as sound, by the tacit admission of the scientific world, requires now only the complete overturn of the wave-theory, and upon its ruins the establishment of the doctrine that sound is a substantial and objective force. This gauge of battle the friends of the new philosophy have most cheerfully and on all occasions accepted, agreeing absolutely that by this sole arbitrament of scientific warfare Substantialism is to live or die.

In concluding the argumentative part of this paper it is impossible to present even more than a small fraction of the considerations going to make up the overwhelming proofs in favor of Substantialism, based on this general discussion of the sound question. This phase of the discussion is elaborately presented, and in great detail, in nearly one hundred questions and answers in the new "Textbook on Sound" which we have just published, and to which all parties are referred who are not sufficiently informed by this circumscribed paper. To avoid injustice to those present, we will add here a single argument against the current theory of atmospheric sound-waves, and thus, by necessity in support of the substantial theory of sound—an argument, by the way, which we have published both in THE MICROCOSM and in THE SCIENTIFIC ARENA, and upon the invulnerability of which we have repeatedly offered to risk the entire cause of the Substantial Philosophy. But we have this to say, in thus prefacing the argument, that no physicist has ventured to accept our proposition, and thus risk the fate of the wave-theory of sound upon the same terms upon which we have proposed to risk Substantialism.

The argument, briefly stated, is this: If sound consists of atmospheric pulses sent off from the vibrating instrument, as the wave-theory teaches, it is plain that the more powerfully such instrument vibrates the stronger will be these atmospheric pulses or condensations and rarefactions, the louder will be the sound produced, and the greater will be its range at a given pitch or given number of vibrations per second. We state only the truth when we say that no unbiased professor of physical science in the land will dispute the correctness of this proposition.

But is it true that the more powerfully the sounding instrument vibrates, and the more powerful are the air-waves sent off, the louder will be the sound? We answer no. Take a turning-fork for example, strike it heavily, and hold it in your fingers, and though its prongs are swinging to and fro a distance of a sixteenth of an inch, thus carving the air, as Professor Tyndall expresses it, into condensations and rarefactions, and sending them forth as sound-waves at a velocity of 1120 feet a second, yet it is an observed fact that its sound cannot be heard by the sharpest ears more than six or eight feet away, notwithstanding these powerful atmospheric pulses whose claimed condensations and rarefactions alone constitute sound according to the wave-theory. The same is true of a heavy wire chord stretched over rigid iron supports, unconnected with any sound-board for producing resonance. Its sounds, when thumbed heavily, can only be heard a few feet away in a still room, notwithstanding the large and powerful air-pulses thus sent off.

Now comes the *denouement* of this unanswerable argument. A locust of a certain species familiar to everybody throughout the United States, and weighing less than a single grain, will sit on a green leaf and by

a tremor of its thorax scarcely visible—at most not one-tenth that of the vibration of the tuning-fork or string referred to—will issue a sound that can be heard a mile in every direction; thus with one-tenth the action upon the air of either the fork or string in the shape of condensations and rarefactions, will produce a sound of 800 times the range, and of more than 80,000,000 times the volume, by accurate estimate. And all this is true even when the fork and string employed are of the same pitch or number of vibrations per second as is the sound of the insect!

Thus do we demonstrate in the most conclusive manner known to the investigations of physical science, that sound does not and cannot consist of air-waves, but on the contrary that it must be a substantial force depending, for the intensity of its radiations, upon the sonorous property or quality of the sounding instrument from which it emanates, and not in any sense upon the mechanical or condensing effect such instrument produces upon the air.

If it be asked, on the supposition that sound is an entity, what becomes of this substantial sound-force after its manifestation ceases, whether it is annihilated, whether it is created out of nothing or made out of the material substance of the sounding instrument, and whether or not the locust, in stridulating for a long time, would not finally dissipate itself and its body disappear in this so-called sound substance, etc., etc., we answer, that all such questions, and scores of others which we have explained over and over in our various publications during the last six or seven years, are suggested by a want of a comprehension of the grand distinction which we have made in this paper between material and immaterial substances.

The whole universe is full of immaterial substance as "the things that are not seen," spoken of in scripture: as the all-pervading fountain or force-element of nature. No substance, material or immaterial, can be lost or annihilated, and no new substance, in its innermost essence, can come into existence; it can only be changed in nature and form by that uncreated and self-existent power which organized and now holds the universe together. By the various processes ordained in nature, the different forms of physical force for special manifestations are drawn from this universal fountain of force in the shape of sound, light, heat, gravity, cohesion, electricity, magnetism, etc.; and in like manner, from the higher domain of this same force-element, correlated to the personal, substantial, and infinite God of the universe, are drawn the vital, mental, and spiritual forms of force for the use of organic beings in this and other worlds, and by the processes ordained in nature to these ends.

When a light, for example, disappears or a sound ceases to be heard, the force which caused and constituted it is not lost, but is conserved in the universal fountain whence it came in obedience to the natural process which manifested it. A magnet may issue streams of substantial force for thousands of years, and yet not the smallest particle of its own material substance will disappear thereby, since the magnetism, though substantial, is immaterial, and hence is no part of the magnet itself, but is brought constantly by it as an agent from the force element of nature, as the supply-fountain for that special manifestation; and as this substance radiates from the magnetic poles, doing its work, the law of the conservation of all force and energy carries its substantial currents back whence they came, to be conserved till again needed either in that or in some other form of force.

But this higher phase of the Substantial Philosophy which we are here approaching carries us into a field of thought, research and speculation, upon which nothing can be said in this limited paper. Our aim has been simply to unfold the fundamental principles of this system of doctrine, and explain the scientific ratiocination which led to its establishment as a new departure in philosophy. We firmly believe that the more the foundation principles of Substantialism, as here set forth, are elaborated, and the correlations of the substantial forces traced and followed up toward their infinite source and primordial fountain, the more beautiful and sublime will the philosophy itself become, founded as it is upon the eternal verity of nature's laws, the broad and revolutionary principle that all force in the essential nature of things, from that which holds a grain of sand intact to that which keeps Neptune in its orbit, from the vitality of the lowliest worm to the spiritual essence of Deity himself, is of necessity a substantial entity.

With the purely physical forms of force, as the causes of physical phenomena, immovably established and vindicated as substantial and objective entities, it was but an easy step to include the vital, mental and spiritual forms of force as the equally Substantial causes of all observed vital, mental, and spiritual phenomena. And thus, having demonstrated the first, did Substantialism claim, boldly, to have vindicated the second, namely, that the life, mind, and spirit of man, as an incorporeal organism, even before the dissolution of the material body should take place, possessed every capability and faculty qualifying it for a substantial, conscious and personal existence in another and a higher life. This field of vital, psychical, and metaphysical investigation, in which the relations of man to the Deity, as also his relations to the lower grades of animal life, are fully considered in our other writings as forming the ultimate and crowning department of the Substantial Philosophy, to unfold and elucidate which a special lecture might readily be prepared, should it be thought desirable.

The anticipation of a future life of vague impersonality, or a half-conscious being of shadowy, dreamy mist, with no real personal physique, or substantial environments, such as houses, mansions, landscapes, rivers, trees, gardens, flowers, forests, cities, streets, and friends, with actual clothing as well as with actual bodies to be clothed, may have filled the theological conceptions and met the religious wants of generations gone by, but no such ethereal views of a fog-environed heaven can meet the aspirations of Christian men and women of the present decade of the nineteenth century; and let us add in conclusion, that if the Substantial Philosophy, in the higher aims of its development, means one thing more than another, it is to strengthen and confirm the Christian believer in the conviction that he has within him an organic, substantial and imperishable personality which, when the earthly house of its tabernacle shall be dissolved, it shall be clothed upon with a real body and inhabit a real house not made with hands eternal in the heavens.

HAECKEL'S OBJECTION TO THE IMMORTALITY OF THE SOUL:

ANSWERED IN ANOTHER WAY BESIDES SUBSTANTIALISM.

TO THE EDITOR OF THE SCIENTIFIC ARENA,

—A friend handed me a copy of THE ARENA containing a paper read by you before the American Institute of Christian Philosophy in the city of New York. Referring to that address you say that Substantialism "is the only possible means of escape from Haeckel's logic in favor of the utter annihilation of the soul at death," and, "if any man thinks otherwise and believes he can devise or imagine any other method of escape than by the way of the Substantial Philosophy, let him write it out concisely and send it to THE ARENA and we will cheerfully print it," etc., etc. Taking advantage of your liberal offer I submit the following, which you will admit to be at least *concise:*

If I understand Prof. Haeckel's conclusion regarding mind force, life force, spirit force, etc., it is based on the assumption—held in common by all materialists—that *mind*, life, etc., as force, is a production of *brain*, or in other words, that what we term the *intellect* is nothing but *transmutated matter*. Granting the truth of this assertion, it follows as a matter of course that mind must die with the brain that gives it birth, and there is no means of escape unless you deny the assumption, which Substantialism does on the ground that mind is not produced by anything, but is a Substantial entity as indistructible as matter itself. To prove this assumption, Substantialism assumes the same to be true of heat, sound, light, magnetism, electricity, gravitation, etc., in spite of all scientific teaching to the contrary, and maintains that there is no other means of escape from Haeckel's logic. Let us see.

Away back in the sixteenth century, Benedict Spinoza taught a system of pantheism. To substantiate the truth of his system, he laid down certain propositions, and then demonstrated them *mathematically*. The following is one of his propositions: "*Of substances which have nothing in common, one cannot be the cause of the other.*" If this proposition is true—and no one has ever yet been able to show otherwise—Haeckel's must be wrong, because *we know* that *mind has nothing in common with matter;* they possess not a single characteristic between them; hence mind cannot be a production of matter; and if it is not a production of matter, it must be an independent existence, which is all that Substantialism claims for it. For a rigid demonstration of the truth of the proposition quoted above, I refer the reader to Spinoza's system of pantheism, which will be found to agree with Substantialism in several respects.

JESSE BEASELEY.

REPLY TO THE FOREGOING, BY THE EDITOR.

WE have not words in which to express our surprise at the foregoing communication, coming, as it seems to, from an intelligent and educated writer. Our only explanation of the mystery it involves is the fact, as admitted by Mr. Beaseley, that he knows little or nothing of the basic principles of Substantialism, having never examined the subject till his mind happened casually to be called to it by a copy of THE ARENA, which was handed to him by a friend. Had he ever before received even a smattering knowledge of the Substantial Philosophy, he would, no doubt, instantly have seen that his reasoning, based on Spinoza's supposed demonstration, was completely at fault, being overturned by the elementary propositions of Substantialism, as everywhere explained throughout our publications.

In the first place, and as one of his greatest errors, it is not true that Haeckel makes mind-force, life-force, spirit-force, etc., "a *production* of brain," or that "intellect is nothing but *transmuted matter*," nor is such a self-stultifying assumption "held in common by all materialists." Suppose that Haeckel and all materialists should really hold, as Mr. Beasely assumes, that mind is a refined form of "transmuted *matter*," can he not see the inapplicability of Spinoza's proposition, as bearing on Haeckel's doctrine, that mind "has nothing in common with matter"? Surely, if mind is "nothing but *transmuted matter*," then, the mind and the body have everything in common! Thus is the very first attempt to answer Haeckel, independently of the Substantial Philosophy, neutralized by the central statement on which it relies!

Had Mr. Beasely not been as deficient in his knowledge of Haeckelism as he was of Substantialism, he would have known that the great German materialist holds to no such weak and indefensible doctrine as that mind is "transmuted *matter*," or any kind of a "*production* of brain," however refined. A "production" must, in the nature and meaning of the term, be an entity, a substance of some kind. Wool, for example, is a production of the sheep; grain is a production of the soil; honey is a production of the bee, all of which as *productions* must be as substantial as the sources from which they were produced.

In direct opposition to this mistaken view of the modern doctrine of materialism, Haeckel and all intelligent materialists teach that mind-force, including life-force, spirit-force, psychic-force, etc., is not a *production* at all, but is simply the *motion* of the brain particles, just as heat and sound are the motions of ether and air-particles, as taught by all science. As motion is intrinsically *nothing* entitative, being *mere position in space changing*, as we have so many times demonstrated in our various publications, it can neither be a "production of the brain," nor can it be any refined form of "transmuted matter."

Haeckel repudiates the idea *in toto* that mind is an entity, product, or substance of any kind; for should he admit such an anti-materialistic notion for one moment, he would nullify his boasted doctrine of the annihilation of the soul at death, since he proclaims as among his strongest materialistic positions that no substance can ever be annihilated. Hence he insists that as nothing but matter and motion exists in the universe, and as mind-force, life-force, and spirit-force are but the *motions* of brain-matter which necessarily cease to exist when the moving mass, whether it be a molecule or a locomotive, comes to rest, it follows that mind, life, soul, and spirit, all being *motions* of brain and nerve-molecules, can exist no longer than such molecules are in motion or during the life-time of the body.

Haeckel does not pretend to account for the origin of this motion of the brain and nerve-molecules. He assumes its existence, however caused, as constituting life, mind, etc., just as modern science assumes the existence of an all-pervading material ether and the molecular structure of matter, whose atomic motions, however caused, are supposed to constitute heat. How these atoms and molecules of ether and of solid matter get their motion or keep it up so as to constitute and transmit heat, physicists do not pretend to explain, any more than does Haeckel try to explain the origin of mind-force and life-force as but the motions of brain-molecules. But Haeckel assumes that life-force and mind-force, which exhibit analogous phenomena to heat-force and light-force, are just as reasonably and logically explained as but the motions of brain-molecules as are heat-force and light-force explained to be but the vibratory motions of material ether molecules.

Haeckel's argument in favor of mind, life, soul and spirit, as but the motions of matter, and consequently in favor of their total cessation at death when these brain particles cease to move, is as invulnerable as logic itself against every religious philosopher, who accepts the mode-of-motion theories of the physical forces as taught in all the colleges of the land. He says in sneering defiance to the minister of religion, who urges on him the scriptural doctrine of the immortality of the soul, first prove that there is any such thing as *soul*, *mind* or *spirit*, as a substantial entity, capable of future existence, after the brain ceases to act, before you preach to me about its possible immortality! If heat, light, sound, magnetism, electricity, etc., are but the various modes of motion of material particles, such as those of air, ether and solid bodies, what theological cheek to deny me the right to assume the same conditions in the molecular vibrations of brain and nerve matter as constituting life-force, mind-force, and spirit-force, whose phenomena are so analogous to those of the physical forces! First explain to me, continues Haeckel, how *heat* can melt platinum and destroy cities, how *magnetism* can lift bars of iron, or how *electricity* can shiver forest trees to splinters, as the mere motion of material molecules and nothing entitative or substantial, before you assume analogous forces, or phenomena-producing causes, in the vital realm to be substantial entities capable of an immortal existence separate from material bodies!

But, says the sage theological philosopher in reply, we *assume*, and the whole religious world teaches, and has always taught, that the life, mind, soul, and spirit of man, instead of being forms of force or motion, constitute a personal, substantial *being* capable of independent existence separate from material conditions, and this universally accepted doctrine of the church and of the Christian fathers we present triumphantly against the materialism of Haeckel, and thereby claim to establish the immortality of the soul by unanswerable argument.

Away with your mere assumptions, replies Haeckel, which prove nothing either in religion, science, or philosophy. You admit my half of the premises, that all the phenomena-producing causes in the purely physical realm, instead of being substantial entities, are mere motions of material particles and which necessarily cease to exist when the vibrating molecules cease to move; and by all reason and consistency in science, I have a right to deny yours and to conclude that mind, life, and spirit, which manifest their powers and move our bodies as magnetism moves the distant iron bar, are but analogous natural forces or phenomena-producing causes on a higher plane of activity, and that they must of necessity be based on the same general principle of the *motion* of material but organic particles.

If but one single form of force or one single phenomena-producing cause in nature, by universal agreement, is admitted to be constituted of the motions of material molecules and nothing else, it must be regarded by every logical mind as the climax of absurdity to claim any other form of force or phenomena-producing cause as a substantial entity. Hence, continues the great German atheist, I accept your voluntary admission, as based on demonstrated modern science, that all the forces of physical nature, including sound, heat, light, electricity, magnetism, etc., are modes of motion, while I challenge you to deny my correlative position when I carry your own logic legitimately into the vital and organic realm and show its analogous forces to be similar modes of motion of organic matter. The merest novice in logic would laugh a clergyman out of countenance who should attempt, after accepting the teachings of modern science, to rebut this tremendous argument of the materialist by the bald assumption that the vital, mental, and spiritual powers are not natural forces, at least analogous to heat, light, electricity, etc., in their method of operation.

But now, what does Substantialism do in this appalling crisis of materialism, when the entire philosophy of human immortality is laid prostrate in the dust of humiliation by a single argumentative blow? Why, the intelligent Substantialist comes up smiling, with a radiant confidence which is born alone of the conscious presence of invincible truth, and requests the scholastic theologian to step aside while he meets the Goliaths of materialism on their own grounds.

He at once admits the incontrovertible logic of Haeckel, that if any one form of force or phenomena-producing cause in nature, in whatever department of its vast realm, is the mere *motion* of material particles, then all forms of force must, in the very consistency and nature of things, come under the same category; and consequently he admits that if a single form of physical force or a single phenomenon-producing cause in nature, such as sound, light or heat, can be absolutely demonstrated to be the mere motion of material particles, and therefore not a substantial entity, then good-bye to all hope of a future immortal existence for humanity, since in the very essence of logic, life, mind, and spirit—other forms of natural force—cannot be immaterial substances, *with heat, light and sound conceded to be but the motions of matter which cease to exist whenever the moving molecules come to rest!*

Having thus accepted the materialistic logic of Haeckel as invulnerably correct, thereby aiding him to spike every theological gun in modern Christendom as trained from a scientific battery, our cool-headed and deliberate Substantialist proceeds to unfold another scientific and philosophical gospel which eye had never seen nor ear had ever heard till it was announced in the creed of Substantialism less than a decade of years ago, namely, that instead of the universe being constituted of *matter* and *motion*, as materialistic science teaches, it is constituted of *matter* and *force*; in other words, of *material* and *immaterial substance*; and consequently that every form of force, without one exception, instead of being a mode of motion of some kind of material substance, is itself an immaterial entity—the motion of the moving body being merely the effect of the substantial force communicated to and stored up in it, however small or large such moving body may be. Hence, it follows that sound, light, heat, electricity, magnetism, gravitation, cohesion, vitality, mind, soul, spirit, even up to the embodiment of all force—the infinite God of the universe—are various forms and degrees of this immaterial subdivision in nature, matter itself being the other grand division of the substantial universe. Can anything be plainer than this?

Conceding this new Substantial Philosophy to be true as relates to the physical forces, the disciple of Haeckel sits confounded and helplessly entangled in the meshes of his own logical network, and exclaims in the agony of his desperation, only demonstrate to me that any one of the physical forces such as sound, light, or heat, instead of being modes of molecular motion, are real objective existences, or immaterial but substantial entities, and my materialistic opposition to the future substantial existence of the soul is gone forever. For why as a logician, which I profess to be, fly into the face of reason by insisting that the vital, mental, and spiritual forces, which I see manifesting themselves in work throughout the animal economy, are only modes of material motion, after it has been demonstrated before my eyes that the so-called modes of motion in the realm of physics are all substantial entities, and that the entire scientific world has heretofore been mistaken?

We need not here extend this reply to show how the physical forms of force have been demonstrated to be substantial entities. Our writings are full of these proofs from the first chapter of the "Problem of Human Life" down through the five volumes of THE MICROCOSM, and winding up with the last volume of THE ARENA and the "Text-Book on Sound," so that those who are not disposed to remain willfully ignorant of these resistless proofs against materialism, have now no excuse left them. Yet, marvelous to contemplate, it is a fact that hundreds of Christian ministers, who have had these proofs of the substantial nature of all the forces repeatedly placed before them as the sure antidote to every materialistic tendency of this age, and with the absolute consciousness that, with-

out these evidences furnished by Substantialism, they would stand tongue-tied in the presence of one of the weakest disciples of Haeckel and Huxley, will repudiate from simple prejudice this shield and buckler of God's truth in the kingdom of nature, and speak slightingly, even derisively, of the only system of philosophy that will vindicate revelation, save the Church from the maelstrom of materialism, and justify the ways of God to man.

DIRECTION OF WHIRLPOOLS AND CLIMBING VINES.

BROOKLYN, N. Y., May 8, 1887.

Editor of the Arena:

DEAR SIR,—Will you explain to your readers why it is that a basin or tub of water allowed to run freely out of a hole at the center of the bottom will always pass out in a whirlpool? And why is it that this whirl always takes the direction opposite that of the common screw?

Also, why is it that climbing vines always take a direction, in passing upward around a tree, *with the sun*, or from left to right? These facts of nature have always been a mystery to me, and by answering the same you will greatly oblige your humble servant, as possibly also many other readers.

Very truly, S. P. THRASHER.

REMARKS BY THE EDITOR.

Mr. Thrasher is entirely mistaken in the nature of the problems he presents. A basin or tub of water, for example, with a hole in the center of the bottom, has no tendency whatever to form into a whirlpool in passing out, provided the water is *still* before the hole is opened; but will run out from all sides directly toward the center, as can be seen if floating bits of paper be placed on the water's surface. If, however, the water be started into a whirl however slight before opening the escape, it makes no difference in which direction the whirl is produced, this spiral movement will continue and accelerate till all the water passes out.

In regard to the direction of climbing vines we have made careful observation, and find that the extreme upper points of certain vines, when young, like the sunflower, incline to point toward the sun, and by following the sun during the day, gain their initial twist in that direction. Of course such vines at the equator, with the sun as often north as south of the vertical line, would be apt to twist as often in one direction as the other; while far south of the equator, with the sun's inclination to the north, as it is always to the south in this latitude, such sensitive vines would, no doubt, incline to twist in the opposite direction to what they do here, and for the same reason. In the case of other vines, we find a promiscuous tendency to twist in either direction, as the young shoots happen to take their initial turn. Out of a score or more of different wild vines which we recently examined in a jungle thirty miles from this city we found about as many specimens twisting in one direction as in the other.

A WORTHY MOVEMENT

TO SUPPLY COLLEGE LIBRARIES WITH THE LITERATURE OF THE SUBSTANTIAL PHILOSOPHY.

BY THE ASSOCIATE EDITOR.

ALREADY the Substantial Philosophy has made such headway and gained such a foothold in the minds of independent scientific thinkers that several of its earnest adherents are now asking and agitating the question, by what means it is possible to call the attention of college professors and students to the teachings of this new departure from the beaten paths of science and philosophy.

During the progress of the first volume of THE SCIENTIFIC ARENA, many suggestions have been made by friends of the cause it advocates, touching this important field of missionary work, which up to the present time has been almost entirely neglected. It is true that near the commencement of this work of unfolding the new philosophy to the world, its founder, Dr. Hall, devoted more than a thousand dollars to sending issues of THE MICROCOSM to some fourteen hundred colleges, universities, and seminaries, most of whose librarians or leading officials expressed a willingness and even gladness to receive and keep on file those magazines for the use of the professors and students. But owing to the limited resources of the editor, notwithstanding his burning desire to spread the cause of Substantialism among seats of learning, he was forced to discontinue it, and to wait patiently till the work had obtained such a hold upon the minds and souls of its adherents as to induce a concerted effort to place those writings within the reach of all who might be willing to read them.

The plan for such a consummation fortunately culminated the other day in a visit from the Rev. Dr. James A. Buck, the venerable Episcopal clergyman of Washington City, who suggested that a subscription be at once started among the friends of Substantialism throughout the world to raise a fund for placing the "Problem of Human Life," the five volumes of THE MICROCOSM, the first volume of THE ARENA, and the "Text-book on Sound," all substantially bound in cloth, in the library of every prominent school in the land that might be willing to accept them. These books to be sent to the various schools at the actual cost of paper, presswork, and binding, including express charges, Dr. Hall having given the free use of the electrotype plates for that purpose.

So anxious was Dr. Buck that this work should be carried out at once, for the good of the greatest and best cause on earth, next to Christianity itself, that he consented to act as treasurer for the fund and to use his personal influence to obtain donations, besides heading the list with a contribution of $25. We are glad to report that so well did the programme of Dr. Buck meet the views of those that happened to be present in THE ARENA office at the time, that three others at once subscribed $25 each.

It is believed that the Substantialists of the country, if their hearts are only in this cause as their words continually warrant us in believing, will at once raise this fund to such a figure as to enable the committee to place these eight volumes in the libraries of every prominent institution of learning in the land. The work, therefore, may be considered as actually commenced, and we now invite every genuine friend of the cause of Substantialism to write to the Rev. Dr. James A. Buck, treasurer, Washington, D. C., naming the sum he will donate to this cause. Each intending contributor of $5 or more, sending his name to Dr. Buck, has the privilege of naming, for each $5 donated, the college or institution to which he desires the books sent, and such schools will be placed on the list for negotiation to be supplied if they will accept the books free of charge. Thus every contributor to this fund will have the satisfaction of knowing that his money has aided in the direction of his own choice.

Let no reader of this notice delay for a more convenient season, but while the noble impulse is upon him for doing a work of which he may always be proud, let him write to Dr. Buck, naming the sum he will donate, to be paid at any time *prior* to *January 1st*, 1888.

A list of the contributors, together with their residences and the amount subscribed, will be printed each month in THE ARENA.

NECESSITY FOR A DIVINE REVELATION.

Continued from page 8.

me whence I came, what I am, and whither I go?" But the stars twinkle on in cold silence, and mock me with their still and solemn splendor. I turn to this ball upon which we live, and plead, "Oh, mother earth, explain to me my origin, myself, and my destiny;" but with mingled light and shadow, the earth coldly turns a deaf ear to my beseeching plea, and opens a dark and damp and clammy grave at my feet! I reach hither and yon, but my hand clasps only phantoms and retains nothing, and at length my weary feet press upon the "cold pavement of death," when I shrink back exclaiming, "Is this the end of all? is there nothing beyond?" Only the echo of my own sad wail comes back like notes of despair upon my anxious ears and aching heart. At the very best all is doubt, uncertainty, or a still deeper gloom. No guiding ray of light, sure and steady, sheds its radiance across my path.

From within me there comes a voice which says: "If there be a God, He must be just, and good, and wise, and He will not leave me thus. He will not thrust me into this wilderness of uncertainty, doubt and despair, to grope as a blind man and perish in darkness, without hope, or guidance, or light. There is, there must be a revelation of truth somewhere to meet this inexpressible and insatiable craving of my whole being, which He has planted within me. He who has created the demand will furnish the supply."

The necessity for a direct and distinct divine revelation from God to man being found in the very constitution of the latter, I look for and find it in this blessed book (the Bible). I open its lids and upon the first page find the mystery solved as I read: "In the beginning God created the heavens and the earth."

I read with delight the simple but sublime story of creation. I learn there that this body of mine is the workmanship of God; that this life of mine is the breath of God; that this active, thinking, living principle within me, this conscious *I am*, is the image of God. I am, therefore, a son of the Highest. I know whence I am.

Being the son of a King, I am myself a king also, and have "dominion over the beasts of the field, the fowls of the air, and the fish of the sea." The vegetable and mineral kingdoms likewise belong to my domain. My title deed to these possessions is given by the Author and Originator of all things, and is absolute and undisputed. He tells me to possess, replenish and subdue my inheritance.

A king I am, also a subject under law. A steward only in my own realm. I hold my tenure of possession by the will of Him who gave it, and he fixes the terms. Obedience is the one law to which I am subject, and its penalty is the complete forfeiture of my estate. In an evil hour I disobey. The penalty falls like blasting lightning upon me. I am hurled from my throne and principality as a planet from its orbit, and the plowshare of destruction drives swift and deep through all the vast empire from which I am driven, and now I see why earth is full of contradiction, mystery, and doubt. In despair I am forced out of Eden, where I flee from my Father, in fear, to hide from his loving face. Sin makes me a coward. Guilt impels me to hide. But the voice of God reaches me. I come forth a culprit to receive my sentence. The court was in session, the Judge in His seat. I stood trembling, my soul covered with sin and shame, and blotched with crime, and none to wash and make me clean. I was in debt, and an utter bankrupt, and there was no creature in all the universe to offer a ransom for me, for they themselves, and all they possessed, belonged to God already by

proprietary right, and to take God's property to pay the debt due to Him would be but adding robbery to other sins. I was lost, and no one to find me: in bondage, with no one to redeem me; under sentence of death, with no one to pardon. I had robbed God of His heritage in me, and there was no one to make reconciliation. I had rebelled, and there was no one to make peace. The sword of justice was descending upon my corrupted body and polluted soul, and I was at the gate of eternal death.

Then out of the bosom of the Godhead comes my Redeemer, with all the requisites to pay my debt and the price of my ransom. He steps into my place, receives the stripes that should fall upon me; lifts the sword from me and receives the blow Himself. I am reprieved. I am released from condemnation, and the burden of the primal sin is forever taken away by Him, save the unavoidable fruits thereof, the sorrows of life and the pains of physical death. But more than this: He becomes my surety for the future on such terms as lifts me again into fellowship with God and kinship with angels, who are made his "minister-spirits" to me; and beyond all this He enters Himself at the court of heaven as my Advocate. All hail! Redeemer, Surety, Advocate!

And now I learn what I am—a child of God, lost and found, sentenced and reprieved, sold and redeemed, and by adoption an "heir of God," a son of His household.

I am not restored to my earthly domain as at the beginning; but the crown, the kingdom, and the priesthood are reserved for me in that country where there is "no more death;" while the wreck of my earthly heritage, shattered and broken, is not withheld from me. But now, the gift of God, "life and immortality are *brought to light*" through the atoning merit and the gospel of Jesus Christ my Lord.

The mystery is solved, the mists are fled, the light is shining. Gloom and doubt are gone. Death is not the end of all. The grave holds not its prey forever. The shout of triumph swells up from its portals as He stands upon its brink and declares, "I am the resurrection and the life." The mother now consigns her precious babe to the tomb, with the cry from her heart, "The Lord gave, the Lord hath taken away; blessed be the name of the Lord." Hope spans the gulf between time and eternity, and the victor's shout comes from the realm of death, "Oh! death, where is thy sting; oh! grave, where is thy victory?" The gates of immortality stand ajar, and the eyes of faith look through into the glorious Beyond, and the soul waits with the song of redeemed triumph upon its lips to set its feet upon the "shining shore," and walk the golden streets. As in the beginning, there is but one condition to all the gifts of God through Jesus Christ, and that is *obedience*.

My task is done, my quest is ended. I have learned whence I am, what I am and whither I go. But all this knowledge comes through direct revelation from God, and is found nowhere else. Thanks be unto the Father for this revelation of Himself, of myself, and my destiny.

OSKALOOSA, KANSAS.

WHAT IS LIFE?

BY S. HENRY.

THIS is a question that has often arisen in my mind. Some years since, the late Prof. E. R. Peaslee defined life to be certain phenomena manifested by the actions of appropriate stimuli, as moisture, heat, light, and electricity, or an organized body. For a time this satisfied me. But when I began to study the Substantial Philosophy the question arose, is life merely certain phenomena? Is it not an entity? I turned to Webster's Unabridged Dictionary for light. It defines life to be "That state of an animal or plant in which its organs are capable of performing their functions."

But this definition does not carry with it the idea that life is an entity.

I submit the following definition for your consideration, with the request that if you know a better definition, you will give it in the next number of THE SCIENTIFIC ARENA.

Life is that force in nature which presides over nutrition.

CAMP POINT, ILL.

REMARKS BY THE EDITOR.

Mr. Henry's definition of *life* is correct as far as it goes, but it stops short of a complete definition. Life not only presides over *nutrition*, but it presides over *organisms*, even when no nutrition is in the process of reception or assimilation. Mr. Henry, however, has struck the keynote of Substantialism when he defines life as a substantial force—a real entity—in contradistinction to the meaningless definitions given in science, such as he quotes. To call life a "state," or condition, as does Webster, in which animals "are *capable of performing their functions*," is childish self-contradiction. How can an animal, or even a vegetable, perform its functions without the exertion of an active force? And if it performs intelligent functions, it requires two kinds of force by which to accomplish such work, namely, *motor*-force, which is life, or vitality, and directing or governing force, which is mind or instinct, as we explained fully in our article on "Cause and Effect," in the January number of THE ARENA, Vol. I, page 121. Near the close of that article, we remark:

"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*. . . .

"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?"

Life is thus the *cause* of vital phenomena, and not at all the phenomena manifested, just as the mind is the cause of mental phenomena, instead of being the phenomena themselves. As well assert that heat, electricity, magnetism, and gravitation are certain phenomena "manifested by the action of appropriate stimuli," as Prof. Peaslee taught about life, instead of being the forces themselves, as the substantial causes of the phenomena observed. True, life-force enables an organic being to appropriate light, heat, electricity, and every form of nutritive stimuli, both material and immaterial, and to manifest vital phenomena in return. But vital phenomena are the effects or appearances resulting from the active force of life as the efficient cause. Keep the law of cause and effect constantly in mind, and vitality as a natural force will never be mistaken for the properties of a living organism, or the phenomena it manifests. (See last No., p. 188.)

PROF. THOMAS MUNNELL, A. M.

WE are glad to be able to announce to the readers of THE ARENA that our able contributor, Eld. Thomas Munnell, has been chosen Professor of Theology in the Garfield University, located at Wichita, Kansas. His work in that promising institution of learning will begin in September, at the opening of the fall term. We do not know which to congratulate most—the Professor, the university, or the community in which it is situated.

We will not, however, try to conceal our inner feelings of regret that it had not been the Chair of Physical Science, rather than that of Theology, to which our friend and co-worker had been chosen. Not that theology is not an important field to cultivate, to which Prof. Munnell is admirably adapted; but hundreds could take his place in that department, while very few, if any, could fill the bill in the chair of physics to meet the wants of the times as could this able defender of the Substantial Philosophy. But we have the satisfaction of believing, with implicit faith, that as true religion and true science are ineradicably allied in God's natural order of things, Prof. Munnell will make his power felt in that University, even in the Chair of Theology, for every department and phase of Substantialism. We expect many articles from his trenchant pen during this volume of THE ARENA, the opening one of which will appear next month.

AN OLD CHESTNUT.

"WHICH side of a wagon-wheel travels the faster, that which is at the top or that which is at the bottom? J. D. BARNETT, B. A.
"FOREST CITY, ARK."

The bottom of the wheel does not travel at all, unless the wheel slides, because the bottom of the wheel is always that part which is touching the ground. The moment that part of the wheel, which for the instant constitutes the bottom, rises and begins to move forward, another part takes its place and for another instant constitutes the bottom, and, therefore, does not move forward. The motion of the wheel is from nil—the point always in contact with the earth—to the extreme upper portion, which is the swiftest, of course. The center of the hub travels with average velocity, being the velocity of the wagon itself. EDITOR.

The following kindly mention speaks for itself:

"Substantial Philosophy."

THE above is the subject of a recently published work by Hudson & Co., New York, and of which Rev. J. I. Swander, D. D., of Fremont, O., is the author.

The book is a formulation of the Substantial Philosophy, of which Dr. Wilford Hall is the founder, and Dr. Swander a most ardent disciple. The work contains the richest thoughts of Dr. Swander's mature mind, being the result of much labor and research on the part of the great scholar. The work is a profound one, as it deals with intricate subjects. The object, however, has been to simplify as much as possible the most intricate parts, thus making it a most desirable work to the reader of average intelligence

Dr. Swander has employed the catechetical method, which is comprehensive, complete, and to the point. While the author takes

the reader through a series of more than eight hundred questions of the most intricate and complex nature, he at the same time gives the answers in a clear, concise, and logical manner. The reader will be highly gratified in procuring a volume of this valuable work. Dr. Swander's style is both clear and pleasing, and only such as comes from a ripe scholar and classic writer. We are more than pleased with this valuable book, and will always cherish it as a jewel in our library and a most valuable acquisition to science. In the formulation of this NEW PHILOSOPHY, Dr. Swander has proven himself equal to the task. His great learning and extensive reading has made him a Hercules in the region of thought and a fit person for the great task he has undertaken. We bespeak for this valuable book a large sale, a thing it justly deserves.—*Bettsville Enterprise, O.*

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.

Progress and Poverty.

BY HENRY GEORGE.

IN reviewing this book a London paper of wide circulation says: "Beyond compare, the greatest work on economic and social questions that has yet appeared; and the forerunner of the most momentous revolution."

The London *Times* devotes four columns to a review of it, but owing to limited space THE ARENA must merely glance at the views of its author.

Mr. George takes the position that the widespread poverty existing throughout the civilized world is abnormal, and results from a violation of two of nature's laws, and that should this violation cease, enforced poverty would soon disappear and abundance for all take its place.

These laws are: First, that a vast majority of people are deprived of the free use of one of the first four elements given by Nature for man's support, and without the free use of which he must either perish or become a slave. This element is *land* to live upon and from which to procure his support.

The *second* law violated is that which gives to every one the "fruit of his toil"—that which he earns either with his hands or brain—this means, *first*, that he is entitled to *all* he earns; *second*, that he is entitled to *no more* than he earns; and, *third*, that any law by which he is deprived of any portion of the "fruits of his toil" wrongs and impoverishes him.

This theory strikes a blow at rent for the use of land and also at taxes upon that which man produces, as they take from him a portion of his earnings.

For the use of land, exclusive of all improvements, the denizens of our cities and villages, and inhabitants of the country at large, pay in rent every year upward of $1,500,000,000, the Federal Government takes from us $350,000,000 more in duties on importations and in internal revenue taxes, and the state, county, and city authorities $500,000,000 more--all drawn from the earnings of the people. Is it any marvel, in view of this enormous drain upon the industries of the country, that poverty is the household companion of millions of homes? that salaries and wages are low; that hundreds of thousands, and sometimes millions, can get no employment; that our merchants and manufacturers are constantly failing; and that, about every ten years, commercial panics, always wrongfully attributed to other causes, drive tens of thousands into bankruptcy and throw millions of industrious men out of employment, converting them into *tramps?*

Is it any marvel that land-owners get wealthy when they take so vast a sum every year from the earnings of the people and often use it to corrupt legislation and establish monopolies which enable them to impoverish their fellow men? Still more. Mr. George proves, clearly, that capital and labor are friends—not rivals or enemies—and that each helps, and is needed by the other, that those who rob the capitalist of his interest and the worker of his earnings are the real enemies and oppressors of both.

The question now arises, what is the remedy? How can we support and sustain all branches of the government without encroaching upon the earnings of the people, and how can we get land in city or country, to live and work upon, without paying rent for it? These two questions being satisfactorily answered, the problem of constantly increasing progress in wealth of the landowner, and constantly increasing poverty of his tenant—a problem that has puzzled the wisest political economists for centuries—will be solved.

Mr. George claims that there is a vast amount of wealth already accumulated and being constantly augmented in the country which has not cost the slightest effort of labor, and to tax this would not violate in the least degree either of the laws of nature named, and from which all the means necessary for the ample support of all branches of the government can be obtained. This is the unearned increment of land in city, village and country—that value which is given to land simply by increase of population, and not in the slightest degree by labor. He opposes taxation of every kind and nature upon improvements and manufactures, because they are the products of labor, but proposes that the unearned value of land be the only thing taxed. Tax this, he argues, both in city and country, and nothing but this, and tax it to the legal interest of its value, and poverty as a necessity will soon cease to exist and plenty for all take its place.

As an illustration: a tract of land located far from any settlement and from a road leading to a settlement has little value except that which labor applied to it yields; but a single acre located in the heart of the business center of New York City, without an improvement upon it, will sell for two millions of dollars, this value being given it by population and without any exertion of labor. Now, he argues, if the people give this value to the land, the people, and they only, have a right to take yearly the interest of its value by taxation, and place it in the public treasury; and were this done in all the cities and large towns of the country, the revenue would amply support all branches of the government and do away with the necessity of duties on imports or any other kind of taxation.

The chain of reasoning by which Mr. George endeavors to show that this course would soon banish poverty and give the use of land free—except necessary taxation—to all, is remarkably clear and logical, but want of space prevents more than a reference to it, and the book itself must be consulted.

Mr. George is now at the head of a political party, the corner stone of its platform being, "Abolish all taxation except that upon the unearned increment of land," and he claims that it is greatly to the interest of all who perform honest labor, whether with hands or brain, from the President of the United States to the humblest citizen, to join it. "Progress and Poverty" contains 403 pages, and can be purchased, in paper cover, for 25 cents, from any newsdealer in the country.

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SKETCH OF THE LIFE OF THE REV. JOHN CRAWFORD, D. D.

BY THE EDITOR.

DR. CRAWFORD, now of St. Thomas, Dakota, and whose portrait accompanies this sketch, is the only son of Lieutenant Crawford, and was born in the county of Londonderry, Ireland, on the 25th of December, 1819, being thus but four months our junior.

At an early age he was sent to school in the city of Belfast, where he attended Dr. Price's Academy, and subsequently the Belfast Royal Academical Institution.

At the age of thirteen he was converted, and shortly after he entertained a strong desire to study for the Christian ministry, in the Presbyterian Church; in which denomination he had been brought up. his family being of Scotch descent. They had been Jacobites, who settled in the north of Ireland after the battle of Culloden in 1746.

He entered the University of Edinburgh in 1844, where he studied two years. While a student here, he preached in the neighborhood of Edinburgh every Sabbath evening, where several persons were converted through these occasional labors.

About this time, after careful consideration, he embraced Baptist views. He was baptised by the late Dr. Alex. Carson, of Tubbermore, Ireland, one of the ablest thinkers of the age, as well as one of the most devoted and successful ministers of Christ; a sketch of whose life and labors appeared in the last number of the *Baptist Quarterly*.

An early acquaintance with this great and good man had a marked influence on the religious and intellectual development of the Edinburgh student: who, for some two years, under the occasional advice and direction of his pastor, applied himself to diligent and uninterrupted private study, making abstracts and written criticisms of the authors he read, while, with the help of a private tutor, he continued his classical studies.

Chiefly through the influence and example of Dr. Carson he early habituated himself to a careful sifting of his text-books, taking nothing for granted on the mere authority of men, either in science or theology.

In 1847 he proceeded to England, and resumed his studies in Stepney, afterward Regents' Park College, London, where he continued two years.

On leaving college, he labored in the parish of Lee, in the neighborhood of London, where he organized a church and erected a place of worship, at a cost of some $24,000.

He ultimately emigrated to Canada, and labored for some time in the province of Ontario, where he was invited to the chair of Church History and Biblical Interpretation in Woodstock Baptist College, now McMaster University, as associate professor with the late Dr. Fyfe. Here he continued to fill theological chairs for some fourteen years.

REV. JOHN CRAWFORD, D. D.

When he first entered upon this work, the institution being in its infancy, and without an adequate staff of teachers, he occasionally took part in the literary work, teaching several branches—as logic, mental and moral philosophy, and political economy; but latterly he pretty much confined himself to his own theological department, all the chairs of which he filled in succession.

Resigning his position in Woodstock, he proceeded to Manitoba, under the auspices of the Baptists of Ontario, where he founded Prairie College, for the training of young men for the Baptist ministry in the British Northwest; which institution was situated in Rapid City, 150 miles west of Winnipeg.

The Canada Pacific Railway, which was planned to run through Rapid City, having changed its course, leaving that place some twenty miles to the north, rendered the location unsuitable for a college site, and which ultimately led to the closing of the institution, with the avowed intention of founding another in the city of Winnipeg; but which purpose has never been carried out.

While Dr. Crawford fully approved of the change of location, the closing of the college, before the denomination was prepared to found a substitute, has always been, in his judgment, a mistake, calculated to retard the progress of the Baptists indefinitely in the British Northwest.

Prairie College did good and efficient work while in operation. Some fifty souls were converted, and eight churches organized, through the labors of its teachers and students; and several young men of promise were practically educated for the Gospel ministry. Some of these, having completed their course in other colleges, are now doing good work for the Master, while others are still pursuing their studies with success, some in Woodstock, some in Toronto, and others in the United States.

After the closing of Prairie College, Dr. Crawford accepted an appointment in North Dakota, by the American Baptist Home Mission. His leisure hours, which, with so large a field, must be necessarily brief, he devotes to his pen. He is naturally of an excellent constitution, and capable of enduring much fatigue, both mental and physical.

Some three years ago, from a careful study of the "Problem of Human Life," and subsequently from reading the five volumes of THE MICROCOSM, he became a firm believer in the Substantial Philosophy; and we are happy to state that he has promised to furnish for THE ARENA, from time to time, some of the products of his powerful pen.

By a lifetime of close study and teaching he has become a strong and original thinker, and a powerful opponent of error in any department of thought upon which he enters, although, while handling error with an unsparing hand, he always avoids personalities in controversy, it being his constant aim to discover and defend truth, no matter from what quarter it may come, or by whom it may be opposed.

It is his firm conviction that there is a great and growing need of scientific reform, much being taught as science in our schools, which is falsely so called, and which is founded upon the wildest hypotheses and assumptions, although commonly accepted by the multitude as *advanced scientific and philosophical thought*. While he would encourage the diligent and careful study of the usual text-books on science, he would have them studied with critical discrimination as the works of able, but *fallible*, men—as *helps*, but not as ultimate *authority*. He would call no man father in science any more than in theology; but, proving all things, would hold fast only that which is good and true.

The time has come, he believes, when theologians should assert their ability and right fearlessly to investigate every scientific question, instead of tamely and timidly submitting to become the tools of a certain class of semi-skeptical scientists, who would preempt for themselves the sole right to authoritative scientific teaching, and yet who are constantly disagreeing among themselves concerning the very scientific essentials which they teach. He thinks, and does not hesitate to avow his conviction, that it is a disgrace to theologians to be the mere fuglemen to these philosophers, lending themselves to the manufacture of a false and ever-varying exegesis, by which to force the Scriptures into harmony with every scientific, or rather unscientific, hypothesis.

From the articles which have recently appeared in this journal from Dr. Crawford's pen, and especially from the one which appears in the present number, our readers can catch a glimpse of his peculiarly critical reasoning powers. Although he has but recently commenced presenting his arguments in favor of the Substantial Philosophy as the connecting link between science and religion, he grasps the subject with a master hand, and a comprehensive sweep of intellect such as few, if any, beginners in this revolutionary work have ever shown.

We rejoice to believe that this bold and manly accession of Dr. Crawford to the ranks of Substantialists will break the ice with the great army of more than seventeen thousand Baptist ministers in this country, a vast majority of whom have stood cautiously aloof from the new philosophy, not realizing its great advantages to the cause of religion which they plead. The unqualified indorsement of this veteran scholar, thinker, and educator, with a ringing clearness which admits of no misapprehension, must put Baptist clergymen, as well as ministers of other denominations, to thinking seriously and to asking themselves if they are not missing the opportunity of a lifetime by remaining indifferent to a system of philosophical and scientific thought which, if properly studied and wielded, would make them masters of the present materialistic situation.

We are happy to give this sketch of a great Baptist worker as a worthy example to the thousands of the clergy of the land who are almost persuaded to be Substantialists, but who timidly hesitate, waiting to learn if any of the scientific rulers or respectable colleges have accepted the new philosophy. We beg of such Christian workers to investigate for themselves its claims to eternal verity, and then to follow the example set by this pioneer crusader of the great Northwest.

"SUBDUE IT."

THOMAS MUNNELL, A. M.

THE Creator paid a very high compliment to mankind when he submitted to them such a long and difficult lesson to learn, and trusted their ability to master it. The command to subdue the earth, Genesis i. 28, implies much more than to cut down the thorns, eradicate the thistles, and cultivate the soil; more than to "have dominion over the fish of the sea, the fowls of the air, and over every living thing that moveth upon the earth," and more than to reduce all vegetable and animal life to our service and for our food. Six thousand years have passed, and we are just beginning to sound the depths of this mysterious saying. "The earth" embraces more substantial entities than "earth, air, fire, and water," and more than the sixty or seventy elements discovered in modern times; for, besides the various gases, metals, and other well-known material constituents of this and other spheres, the earth seems full of powers never until recently suspected, that were embraced in the broad commission to "subdue it."

When we subdue the forests and wild prairies in such a way that they obediently contribute to our food, shelter, and raiment, we have wrested from Nature only the merest hint as to what she has yet in store for us. This scarcely skims the surface of her hidden and helpful treasures, but is a mere intimation of what lies beyond. The proportion of land to water, of three to one, so as to produce sufficient evaporation for the rainfall necessary for vegetable growth, would have been a useless arrangement had not man been enabled to utilize it by bringing it into subjection to his own purposes, and without his practical study of the powers of sunshine and soil to the same end. But this primary task was given him first, and how well some have learned it may be seen by the difference between agriculture in civilized and heathen lands.

To subdue gravitation to our uses was one of the earliest and easiest mental processes, because that substantial entity works always and everywhere without the use of machinery; but not so when they first tried to hamper the erratic force of steam. This was found to be a wild steed that could not be so readily curbed, harnessed, and trained, and yet he was a part of the earth which we were commanded to subdue, and subdued he must be; and, as the first thing was to make his harness, the steam engine was begun. Rarey, Gleason, and others can thoroughly subdue a wild, recalcitrant equine in an hour, but thousands of industrious and ingenious men have been working at this harness ever since the days of James Watt, which they have not yet finished; but the obligation was laid upon Adam and his descendants to not leave steam unsubdued, and so the work goes on till this day. But the services already rendered by this mighty courser have been so distinguished that he has long ago paid for himself more than a million times, a fact which powerfully vindicates the wisdom of God in placing this duty before us at the beginning. No philosopher has ever yet told us why the minute particles of heat—less than microscopic—feel such an aversion to each other that, in their great desire to separate, they push at the rate of 2180 pounds to the square inch on the piston-head. Heat-particles not only refuse to fellowship one another, but are opposed to all companionship among the particles of all liquids, metals, and every other material substance; and so wherever they can insinuate themselves the work of expansion at once sets in with more than crowbar might. Iron particles have no wish to part company, but the reverse; and yet, in spite of cohesion, heat can compel them to let go all holds and flow like a river. This disturber of the peace that seems to have no respect to laws nor to the established forms of material things, this communist that is ever ready and eager to flow all things into chaos again, belongs to the things that man was commanded to subdue and render tributary to his gratifications; and how well he has accomplished his task let Science say. Let warmth without conflagration, expansion without explosion, and the throbbing engine doing all the heavy work on land and sea all round the world, say whether man has caught this most heartless of all the natural forces and harnessed him to do the work of the world.

But heat, although hard to capture and to confine within the limits of utility, was, nevertheless, well known to exist from the first. Not so with electricity, for its very existence, as such, being unknown through all the centuries until so recently, no attempt could be made to subdue it to our use. Its flashes and crashes were going on in the heavens when this order was given to our first parents by Him who knew that their studious descendants would some time put out a set of sharp detectives to ferret out all its hiding-places and reduce it to almost perfect obedience to their will. The first thing was to catch the coy creature in spite of its inaccessibility and its aversion to familiarity; but Franklin's experiments began the demonstration of the fact that electricity was not so much opposed to running errands for us, if we would only lay a good track for it to run on. Until we fixed up lightning-rods and telegraph wires it never had any "straight paths for its feet," but had to force its zigzag way through the air from cloud to cloud, as if it was trying to give man a hint, by such pyrotechnic displays, that it would prefer a better way of getting along in the world, which he might furnish to his own advantage. And now that it has become somewhat accustomed to our ways, it seems not to be satisfied with flashing our messages round all the world and lighting up the darkness of our nights, but is disposed to drive our enginery, to navigate the air, and even to heal our diseases. When we coax it to drive a toy-machine and smile at its mechanical feebleness, we have only to consider that portion of its energy manifested in the riven oak or in the cyclone's stride not yet "subdued" to our service—a task which is yet before us, and which is yet more fully to justify the investment the Almighty has made in creating man in His own image. Electricity, as has been thoroughly proved, is not a lawless force, for whether in a wire or in a storm it obeys the law of its being that governs there, and whenever man shall find out how to seize and direct its now unmanageable currents that desolate the country, he may have all the power he will ever need to run the machinery of the world.

If we consider the simple question of fuel it will illustrate the subject in view. In countries where there is nothing better they have to be content with dry grass, "which to-day is, and to-morrow is cast into the oven." In other lands the forests have been used until exhausted. Then vast coal fields have been brought to light, developed, subdued to our use, and in many parts exhausted even, where machinery has been used to lift it from beneath. Then long before we came to want, petroleum was discovered and laid under contribution for heating as well as other purposes; then, as if determined to destroy the necessity for this drudgery of mining for our fuel, natural gas comes to the surface voluntarily, and offers its services for almost nothing to light our streets, warm our houses, and run all our factories of every kind. But none of these things limit the fuel supplies, for it would be no greater achievement to extract it by some chemical process from the air, as the locomotive speeds its way, than was the development of the telephone or electrical light. Large sums are now being invested to develop heat by friction, for every solid is full of fire, and when we shall have laid all these resources under contribution for our personal comfort and for mechanical purposes, we will see what vast thermic treasures were from the first laid up both for the just and the unjust.

Such samples of man's ability to appropriate the forces around him show that the trust committed to him was not in vain, and that vast fields of territory yet unconquered will no doubt gradually fall under his dominion. But it would be strange if, while discovering so much of temporal good in the physical world he should have found out nothing that could help out his conceptions of spiritual life. While the coarser and more ponderable substances shade off into the finer, lighter elements until we reach magnetism itself, that seems to defy all material law, as if lying upon the very border of the spirit land may he not "subdue" such physical facts to the building up of his faith in a spiritual sphere just a little over the line, and not far from where "footfalls" might be heard on "the boundaries of another world"? Surely we are entitled to any light that may be thrown upon the "problem of human life here or hereafter" from any side lights from science and philosophy; and as nature leaves no chasm between daylight and night, but fills it up with twilight, may we not feel sure that, as night gradually merges into day, and as material substance gradually merges into the immaterial, so this life will flow into the next frictionless, without a chasm, and without impediment? This thought, so recently and yet so fully developed by Substantialism, is the highest appropriation of the above command, and is in fullest harmony with Him who intends at last to "*subdue* all things unto Himself."

OUR ESTEEMED CONTRIBUTOR—THE REV. DR. CRAWFORD.

WE most heartily commend the following very critical and scholarly communication of our Dakota contributor to every reader of THE ARENA. We do not know when we have been more interested in a metaphysical line of reasoning than in the one here gladly printed. Let us suggest, however, that the reader who desires the full benefit of the Doctor's fine distinctions in facts and discriminations in terms, should turn back to the May number (Vol. I., page 188), and read carefully the editorial on "Material and Immaterial Substance" to which Dr. Crawford alludes in terms of such kindly commendation. It was on account of suggestions in part in a previous communication from the Doctor on the possibility that life was but a property of organized beings, which led to that editorial. We cannot be too grateful to him for having called our attention to that phase of Substantialism, thus calling out our direct reply. And we will add our thanks to the Doctor not only for accepting our line of argument as correct, but for elaborating it by comparing the all-pervading life-force of the immaterial organism to the equally all-pervading material blood-element in the structure of the physical body which the immaterial had built up. But here is the Doctor's masterly paper.—EDITOR.

ANALYSIS OF THE SOUL.

BY REV. J. CRAWFORD, D.D.

DEAR DR. HALL,—I desire to thank you heartily for your kind letter, and also for your "remarks" on my article in this month's ARENA, just to hand.

I am glad to find that the difference between us on the subject of that article is not so great as might at first appear. Indeed I take pleasure in stating that I have very seldom found reason to dissent from any statement that proceeds from your own pen, although I cannot always approve of some positions taken by other advocates of the Substantial Philosophy, of which you are the honored founder, and through which you have done so much to promote the cause of true science and true theology.

While I contend for the *unity*, in contradistinction to the *duality*, of man's spiritual organism, I am sorry, if, in anything I have written, I have unintentionally made the impression that I believe the soul, or spiritual organism in man, to be but one *homogeneous* substance. As in the physical organism, there is a variety of material substances, such as bones, muscles, nerves, etc., so is there a variety of spiritual substances which make up the immaterial organism, both in man and beast.

In this respect, then, I think we are agreed, as well as in respect to the *dual* nature of man. As there is in him but one physical organism, although possessing a variety of parts, and the materials composing those parts; so is there but one immaterial organism, possessing various parts, as well as being composed of a variety of spiritual or immaterial substances.

If I be correct in the above representation it follows that the mind of man is not like a mathematical point, having position without magnitude, as the text-books commonly teach, but an extended organic form, exactly answering to its physical covering; or, rather, with its material structure adapted to it, as its covering and organ. The spiritual as well as the material organism in man has *extension*. Its extension is bounded, limited; while the great spirit is boundless, infinite.

While I freely admit—nay, I contend, that the immaterial organism in man is complex, possessing not only different parts, but different component immaterial substances, I strongly object to that phraseology, which makes psyche, or nephesh (soul), one distinct substance, or entity, and pneuma, or ruah (spirit), another. The term soul in Scripture is invariably applied to the *entire organism*, and not to a part; and so of spirit, it always covers the whole ground of man's spiritual nature.

If, in analyzing the spiritual organism in man, terms are to be given to each distinct element, it would avoid much confusion if other terms were employed to designate them than those of *soul* and *spirit*, which Scripture has invariably applied to the entire organism, and never to a separate part. The same observation will apply, with almost equal force, to the term *mind;* which, if I mistake not, is commonly applied to the entire rational faculties in man, as a complex whole.

But, while I contend that the terms soul and spirit are always applied in Scripture to the entire immaterial organism, I do not say that they are perfectly synonymous. Here let me repeat from my article. "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."

By employing these two terms to designate, contrary to Scripture usage, two distinct entities, and by contending for trichotomy in man, there is a virtual admission that man's immaterial organism is composed of no more than *two* immaterial substances, soul and spirit; whereas, if I mistake not, some at least of these very writers, who contend for the trichotomy of man, teach a much greater number of elements in man's spiritual nature than two, soul and spirit.

I am strongly of opinion that it will be no easy task to make out an exact analysis of all the distinct forms of force composing the immaterial organism in man; and I very strongly suspect that he who thinks himself most competent for the task is the least to be trusted.

In making out an analysis of the outer man, we are dealing with things tangible, and to which we can constantly apply material tests; but, in our examination of the inner man, all such tests fail us. We can only reach these spiritual elements through their effects, and here there is great danger of being mistaken. It is much easier to analyze and define the various functions, or the attributes, of the soul, than the distinct substances or spiritual entities of which the soul is composed, as more than one distinct substantial element may be required to give effect to one function, or be the containing subject of one attribute. For example: Does the *will* reside in only one substantial soul element? Does *memory* require no more than one force element, or does it require for its exercise a combination of such elements? As physical functions often require for their exercise a combination of material substances in their organs, so may it not be that spiritual functions require for their exercise a combination of immaterial substances or entities in their organs? Again, if, according to some, *mind* be regarded as a *distinct* form of force, can it work without the co-operation of *life?*

In making the analysis, care must also be taken not to confound either the act or the attribute of the soul, or part of it with the soul, or the operating part of the soul itself.

I write these things not to dissuade any one from attempting an exact analysis of the spiritual organism, but to caution against rashness, which would tend more to confusion than elucidation.

Before closing this article I offer a suggestion to those who would attempt an exact analysis, not of the *faculties* of the soul, but of the immaterial *organism* itself.

I am strongly inclined to think that the best help will be obtained from a careful examination of the material organism, in which the spiritual resides. If this outer man be the exact clothing of the inner, and not only adapted to it, but constructed by it, I think the various parts of the material will be most likely to throw light upon those corresponding parts of the immaterial, which were not only their model and guide, but their artificer.

I cannot close without again thanking you, sir, for the light which you have afforded me in your editorial, under the heading "Material and Immaterial Substance." I must confess that I was strongly inclined to regard *life* as but the *property*, or *attribute*, of the soul of man and beast. The editorial above named has, however, convinced me that life is *more* than a property—that it is one of the constituent elements of the soul; but differs from all the other elements, inasmuch as it occupies no distinct local position in the spiritual organism, but pervades it in every part; and, by its all-pervading activity, all the parts of the organism are built up, and supplied with power for the discharge of their respective functions.

Between the life and the blood there seems to be a strong analogy in the two organisms, the material and the immaterial. Like the blood, life is confined to no distinct position, but pervades the entire organism; and, like it, supplies what is lacking in every part.

This view of the case, as you have well argued, in the above editorial, obviates the necessity of any immaterial force emanating from the external object of sense in taste, touch, and (*perhaps*) smell, to their respective sense organs. The life-force is sufficient to convey to our consciousness the sensation from the *material* external object, which comes into immediate contact with the sense organ, just as it conveys the sensation from the *immaterial* external objects of light and sound, which come into immediate contact with the organs of sight and hearing. The only difference is that, where distance intervenes between the external object and the appropriate organ of sense, an immaterial force is *required* (light and sound) to convey the impression to the sense-organ, before the life can take up that sense-impression, and convey it to our consciousness. Whether the sense-impression on the organ be made by the contact of a material or immaterial substance, life takes it up, and conveys it to our consciousness. Distant objects require an immaterial force to convey the impression to the organ, while these objects, in *immediate* contact with the organ, require no medium to convey the impression, and it is the *impression* which life takes up, and conveys to consciousness.

I remain, Mr. Editor,
Yours in the truth,
JOHN CRAWFORD.

CREATION OUT OF NOTHING.

BY J. I. SWANDER, D. D.

NINE stormy years have rolled their surging billows on since the world was startled by the first appearance of the "Problem of Human Life." During that time the front phalanx of the human race has recorded more intellectual progress than had been made in any equal measure of its previous history. It is not claimed that this remarkable stride of progression is largely attributable to the new system of philosophy recently introduced. The advocates thereof are content to maintain that there has been no scientific discovery since the dawn of creation more wisely ordained to direct the newly stimulated energies of the human family toward the proper goal of its being.

That there should have been considerable fluttering and opposition to this new factor upon its introduction into the world's historic onflow is just what might have been expected, according to the records of all past conflicts between paradoxical truth and popular error. The public mind has never been found willing to take the medicine suggested by a proper diagnosis of its chronic malady. Men will throw physic to the dogs even while they are dying of constipation. What is true of the race in its physical ailments is equally true of men in their mental morbidity. And yet there are exceptions to the rule. The few are willing to prove all things. Such was the condition of the learned public when Substantialism was brought from a hitherto unknown Gilead and offered as a sovereign philosophic balm. At first it was generally despised and rejected of men. They hid, as it were, their faces from it. Then a few began to smell the cork of the curiously-labeled bottle. Soon after a few commenced to taste its contents under the arches of their skeptical palates. Some of these found it both an alterative and a tonic. It became a medicine for the mind, or rather an antidote for the poisonous stuff with which the public mind had been gorged and gulled for twenty-five hundred of the world's most eventful years. At that point the scholastic doctors began to see that the Substantial Philosophy was a medicine which was interfering with their large practice in the writing of books, delivering of lectures in richly endowed colleges, and in their advocacy of certain uncertain theories of science which had stood the gentle toleration of ages for no other reason than that they had never been examined in the light of that basic principle of truth which the "Problem" was the first to introduce for the candid consideration of all earnest, honest men.

Looking over the past nine years the scene is really amusing to one who finds himself inclined to notice how the "Problem" was first received, and to witness its effects upon those who have had the wisdom and courage to give it a careful reading. The most amusing chapter of its history, outside of the discussion on sound, is that which records the treatment it received from some theologians upon the point where it touched the question of creation out of nothing. Among these may be mentioned, as some of our able and orthodox teachers, Rev. G. H. Shelldrake, Dr. W. W. Barr, President Clark Braden, Rev. M. Stone, D.D., and quite a number of others, some of whom have recently written to us privately requesting that we "set Dr. Hall right on that question," and whose names we are not now at liberty to make public. By consulting the later editions of the "Problem" and the interesting files of THE MICROCOSM and ARENA the reader may see that these good men and scholarly critics have been most seriously exercised over Dr. Hall's cosmogony. They seem willing to accept the Substantial Philosophy, acoustics and all, upon the condition that its founder consents to teach that it and everything else has been made out of nothing.

Some of these critics have charged that Dr. Hall's teaching upon this point would naturally and logically lead to materialism. Others thought that it was the very nest in which Spinoza laid the egg and hatched the foul bird of pantheism. A few others feared that, according to such teaching, God was in danger of gradually diminishing himself by the creation of additional worlds. But the most amusing of all these critics were those who maintained that it was essential to the omnipotence of an Absolute Being that He should be able to create all things out of nothing, while they ignorantly *stultified themselves by denying his ability to make the same or similar things out of something substantially, though not materially, pre-existent.* Moreover, these men, while they criticised Dr. Hall's theory of the genesis of creation, not only turned the breath of Almighty God into their convenient conception of nothing, but also at the same time differed from each other, in their premises taken and conclusions reached, fully as much as any one of them differed from the author of the "Problem" upon the point whose truth they called in question.

This point—the point at issue between Dr. Hall and the creation-out-of-nothing theorists—is largely, if not primarily, a question of science; and no theory, claiming revelation for its authority and faith for its guide, can ever be entirely satisfactory to a strictly scientific Christendom until the obvious teachings of a better philosophy than any which has hitherto ruled the world are permitted to assist in the proper interpretation of God's infallible Word. The unanswerable outgivings of Substantialism have already had a telling and salutary effect upon many who formerly held to the old theory of creation. We have an interesting letter in hand from such an one—an eminent doctor of divinity and teacher of theology in one of the first seminaries of this country. We give his language, but withhold his name:

"On the subject of the relation between the spiritual and phenomenal worlds I feel that your views harmonize with mine, and also as to the objective entity and substantiality of the invisible world that underlie and uphold the natural world. I agree with you, also, that the universe is not made out of 'nothing,' in the old sense, for that would make creation *magical;* yet I might differ from you in my view of creation. My view is that the worlds proceed and come forth from, or through, the eternal Logos, who is not only the prototype of man, but of the whole creation as well; yet not by emanation, but by the divine will. Substantially, nothing is added to God by his work of creation; yet phenomenally, that has come to exist which was not."

While the above quotation contains something of an effort to split a gray and venerable hair, it also smacks largely and loudly of genuine Substantialism. What a pity it is that these good Christian men do not avow their convictions more candidly and gracefully. What is really the matter with them? Is there not an offense in this true philosophy, even as there is an offense in the true religion? Blessed are they who are not offended in the founder of either. And yet what a pity! We never can forgive Dr. Hall for drawing his first breath in the backwoods of Steuben County, New York. Had he allowed himself to be born in a regular college, or rocked in the cradle of some German university, or had he been fed with a "respectable" spoon in the Royal Institute of Great Britain, some of these men who are now barricading themselves behind the sand-heap of false respectability would be the first to toss their beavers in the air in honor and acceptance of the Substantial Philosophy. They "agree with you that the universe is not made out of nothing," and yet hesitate to acknowledge the mastery of that plebeian pen whose strokes have shattered the world's most arbitrary fetters of unscientific slavery, startled the schools from the delusions of their materialistic dreams, and projected a system of thought which is now moving around the planet with a sweep of power that no prejudice can successfully resist.

But what has the question of the genesis of creation necessarily to do with the central principle of Substantialism, whose soundness was so candidly and manfully conceded by that great scholar, Dr. Good, of Heidleberg Seminary, Tiffin, O.? It is the writer's belief, as well as the belief of Dr. Hall, as expressed in a recent number of THE ARENA, that a man may be a good Substantialist without holding with the founder of that philosophy and with Rev. Joseph Cook, that God evolved, condensed, or created all things from Himself. To illustrate: One class of scientists hold that man was produced from nothing; another class insist, with the followers of Darwin, that man was evolved from the monkey; and the third class claim that he was made out of God's own substance, and yet they all consistently believe in the veritable existence of the human family. By all of them it is admitted that humanity in the concrete is a form of being.

Just so with the question of immaterial being in the universe of God. He should be regarded as a good Substantialist who believes in the veritable existence of such immaterial substance (without any reference to the question of its origin), and believing, proceeds to show his faith by speaking and writing in defense of this central principle with which he is scientifically identified and permeated. This view is justified by an authoritative precedent in history. In apostolic times the Jewish converts were taken into close Christian fellowship, notwithstanding some of them continued to hold certain doctrines and customs which had been rendered obsolete by the Founder of the Christian System. Like Christianity, Substantialism imposes no unnecessary burden upon the shoulders of its disciples. It only requires that they discontinue eating the tainted meat once offered at the altars of materialistic idolatry; and that they subsist upon and strengthen themselves scientifically by the use of that invisible food which shall continue to endure after the phenomenal world shall have passed away with the smoke of its last sacrifice.

FREMONT, O.

PROPHETS OF EVIL, WHO ARE THEY?

BY JOHN C. DUVAL.

In the February number of the *Popular Science Monthly*, there appears an editorial from which the following is an extract:

"PROPHETS OF EVIL."

"It is remarkable how many different writers are devoting themselves nowadays to proving that, under the influence of the scientific and philosophical theories most in vogue, modern society is rushing to destruction. * * * Now it strikes us that all this momentarily fashionable writing is conceived in a very idle strain. What the world wants is not a succession of jeremiads over the effects likely to be produced by the prevalence of certain opinions, but a demonstration of the truth in regard to those opinions. If the theories of Darwin are false, let their falsity be exhibited. If Mr. Spencer's wider scheme of evolution is illusive, let its illusiveness be proved. The press is as free for the opponents of these great thinkers as for their adherents. The platform is open to them; the pulpit is as yet theirs almost exclusively. They can have nothing therefore to complain of as to the condition of the controversy; and yet, in all their utterances, we may detect a certain note of dissatisfaction, as if, somehow or other, the verdict was unjustly going against them. The verdict, however, will follow the evidence, and the world will not accept as evidence against a scientific theory the mere assertion that its moral effects are injurious."

After reading carefully the whole of the article from which the above extract is taken, I could find no allusion whatever to any scientific theory except that of Evolution. Now if the jeremiads referred to have been called forth by the fact that a majority of the scientists of the day are disposed to believe in the "Scheme of Evolution," I have seen none upon the subject. Evolution is simply a disputed scientific question, and one by no means as yet generally accepted by the scientists of the day. But, even admitting that such was the fact, I cal

see no reason why such a theory should threaten society with destruction. A Deist, or a Christian even, might believe in Evolution as far as it has any moral bearing upon society. One might just as readily believe that the Deity could accomplish his purposes slowly, in time, through the operation of laws, as he could by his mere flat. If, ages ago, man was evolved from the monkey, he is not a monkey now, but a man: and, I would just as soon owe my origin, physically, to the carbon, hydrogen, nitrogen, etc., constituting the body of a monkey, as I would to those substances taken directly from the "dust of the earth." The constituents of the physical frame are of no consequence, it is the "divine afflatus" that *constitutes the man*, whether it were breathed into inanimate dust, or into some combination previously formed from it. The monkey, I suppose, more nearly approximates to the form of man, than any other animal, but yet what a vast hiatus there is intellectually between the man and monkey, that is, the divine afflatus has been breathed into the one and not into the other.

But I have seen no jeremiads on the subject of evolution. It is, as I have said, merely a theory, by no means as yet satisfactorily proven, and even if it were, it contains no element of danger that I can perceive, to the morals of society. Then what *are* the theories or philosophies to which the writer in the *Popular Science Monthly* alludes when he says, "it is remarkable how many able writers are devoting themselves nowadays to proving that under the influence of the scientific and philosophical theories most in vogue, modern society is rushing to destruction."

There is no conflict between scientific theories and religious sentiment, whatever there may be between them and the dogmas of creeds or sects. On the contrary, the further we can, by the aid of scientific knowledge, penetrate the mysteries of nature, and investigate the wonderful and harmonious character of the laws that govern the universe, the more we are inclined to recognize the necessity for some intelligent contriver and ruler behind them all. Matter, of itself, is utterly insufficient to account satisfactorily for the condition of the universe, even as we can see it from our limited point of view.

If one who had never heard of a locomotive engine should find a piston rod or wheel, he could hardly doubt that they were designed and formed by some intelligent being; but if he could see the whole engine in motion, could examine its construction, and the adaptability of all its parts, the one to the other, to enable it to perform its work, he certainly would not refer the origin and contrivance of such a machine to the "all potency of matter." And yet we can readily perceive, even with the limited knowledge we possess, that the universe is an infinitely grand machine, controlled by unchangeable and harmonious laws, whose operation can only be reasonably accounted for by admitting the existence of an omnipotent ruler.

Unless the writer of the article in the *Popular Science Monthly* included materialism and atheism among the theories or philosophies of scientific thought, I am totally at a loss as to what theories or philosophies he refers, when he says, "It is remarkable how many writers," etc. If they are included, then certainly it is not wonderful that so "many writers" should bewail the prevalence of these doctrines, and consider them dangerous to the well-being and morals of society.

A belief in doctrines that deny the existence of a God—that assert there is no such things as right or wrong, because in doing or acting, we are simply obeying the *irresistible* laws that control our mechanism, must necessarily be fraught with evil to society, through the destruction of all religious sentiment. It is useless to tell me that education and increase of knowedge will more than compensate for the loss of religious sentiment. After one has lived to "three score years and ten," he knows too much of human nature to believe that man will become more virtuous (whatever may be his knowledge), by convincing him that he is not a responsible being, and that his transitory existence here (as far as he is concerned) will be the end of all things. Most of us admit that man is naturally more prone to evil than good, and consequently, if he is not restrained by *something*, that evil must predominate. Religious sentiment is the only moral restraint upon man, and certainly there is nothing of it inherent in the doctrine of Materialism or that of Atheism. It can only result from a belief in the existence of a God.

What arguments can be brought forward to prove the non-existence of a supreme ruler of the universe? None that I know of, unless it be that he does not see proper to manifest himself to our physical senses. On the other hand, if there be no manifestation of an intelligent ruler of the universe, to our material senses, certainly our reason—our intellectual faculties bear sufficient evidence to the fact. No one who does not willingly, or rather willfully, blind himself to this evidence, can refer the status of the universe to *anything* but an omniscient, omnipotent ruler, for reason revolts at the idea that it is due to matter alone. Matter may be very "potent," but as we know it is void of all intelligence, and even of life, assuredly it could not have acted intelligently in the formation and arrangement of the universe, or in such a way even as to convey the idea of "apparent design." It is just as inconceivable to me that matter could always act with "apparent design" as that it could act designedly. "Apparent design," when it is shown in everything we investigate, is equivalent to design itself.

In conclusion I repeat, there is no conflict between genuine scientific theories and religious sentiment. The poet says truly, that "the undevout astronomer is mad;" and he might with as much truth have included the naturalist, the chemist, the botanist—in fact all who investigate and study the phenomena of nature.

EL PASO, Texas.

REMARKS BY THE EDITOR.

WE do not differ essentially from our excellent contributor, who has proved himself to be one of the most careful thinkers of modern times, on the unreasonable claims of materialistic thought. With him we do not hesitate to believe that it would be entirely possible for God to have created man out of a baboon, or even out of a Japanese salamander, had the Allwise Author of nature been so disposed. Such creation of one living form out of another by Almighty fiat would have been, no doubt, just as feasible for infinite power, as to have created man's body out of the dust of the earth. Nay, we go even further in our agreement with theistic evolutionists, that it would have been entirely practicable on the part of omnipotent power and omniscient wisdom to create man's organic structure by infinitesimally slow stages of development, which Darwin calls "slight successive variations," had that been his chosen method of creation.

But we may depend upon it, had such been God's way of originating the various organic species, each of these infinitesimal variations, tending toward such an end as a specific form of organic structure, would have been as much a direct and special miracle, designed and executed with as definite a purpose, as to have spoken a full-grown elephant into existence out of a ledge of sandstone, or as to have converted a reindeer direct into a wild boar at a single stroke.

The question at issue between religious philosophers and modern evolutionists is not whether the transmutation of all the various species which inhabit this earth might not have been effected by slow stages of development, through the miraculous interposition of an intelligent power over and above nature. No theist questions such a possibility for one moment. The two real questions at issue in the premise are, first, is such a process of the creation of animal species a rational and consistent supposition? And second, is there any proof from the volume of nature properly interpreted that such a process of creation was adopted by the infinite intelligence of the universe?

In answer to the first question we ask another: Is it rational or consistent to suppose infinite intelligence adopting a process of producing a single species involving countless millions of direct miracles—one for each slight successive variation—when a single miraculous fiat would have accomplished the work at once? Darwin himself admits that ages upon ages must have elapsed for the production of the smallest specific characteristic in organic beings, through these "slight successive variations" under the vital action of "natural selection and survival of the fittest." Of course Darwin denied any intelligent design or miraculous intervention in these slight specific changes which finally led up to a given animal species. He knew that to attribute such myriad miraculous changes to an infinite intelligent designer would be superlative nonsense as compared to the process of direct miraculous creation for each specific form. But his would-be followers, less shrewd than their cunning master, accept the results of his claimed researches, but have spoilt the entire philosophy of rational probability by involving the Deity in the absurd performance of millions of miracles when a single flat would have accomplished the same result.

In answering our second question, as to what if any rational proof exists in the volume of nature in favor of these slight successive variations, and final transmutations as God's probable method of creating the species, we can only refer our readers to the volume where we have made that special question the most exhaustive and elaborate effort of our whole life. It will there be found in the 7th, 8th, 9th, 10th, and 11th chapters of the "Problem of Human Life," which see.

ADDRESS ON EDUCATION.

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

(Concluded from last month p. 6.)

IN the culture demanded by the times, (4) WE MUST DISTINGUISH BETWEEN FALSEHOOD AND TRUTH IN PHILOSOPPY, etc. *Philosophic truth is not created, it is discovered.* Like the sun rising above the ocean level, it instantly dawns on us: we shift and shift until we find the right point of view, and all at once her fair virgin figure appears encircled with graces and light charms, and by its witchery attracts heart and mind.

False philosophy is created, as are pictures on canvas. At first there is here a stroke and there a dash: and at last a conception takes shape and form, and the likeness of a landscape appears. This landscape is of human origin; that sun or that virgin is divine. For this purpose, *i. e.*, to discover truth, God has winged the soul of man, and bids it soar on thought's pinions until it poises above flowers more fragrant and deer more graceful than Hudson and his men ever gazed upon. In the field of philosophy, *we must watch and counteract the tendencies of modern sensationalism.* This theory, based in the assumption that ideas are copies of past sensations, and that from these all thought and emotion spring, and that the soul is the result or termination of a series of material ac-

tions, must be refuted. We must emphasize the fact that it confuses cause and effect with antecedent and consequence, which Cousin says is "a theory destructive of all true metaphysics," and either ignores the essence of mind, or considers the term "mind" as mere fiction.

At this point *we must emphasize the arguments for the soul's separate and entitative nature, etc.*

Its uniqueness of phenomena which sustain no relation to space, the lack of testimony of consciousness to its materiality, the soul's ability to distinguish between matter and itself, as revealed in designation and controlling power over the body; the soul's self activity as distinguished from the inertness of matter, the potency of memory, imagination, hope and fear. We must insist that in the abstract uniqueness of phenomena and character, argues for uniqueness of nature, and that, not until we see life naturally evolved from death, can we for a moment admit that a consciously self-active soul is the offspring of inanimate powerless matter. The soul is it acts, it produces results, while matter and zeroes are powerless.

2. *The positive philosophy must be presented as an utterly comfortless hypothesis.*

Originated by Comte, who imbibed his anti-religious tendencies through Condorcet from D'Alembert and Voltaire, and further developed by Mill, Buckle, Bain, Spencer and others, it proposes by philosophy to reorganize the moral, religious, and political systems, but *it leaves all that is highest in man unprovided for.* It gives the lie to Scripture, declaring that if God is, he must be forever unknown, when in fact "God was manifest in the flesh," and Jesus said: "If ye had known me ye had known my father also." "He that hath seen me hath seen the father." *It blasts the fondest hopes of man.* It leads back the resurrected Christ into the tomb, and rolling the stone to its mouth, seals it forever, leaving man to die *alone.* No wonder that the mother of Hume, when her son David had wasted away her faith by his superior reasoning, wrote him a letter from her death-bed, vainly begging him to restore her lost peace. Oh, be it delusion if needs be, but rather than die thus, let me die as did Jams, exclaiming, "I am not disappointed," or like Clark, saying, "Tireless company, tireless throng, the song of the angels is a glorious song." or like Wakely, let me behold the jasper ramparts when life sinks space, and let me shout, "Open ye gates and let my chariot roll in."

This philosophy casts a shadow over the hope of future reunions with the sainted dead. A half century ago, a maiden sought and found the Saviour not many miles from this city; here she afterward resided and worshiped, and here she wedded. In due time the vine bloomed, but the hand that pushed a new-born immortal out on the sea of life was chilled by the blast from the waters; dying she commended her offspring to God, and went hence. In after years the child at the age of sixteen was converted at a Methodist altar in this city—arising in the comfort of a new-born hope, that boy reveled in the belief that "there was joy in the presence of the angels of God over one sinner that repenteth." He believed that his mother knew of his conversion, and in all after years amid the life-battle, his inspiration has been that "mother was waiting." That mother was my mother, and that boy was myself. Shall I accept the positive philosophy, and bid adieu to all hope? Oh, away with such a system. The culture for the times is that which reveals it to be an utterly comfortless hypothesis.

3. *The "sweet and light" culturism of the day must be shown to be powerless to control and save men.*

The attempt with Huxley to "train passions to come to heel" by a vigorous will is to take no notice of the wreck of man's nature; and to undertake, with Matthew Arnold, to improve man by fixing his attention on himself is to attempt the impossible.

Wrecks are not self-reconstructive. To attempt this is to insist that a man shall resurrect himself by drinking at culture's stream, and gazing upon the beautiful, when already his larynx is stiffened by death, and his eye already sealed to the beauties upon which he must look to live. Not until some blind Bartimeus restores his own eyesight can we hope by means purely human to reconstruct humanity. Not until some Lazarus, already dead and entombed, shall open his own grave and loose his own hands, can we expect a race dead in trespasses and in sin to "arise and shine." The sophisms of Hume and Berkley, the idealism of Kant and Fichte, the sensationalism of Hobbes and Mill and Lewes, the materialism of Darwin and Haeckel, the positivism of Comte and Spencer, the culturism of Huxley and Arnold, are poor substitutes for a faith like that ofMilton, upon whose sightless orbs heaven's sunbeams played in vain, but who, because he oftenest bathed his wings in Scripture water, of all mortal singers soared nearest to the great white throne.

These false philosophies are like some laws described by Curran; while with luxurious branches they appear to aspire to heaven, their infernal roots shoot downward to their congenial regions, and are intertwined in hell.

4. *The tendencies of false philosophies, like those of false science, are all in the direction of individual and collective, or national peril and ruin!*

Give us a less Christless culture in America to-day, and we will hear less of communistic and socialistic troubles. Earthquakes are beyond human control, and so is unrenewed human nature.

The relation of false science and false philosophies to the living, burning questions of the day is more intimate than some imagine. The same unclean composition of dust and oil which is found on the locomotive axles of the Elevated R. R. in New York City (though the careless engineer may be unconscious of the fact), drips and falls upon, and soils and ruins the garments of the passers-by on the cross-walks below. So the errors and skepticism of higher orders of intellect in the world to-day drip down and pollute the lower classes of society, and breed that recklessness of human rights and of human life which is always characteristic of man, unrestrained by a controlling belief in God and human responsibility.

Communism, socialism, and the like, those cormorants with the saltness of the other hemisphere yet on their black plumage, are with every gale sweeping across the sea, not alone to consume our corn while they contemn our counsel, but to feed and glut upon our virtue. Russian filth and French putrescence pour in upon us, as though we were the common sewer of the nations, until some doubt whether between the chill of a cruel communism on the one hand, and the fear of a damnable, unsanctified political ambition on the other, we may not, as a nation, enervate, and gasp, and die. And now,

With these evils threatening the nation on every hand, with labor's companionships to-day antagonistic to her interests, in that communistic sympathy and tendency is the viper at her breast, whither shall we look for help?

The knowledge which best fits man for the discharge of citizenship is not, as Spencer claims, "that of the natural history of society in the past;" nor does it result from "a higher morality, reached by slow growth;" nor yet by teaching right to be the generalization of expediency. If this nation is, like Joseph, to go from pit to power; if she is, like Daniel, to move from dismal den to delightful destiny; if she is to counteract, and uproot, and exterminate from within herself those inevitable results of skepticism, the substitution of rashness for reason, and of bullets for ballots, it must come, not from a culture materialistic, fatalistic, or æsthetic, but a culture harmoniously theistic in all departments of investigation and thought, whether in the field of physical study, philosophical deduction, or religious inquiry. In brief, the culture demanded by the times must emphasize the substantial nature of all forces, the insufficiency and unreasonableness of all skeptical philosophies, including that of comparative religions, and, above and beyond all this, it must emphasize the doctrine of endless punishment, and insist that the whole system of Biblical truth depends for its intensity and success on the fact of endless retribution. Say what we will about the power of love, if we drop out the terrors of the law a sickly sentimentalism will prevail, and revivals will grow scant in numbers and power. Dr. Watts said that of all the converts to spiritual religion whom he had ever known, only one had been at first awakened by the amiable aspects of Christian truth. Men must feel the awfulness of doom before they will fly to the Saviour. The true theodicy must find its bearings in all the attributes of the Almighty.

In the business life of this nation, Christianity is weakened, and in some quarters *paralyzed* by the virtual denial of this terrible truth, by the preaching of future probation and other heresies, while the whole drift and thread of the Bible is in another direction. No man can insist on immediate repentance who promises abundant opportunity for it in the future. Then too the culture for this age must lay stress on the necessity for and the possibility of the new birth, through the death and mediation of Jesus Christ.

In conclusion permit me to say that,

Such culture is essential and indispensable, because the eternal destiny of man hangs solely upon the moral condition of the soul at death.

The day hastens when character, and character only, and that after a divine ideal, will have its reward. Rambler's statement that "Virtue is the only solid basis of greatness" finds its verification, not only in the rise and fall of nations, but holds true of individuals as well.

My friend planted in her garden the seed of the evening primrose, which all through the first year was only a low, unpretentious plant, but after a fall, a winter, and a spring-time, there came a summer, and then appeared in the dark hours, when other buds were closed and withered, fragrant flowers so beautiful that to behold was to admire them, and they were greedily seized and carried into the brilliantly-lighted parlors. So in this world, amid the sunlight of time, the so-called wise and, cultured, and famous, together with their soul-destroying theories, are admired; the Tyndalls, the Hartleys, the Bonnets, and the Spencers, attract attention, and science and culture, so-called, leave character apparently at a discount; but after the fall-time of chilling tides and withering leaves, after the winter-hour of crushed hopes and frozen joys, after the spring-time of bursting graves and revivified bodies, in that hour when human standards of greatness vanish like mist before the rising sun of truth, then comes the summer of true manhood, and then character, all fragrant with an odor sequential upon contact with the master, will be admired, and the possessor, whether he be "golden of thought and tongue," or "in learning small," will be carried by angel bands to the more substantial joys of a celestial environment.

O thou Great Teacher, let us each see that while the scholarship acquired at Gamaliel's feet is good, a light from heaven on our journey Damascus-ward, or the soul-cleansing and inspiring baptism of the spirit in some upper chamber is better. Let us realize that that culture is best which, ivy-like, twines about the cross for support; for there

in dark hours dews of grace distill, there in the morning the sunshine of divine favor bathes the vine, and there, and there only, in the hot mid-day of affliction birds of promise and good cheer sing their inspiring songs.

SPONTANEOUS GENERATION.

BY REV. J. J. SMITH, D. D.

TIME was, according to the universal testimony of geologists, when, in consequence of the intensely heated condition of our globe, it could not possibly have contained a single animal or vegetable inhabitant, or so much as a single life-germ or seed of any kind whatever; but when it must have necessarily consisted wholly of lifeless, inorganic matter. But now there is in this respect an entirely different state of things. We see now on every side, above us, beneath us, and around us, life and motion, involving the most wonderful material changes, contrivances, combinations, adjustments, and adaptations, that are incessantly going on in obedience to established physical and psycological laws, by which matter is constantly assuming new forms and new conditions. The air, the earth, and seas are swarming with untold myriads of life-forms of marvelous designs of skill and beauty.

Now, from whence came all these animated creatures with their wisely contrived organisms, their astonishing complexity, and their wonderful instincts? The only intelligent and satisfactory answer to this question possible, is that given by Moses, who so distinctly affirms that God *created all things*. This statement at once assigns a sufficient and adequate cause for all we see and know. It grandly solves the great problem of the universe, and clears up the otherwise inexplicable mystery of the origin of all life-forms. And yet such is the hostility of evolutionists to the Bible record, that they utterly reject these sublime and lofty utterances of Holy Writ, and seek a cause and explanation in matter itself.

This rejection has compelled them to resort to the hypothetical and absurd doctrine of spontaneous generation, which had its origin in the dark ages among the heathens, and which has never been proven, nor is there the remotest probability that it ever will be. In fact, modern scientific researches, experiments, and investigations have well nigh, if not altogether, established the utter impossibility of such a consummation. It is a theory that cannot live in the presence of too much knowledge. Hence, the belief in spontaneous generation was well nigh universal previous to the seventeenth century. The celebrated Italian naturalist, Redi, in 1668, was perhaps the first who undertook to prove (and who did prove) that the worms and insects that so universally appeared in decaying substances, and which were supposed, at that time, to be generated spontaneously, were actually developed from eggs which had previously been deposited in these substances by the parents. Other writers soon followed, with such an array of additional facts, gathered from a large number of carefully conducted experiments, that they seemed to have fully settled the matter for all coming time, as to the worthlessness of this old, puerile theory. And yet, modern evolutionists, having rejected the Bible, are left no alternative but to go back to this "gospel of dirt," as Carlyle has fittingly designated it, for their own origin. Hence, Haeckel says:

"A truly natural and consistent view of organisms can assume no supernatural act of creation for even those simplest original forms, but only a coming into existence by spontaneous generation." ("History of Cretion," Vol. I., p. 48.)

Prof. Tyndall, even after having frankly admitted the *inertia* of matter, says that he sees in it the "promise and potency of all terrestrial life."

"If it were given me," says Mr. Huxley, "to look beyond the abyss of recorded time, . . . I should expect to be a witness of the evolution of living protoplasm from not-living matter." ("Critiques and Addresses," p. 239.)

Such is the absurd theory which evolutionists are to-day putting forth to account for all the physical and mental phenomena that are seen in our world. Only think of it! Mere matter, which is absolutely lifeless and inert, doing all these marvelous things! But it is claimed, in order, if possible, to get over this difficulty, that organization and life have resulted from certain inherent laws in matter. But if so, from whence came those laws? Who made them? for they could not have made themselves. Laws necessarily imply a law-maker. And as these laws give unmistakable evidence of the most consummate wisdom in planning, and the most amazing skill and power in executing, they must have come from an all-powerful intelligent source, and, consequently, they must necessarily have come from without. And this absolute necessity in the case, this inexorable demand of true science, is furnished by the Bible record, and is furnished nowhere else. Hence, nothing is gained by evolutionists in postulating as they do, and that without a particle of proof, that matter has inherent laws capable of evolving organization and life; as these laws must, in that case, necessarily have come from without, and from a higher source than mere matter. So that the effort of these atheists to banish the Creator from the universe involves them in inextricable difficulties and absurdities from which there is no escape; while it requires an amount of credulity a thousand times greater than is required to believe in the Bible theory of the origin of all things.

But more anon.

TOMKINS COVE, N. Y.

EVOLUTION, DEVELOPMENT AND GROWTH:

IN THE LIGHT OF THE SPIRITUAL KINGDOM.

BY REV. A. D. POTTS, A. M.

IN entering upon the consideration of this subject, with respect to the importance of spiritual matters, I do so with the most reverential frame of mind, and with a full sense of the gravity of the subject-matter. Doubtless there will be some who, not wishing to draw the lines of distinction between the true and the false, between the right and the wrong use of words, will be ready to classify me with those who teach the corrupt and ill-fated theory of wild scientific evolution.

I know it will be difficult in the production of such a treatise as I aim to set forth to steer clear of the Scylla of uninvited criticism, and the Charybdes of gross misrepresentation. But, before any one brands me as an adherent of a creative, or self-existent evolution theory, I would kindly ask him to read again, if he has done so before, my creed of evolution, as given in my former article on the above subject, when I endeavored truthfully to trace the progression of men and things in the natural kingdom. There I distinctly stated that I did not believe *in a creative evolution—an evolution self-generating in the finite and natural world, but that I 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 things.* With this reference, I am ready to declare that God is the author of all life, whether natural or spiritual.

Without His creating and endowing power nothing could exist.

And further, I declare that from nothing nothing can come.

The expression *ex nihilo nihil* re-echoes this sentiment. Whether you view the declaration in the light of natural or spiritual progression you will reach the same conclusion. In the natural world God is *the Creator*, and in the spiritual kingdom the same omnipotent Being operates.

And herein comes our knowledge of God's *natural* way of doing things.

In a certain qualified sense you cannot divorce God from nature.

For instance, the child is not only born with natural life, but also with an organism, so to speak, capable of receiving spiritual life. When God made Adam—the first man as such was a lifeless body of clay.

When God breathed the breath of life into Adam's nostrils the inanimate clay became a living, sentient, intelligent, moral, and religious being. And something of the same order has been transmitted by our Creator to parents in the production of their offspring. I believe that the soul is as truly born as the body. I believe that both body and soul are created by God, who uses parents as the divinely chosen instruments. As the body cannot live and move without God's permission, neither can the soul operate and unfold in the blessed light of divine truth unless God energizes that soul. This idea precludes the notion of a developing God.

God does not, yea, never did unfold, develope, and grow. None but a perfect being could do what He has done and is still doing. When God created the first pair of human beings in Eden, I assert that He formed a perfect man and a perfect woman.

To prove this I need only quote His own words when He said: "Let us make man in our image, after our likeness." And even through the Fall man did not absolutely lose that divine image. Oh, no, but in the fearful ordeal man had that glorious image badly defaced and changed. To come back, then, to that original state of purity there must be a new start, as it were. Born once will not answer in man's peculiar case. Born again is the necessary qualification. Man cannot live a holy life without being endowed with such a life. If he was once a natural babe, he must likewise be a spiritual babe. And as natural babes must have food suited to their special wants, so also must spiritual babes be particularly supplied. In either case there could be no growth without the necessary nutriment.

The apostle meant this when he said: "As new-born babes, desire the sincere milk of the Word, that ye may grow thereby; ye also, as lively stones, are built up a spiritual house, an holy priesthood, to offer up spiritual sacrifices, acceptable to God by Jesus Christ." And what does this condition imply? Does it not mean that there is a time when Christians are young? Does it not mean that children in spiritual matters need the pure milk instead of the strong meat of the Divine Word? And again, are not beginners in grace called babes? If so, are they not expected to unfold, develop and grow until they become new men in Christ Jesus? It cannot be denied that the faith of the child grows as the child itself grows. The knowledge of God imparted by the parent, for instance, ripens into higher, deeper and fuller knowledge as the child nears manhood and gives himself sedulously to the study of holy things. Indeed, such a course is in harmony with all right thinking. Natural children only become men and women by natural growth.

They are not born full-grown men and women at once. God laid down a law governing such conditions when He implanted in the male and female the procreative power. It would be absurd to hold any other view. It would be monstrous to think of a human mother giving birth to a child as old and as large as herself. That the child may

become as old and even older, as large and even larger than herself, is a question admitting of no speculation. Such a result would be nothing short of the law of growth, as such law has been stamped upon the race of mankind. And the same law applies with qualified restrictions to the growth in grace.

The only difference to be observed is that the true child of God can never become older and stronger than God.

There is only one invariable rule of perfection in the kingdom of grace. In the kingdom of nature, as we are wont to understand it, perfection may not be reached at the same points. The mental capacity of the son, for instance, may be greater than that of the father.

Perfection in the father and in the son, in this instance, are points of different magnitude. Indeed there are no real definite limits to such matters.

But let us take another illustration where the law, so to speak, of perfection is more definitely marked.

The dwarf pear tree, for instance, is just as perfect as the giant oak of the forest, in the sense of kind. And no one finds fault with the law of growth that permits the pear tree to stop at a fixed point of three or six feet. On the other hand, all who enjoy the fruit of the tree in question prefer the arrangement.

When we come to view perfection in spiritual matters, we have but one ultimate end —Jesus Christ is perfection there.

The word of command with respect to those who are desirous of growth in grace is, "Be ye therefore perfect, even as your Father which is in Heaven is perfect."

No model less perfect than the perfect Godhead must be imitated.

Thus, then, since it is utterly impossible to expect natural life and activity without conception and birth, so, likewise, is it impossible to have spiritual life and its attendant results without being "begotten of God," and without "being born again of water and the Spirit."

When the soul of the believer is baptized with the spirit of Christ, that soul begins to live truly a spiritual life.

Its quickening process goes on and on until the babe in Christ Jesus becomes the full-grown spiritual man. And this will always be true, unless the grace of God is *willfully* and *obstinately* resisted by the individual. The quickened soul is ready to develop until it comes into the higher, purer life.

The Scriptures prove this when they declare, "But we all, with open face beholding, as in a glass, the glory of the Lord. are changed into the same image from glory to glory, even as by the spirit of the Lord." Then other passages of Holy Writ fortify our declaration in this wise: "For the perfecting of the saints" we learn that certain powerful agencies have been set to work, and that these are to operate "till we all come in the unity of the faith, and of the knowledge of the Son of God, unto a perfect man, unto the measure of the stature of the fullness of Christ." And again, proof of unfolding, development and growth is found in the words which declare that we shall come up from childhood in grace to manhood in holy things. The words are these: "That we henceforth be no more children, tossed to and fro, and carried about with every wind of doctrine."

What does all this mean but the becoming stronger in the Lord?

It cannot be denied that Paul was a stronger Christian, a greater and more perfect Christian, during his missionary tours than he was when converted on his way to Damascus. His work, and his love for the work, made him fully identified with Christ's cause. And thus it is that those who begin well will go on well, other things being equal. The steps are successive, and bring the child of God higher each move.

The Bible sanctions such a course when it says: "Add to your faith, virtue; and to virtue, knowledge; and to knowledge, temperance; and to temperance, patience; and to patience, godliness; and to godliness, brotherly kindness; and to brotherly kindness, charity." And what is charity but love? Love to God and to our fellow men reaches from earth to heaven. It is the great cap-stone in the monument of Divine approval. It makes the believer one with God. But the prophet Hosea adds testimony when he says: "They that dwell under his shadow (God's) shall return; they shall revive as the corn and grow as the vine."

Indeed, many more passages might be quoted to show that development and growth in grace are not foreign terms. I verily believe that in the world of time and things there is true evolution and false evolution; proper development and disproportioned development; choice growth and also fungus growth.

Our vocation is not to waste time in trying to make the false true; the irregular, regular; the fungus, choice.

It is our honest business to deal with facts and not with fancies; to respect truth, and not to quibble about it; to substantiate right and not to associate with wrong. No one who is honest in the choice of words will be afraid to speak of Christian evolution when he remembers that the term may be used properly, and, again, improperly.

The enemies of Christ called him a glutton and a wine-bibber, and he was neither. Some who heard the report believed it, and never tried to find out the truth. It is not an uncommon thing to hear the highest good illy spoken of. Neither is it of rare occurrence to hear of good things being abused simply because prejudice is allowed uninterrupted sway. Wrong interpretations do not make right things wrong, but, rather, set forth wrong things as right. No one is really responsible for a misconception but the one who deliberately warps the web of truth. Let right things be called by their right names, and no harm will befall the pure truth and its Author!

PLEASANT UNITY, PA.

"NEARER, MY GOD, TO THEE."

BY MRS. M. S. MORGAN, M. D.

No poetical inspiration that has found expression in language has touched more intensely, or with a more universal power, the spiritual nature of humanity than this beautiful hymn. It has been translated into various languages, is sung by different nations, is used in the church service of varied and often diametrically opposite creeds. It is one of those productions that will survive the changes of civilization and live through all the progress of thought; for it is the expression of the soul's deepest feelings, its most spiritualized aspirations: it is the throbbing of the human heart in its effort to commune with the Divine Essence; and this longing will ever actuate the human heart; for no matter how highly developed the individual may become, the essential elements of soul will never change, and its relation to Spiritual Infinity will ever be the same.

The purest and highest poetry is that which possesses the inherent vitality to stir the heart to its most profound depths, to quicken its finest and loftiest instincts, until by the wings of spiritual intuition it is borne to the Mount of Pisgah, and from its heights, earth, with all of its allurements, stands silhouetted against the brightness and beauty and glory of the promised land. And it is these elements of suggestive power which this hymn possesses—which attune the finest issues of the human heart—that give it place among the highest order of poetry.

"Nearer, my God, to Thee!" What an indefinable power to thrill the innermost depths of being is embodied in the substratum of these words! and how truly that longing may be realized in every department of our daily life! Every victory over self, every effort to grow into a better life, brings us nearer to God. Every discovery we make in the chemical world, in the mathematical, physical. astronomical, geological, botanical, physiological, biological, or psychological world, gives us clearer and more defined knowledge of the working of creative power, and thus brings us nearer to the Infinite One.

But in a more exalted sense are we brought nearer to God through the quickening of the spiritual elements of mind, which brings a consciousness of the loving, sympathetic, Omnipotent Power who lives and breathes through all his creation.

When we gaze upon the landscape, glorious in its beauty and sublimity; when we behold the exquisite tinting of sky and cloud, of foliage and flower; when we hear the music of Nature, played by her own Æolian harps, or chanted by her more powerful immaterial forces, there comes an inspirational insight into the poetry of spiritual truth, a quickening of the soul's most subtile energies, which make it throb and quiver in an ecstasy of delight. Yet all this comes through the soul's own inherent powers, through that energy delegated by Creative Beneficence: and by thus using these forces which link it to the supernal, it comes nearer to God. All these beauties. and graces, and harmonious blendings of the material world have no power to act upon the mind, to give it inspiration, or to develop its capacities.

Matter, in and of itself, has no power to act, to make an impression, it is merely an inert substance, a phenomenal expression of immaterial force. The tangible expressions of these immaterial forces may be such as to convey to the senses the idea of beauty, grace, and harmony. But it is through the soul's own inborn powers that these conditions are impressed, and its sensibilities intensified in their productive action. All the inspiration that can come to the human soul is through its own developed elemental faculties: these faculties take cognizance of the harmony, grace, sublimity, and beauty of the Divine force, speaking through these tangible forms; and thus the soul-element of man comes into communion with the omnipotent and primordial force, feels its bond of sympathy, and through a spiritual telegraphy the electric love flashes and brings it nearer to God.

All the material forms of the universe are but, in effect, the phenomena which make tangible to our senses the real though immaterial existence and force; they are but shadows of the enduring reality by which they exist, and they who cannot descry the real beyond the shadow "have eyes, but they see not." This immaterial force, this spiritual element surrounds us everywhere: but it will not flow into the soul or quicken its energies unsought. To man has been delegated the power of independent action, the power to place himself in harmony with the immutable forces of the universe, and thus through his own labor develop every element of his being.

The elements of mind are the free gifts of the Creator, and with them came also the gift of inherent force. This inherent force is the implanted divinity, through the action of which man can attune his being in harmony with that of the Infinite. Through the exercise of these elemental soul-powers they become developed, intensified in their perception, purified in their aspirations, and gradually lift the individual nearer to the immaterial reality. And just in proportion to our effort to come into harmonious communion with the invisible, all-pervading Love-force will the higher elements of our natures unfold and come nearer to God.

(*Continued on page* 30.)

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.

Whole Series, Vol. 7. New York, July, 1887. No. 2.

$1.00 a Year, Single Copies, 10 Cents.

For sale by American News Company and all leading newsdealers.

See Club Rates.

Subscribers should begin with the Volume, but may begin with No. 7. Give FULL NAME and POST-OFFICE of each subscriber, and in ordering a change of address, the *old* should be given with the *new* address.

All communications intended for the pages of THE ARENA to be sent to the Editor.

RATES OF ADVERTISING:

15 cents per line. $2.00 per inch.
Over one Column, 10 per cent. Discount.

Remit by express money order, draft, P. O. order, registered letter, or postal note addressed to

D. K. ELMENDORF & CO., Publishers,
38 PARK ROW, N. Y.

AVERAGE CIRCULATION LAST VOLUME, 15,000 MONTHLY.

Publishers' Department.

(See also second cover page.)

TO FRIENDS AND PATRONS OF THE SCIENTIFIC ARENA.

GREETING: As elsewhere announced in this issue by Mr. Hudson, a change occurs in the business control of THE SCIENTIFIC ARENA. In assuming responsibility in publication of THE ARENA, we cheerfully subscribe to the doctrine of the new philosophy, and shall heartily supplement the praiseworthy labors of Messrs. Hall and Hudson.

THE SCIENTIFIC ARENA will continue to be the official organ of the Substantial Philosophy. Dr. A. Wilford Hall, Ph. D., LL. D., will remain editor-in-chief. Rev. H. B. Hudson continues associate editor. They, with the publisher, will exercise every proper means to add to the already large list of distinguished writers who contribute to the columns of THE ARENA.

While thus assuring to our readers the original contributions of the best thinkers in the ranks of both clergy and laity, an effort will be made to provide subject matter for the home circle, and we hope to make THE ARENA a welcome visitant to many more thousands of families, as "our family paper."

A department for *Young Substantialists* will be not the least important. We earnestly ask our readers to encourage this primary department. Original contributions for this *Substantialists Primary*, from youth of both sexes, will be received. A prize of a full set of Dr. Hall's books is offered for the best manuscript essay upon "The Substantial Philosophy." Such MSS. to be brief, written in plain hand, and to be forwarded to Publisher of THE ARENA, by the 15th of August. The name of the successful writer will be announced in THE ARENA.

And now, with all the "Gravity," "Magnetism," "Cohesion," and "Light" we can introduce as factors in our efforts for success, we go to work.

DAVID K. ELMENDORF,
Publisher.

AT THE "HELM."

MR. DAVID K. ELMENDORF succeeds to the proprietorship of THE ARENA; Mr. Elmendorf had, for some months previous, been in charge of the advertising department, and thus comes into the direction of the entire business conduct of the journal with a clear knowledge of its needs, and I am happy to say, with a strong purpose to meet them with promptness and energy. The relief this change affords to the associate editor will be appreciated by our readers, when it is stated that during the past year, in addition to the exacting duties of the business conduct of THE ARENA, he has also retained the pastorate of an important and rapidly growing church in the city of Brooklyn; the experience of the past year has shown that such a press of labor could not be sustained another year, hence this change. Dr. Hall will wield the same trenchant pen as editor-in-chief, while the corps of contributors will be increased; and the associate editor hopes to be able to aid in the great struggle by an occasional article. In the strong confidence that this change adds to our strength, by the gain of the undivided labor of an able man at the helm, this announcement is made to the many readers of THE ARENA. Now let the Substantial forces "move forward all along the line."

HENRY B. HUDSON.

THE "AMERICAN BAPTIST FLAG."

SUBSTANTIALISM VERSUS PANTHEISM.

BY THE EDITOR.

AT the request of a number of the leading Baptist clergymen of the west and south we print the following, which we clip from the *Baptist Flag*, of St. Louis, Mo., of recent date, with our reply to the same. The *Baptist Flag* is a prominent, influential, and ably-conducted paper, of that denomination, and its editor, the Rev. Dr. Ray, from some unaccountable misapprehension, has taken frequent occasions, during the past few years, to make disparaging remarks concerning the "Problem of Human Life," characterizing it as a book favoring pantheism and infidelity. In the view of these Baptist ministers who have written us, this erroneous impression should be corrected at once. But first, here is Bro. Ray's latest pronunciamento, with the letter of the Rev. Mr. Woodbey, which called it forth:

"THE PROBLEM OF HUMAN LIFE.

"DEAR BROTHER RAY,—I have read, with much surprise, your charge of false philosophy and infidelity, made against Mr. Hall's "Problem of Human Life." I have read and re-read the "Problem of Human Life," as well as his monthly publications, and failed to see in them the faults you intimate. I regard Mr. Hall's book as the best stroke of the present century—one which has effectually crushed the leading materialistic philosophy of the day. As a reader of the *Flag*, I respectfully ask you for some further explanation, through your columns, lest some of your many readers be prejudiced against reading what many regard as the best religio-scientific work now before the public. Let us hear from you.

Yours in Christ,
G. W. WOODBEY."

Omaha, Neb., April 16, 1887.

"BRO. RAY'S REMARKS.

"It has been some years since we read Mr. Hall's Philosophy of Human Life. We were then impressed with the fact, that while the work had some merits, in a scientific and literary point of view, it contains the seeds of death and infidelity. We are still of the same opinion. On page 56 of Mr. Hall's "Problem of Human Life," trying to answer the charge of materialism and pantheism, of God, Mr. Hall says:

"He is an intelligent, powerful, acting, speaking being. Christ was the express image of His person. He was seen by Moses. His word is himself. He is substantial, because his word became flesh and dwelt among us. If this word could become flesh, it could become wood, or rock, or iron, as well. Hence, I assume that, instead of God's making all things out of nothing, as the Westminster Confession of Faith teaches, He condensed them out of His own all-pervading substance—His word—the same as His word was changed into corporeal flesh."

Again, on the same page, he says:

"It is, therefore, easily understood that physical organisms were condensed and framed out of that portion of God's omnipresent substance suited to such material existences; their vital parts out of a higher or finer grade of God's substantial nature; while the mental faculties and powers, including that highest of all the substances constituting man's dual organism—spirit—were but drops out of the higher qualities of God's intellectual or spiritual essence. In this way man, receiving his higher spiritual substance as an atom of God's Divine intelligence and higher spirit-essence, was made in the 'image of God.' Your objection, therefore, that this view smacks of materialism and pantheism, has no foundation in fact. All nature is but an atom, so to speak, of God's substantial being, while He still exists over and above nature, and independent of this drop of His entitative being—out of which the universe has been framed. Pantheism teaches that nature is God, and all there is of God. My theory teaches that the material universe is but a small fraction of God's entity, and no more constitutes God Himself than the new-born infant constitutes the mother herself, because its organism came from a part of her own. I sympathize with any man who cannot distinguish between this sublime conception of the origin of nature and organic beings, and the godless theory of pantheism."

If this is not refined pantheism, we are totally ignorant of the meaning of that term. It makes the material universe, including men, beasts, rocks, and earth, a part of God himself! Mr. Hall's exceedingly dangerous philosophy, carried out to its conclusion, would make the devil, himself, a part of God. Such scientific nonsense is wholly unworthy of Christian indorsement.

We are still surprised that the eulogies of such a book were published in the *Religious Herald* without rebuke.

Reply by the Author of the "Problem."

Now, we feel sincerely sorry for Bro. Ray, that he has not given his intellectual powers a better show in this attempted effort at philosophical discrimination, though at the same time, we thank him for quoting so fully as he has done from the "Problem of Human Life," thus giving his readers a chance to judge for themselves as to the probable correctness of his conclusions. We venture to assert, that even with these isolated quotations before them, not one intelligent reader of the *Flag* in one hundred would reach the same conclusion arrived at by Bro. Ray, as to the identity of our views with the doctrine of pantheism, or as to the tendency of our book toward infidelity.

We rejoice also that the Baptist ministers of the country who read the *Flag* are generally in the habit of thinking for themselves, without any special regard for the *ipsi dixit* of Bro. Ray, even if he is their editor; while we are even more rejoiced to know that many of these same independent Baptist ministers at this very time are attentive readers of THE SCIENTIFIC ARENA, as well as confirmed and outspoken Substantialists.

We will only add in this prefatory con-

nection that could Bro. Ray be induced to divest his mind of its foolish and useless prejudice, we feel sure he would soon become a stanch defender of Substantialism in the *Baptist Flag*—that is, should he candidly and carefully read only the back numbers of THE SCIENTIFIC ARENA. And then, should this fortunate change come over his mind, and he thereby learn to wield his versatile pen in that direction, as he now does on minor topics, his paper would soon become a real battle-flag for the cause of a religious philosophy which would carry with it, in scaling the ramparts of materialistic infidelity, a prestige from which the disciples of Haeckel, Huxley, and Ingersoll would flee in dismay. Let us see if we cannot even yet succeed in converting Bro. Ray from the error of his ways by the help of our Baptist brethren who read THE ARENA.

One more word before coming directly to the charge of infidelity and pantheism made against us in the *Flag*. Had Bro. Ray been at all acquainted with our more recent writings, he would have known that this casual suggestion of the probable creation of the universe out of God's *substantial essence*, instead of out of *nothing*, has never been put forward as anything more than an incidental question of individual opinion, and in no sense as an essential factor in the philosophy of Substantialism to which we are devoting our life. (See the Rev. Dr. Swander's paper in this number.) By even a slight, unbiased examination of the "Problem of Human Life," Bro. Ray would see that ninety-nine hundredths of its religio-philosophical teachings, so far from containing "the seeds of infidelity and death," as he so thoughtlessly charges, are devoted to a philosophic and scientific overthrow of Darwinian evolution, to the establishment by the natural analogies of science of the substantial nature of the soul as a basis for human immortality, and to the breaking down of materialistic atheism as opposed to the existence of a personal, substantial, and intelligent God.

Bro. Ray surely cannot secretly be a Darwinian evolutionist of the theistic type, and therefore feel, as certain critics have felt before him, that the "Problem" was treading upon his own transmutation corns! No, he believes nothing of the kind, but knows that these main drifts of the book are in strict accord with the religious work which he himself is trying to accomplish in his own way. These scientific and philosophical arguments in favor of religion and against materialism have been hailed by the religious press of all denominations as a godsend in aid of their own efforts to convert the world from infidelity, and have been commended to their skeptical readers with an earnest enthusiasm *such as no other book has ever received.* Of this we have an abundance of proof right at hand, as shown on the last page of this number. Yet Bro. Ray, shutting his eyes to all these acknowledged merits and advantages of the work, fastens upon one comparatively trivial matter of mere opinion, upon which most of his own brethren even differ from himself; and because he does not happen to agree with the writer, with Joseph Cook, or with the vast majority of educated clergymen upon this one point only, he proceeds violently to denounce "Mr. Hall's *exceedingly dangerous philosophy*" as "*wholly unworthy of Christian indorsement!*" We appeal to Bro. Ray's coworkers in the ministry if this is a fair, Christian course to pursue. We cannot refrain from expressing the opinion that if Bro. Ray shall ever chance to read this article, with what is to follow, he will be heartily ashamed of his unkind treatment of the author of the "Problem of Human Life," and unless we mistake the man, he will frankly apologize in the *Flag*. But now let us examine his charges of pantheism and infidelity upon their merits.

First, look at these words quoted by Bro. Ray, from our humble "Problem of Human Life":

"All nature is but an atom, so to speak, of God's substantial being; *while He still exists over and above nature and independent of this drop of His entitative being out of which the universe has been framed.*"

Does this sentence, which is the essence of all we said on the subject, "contain the seeds of death and infidelity"? Is this placing of God as a personal being above nature and independent of nature "refined pantheism"? Is it an "exceedingly dangerous philosophy"? and is it "wholly unworthy of Christian indorsement"? In a single word, is it possible that a man of Bro. Ray's age, erudition, and experience, cannot see the difference between this grand religious sentiment and that of pantheistic infidelity, however "refined," which denies any God except nature itself? We again thank the editor for thus quoting our true sentiment concerning any one who could so misconstrue our meaning, namely:

"*We sincerely sympathize with any man who cannot distinguish between this sublime conception of the origin of nature and of organic beings, and the godless theory of pantheism.*"

But what is the real difficulty which Bro. Ray has so strangely encountered in our teaching, which he calls "scientific nonsense," which he denounces as containing the "seeds of death and infidelity," and which is "wholly unworthy of Christian indorsement"? Why, this is it, and this is all there is of it: He thinks if the world was really made out of God's infinite substance, that it must still remain, in the same deific sense, "*a part of God himself.*"

But is it possible that Bro. Ray cannot see the self-destructive absurdity of this conclusion, in the light of his own theory of creation? He believes that the world was made out of *nothing*, according to the Westminster Catechism. Does he believe that the world *still continues to remain a part of nothing itself?* If not, what becomes of his bald complaint that "*It*" (our doctrine) "*makes the material universe, including men, beasts, rocks, and earth a part of God himself?*"

Surely Bro. Ray is one of these "*men*" he speaks of. According to his own theory, he himself must then have been made out of *nothing*; and according to his own logic, as expressed above, he must still remain *a part of nothing itself!* This being so, we ought not to expect anything very solid or substantial from his pen! Because potatoes, for example, are made out of dirt, does he believe that they remain dirt, and that he is eating *dirt itself* when he eats potatoes?

But Bro. Ray has struck even a worse difficulty than the above, and seems to be in serious trouble about it. If God created the universe out of his own substance, then "Mr. Hall's *exceedingly dangerous philosophy*, carried out to its conclusion, *would make the devil himself a part of God!*"

Now that would be a bad state of affairs, we must confess, and if not "scientific nonsense," would at least be "wholly unworthy of Christian indorsement." But as the Lord helps those who help themselves, let us see if Bro. Ray can't be made to help himself out of this *devilish* difficulty. If God really made the devil at all, of course Bro. Ray insists, according to his creation theory, that his satanic majesty must have been made out of *nothing*. It follows, then, according to his logic, that the devil must still remain *a part of nothing itself;* and we do not see why the Universalists ought not to throw up their best beavers, as Dr. Swander has it, in favor of Bro. Ray's liberal religious philosophy, and give him a magnanimous indorsement as well as a unanimous vote of thanks for proving the devil to be a nonentity!

But according to our earliest recollections of Baptist orthodoxy, in which church we were raised by a pious Baptist father, we were taught to believe that God created an *angel*, and that this angel voluntarily made himself a *devil!* Bro. Ray, it seems, has improved upon the old Baptist doctrine, apparently to aid the Universalists in getting rid of the devil entirely, by proving him to be *a part of nothing itself!*

But honestly, Brother Ray—as we do not wish to perpetrate any more logical fun at your expense than we can help, much as you may deserve it—let us try to be serious. You believe that Adam's living soul was made direct from God's vital breath, just as the angel was made who afterward made himself a devil. Of course you do, for God "breathed into his nostrils the breath of life and man became a living soul." Now, in the very essence of logic, if one part of man was made of God's substance, the other part ought to be; and if one single thing which God made is proved positively to come from his own substance as an original part of himself, as in the case of Adam's living soul, the evidence is conclusive that this was God's primordial metnod of creating everything.

God is never once reported as making anything out of *nothing*, while He is repeatedly reported to have made one thing out of another. As an example, he made Adam's body out of dust, while the dust must have been primordially made from himself, just as was Adam's soul. If it was God's habit and method to make things out of *nothing*, why did He not leave a positive example by making Adam's body out of nothing, instead of using something substantial as a working material? How easy it would have been thus to put on record at the beginning of earthly creations a direct proof of creation out of nothing, and thus have avoided all grounds for misapprehension!

The plain truth is, and Bro. Ray, as a logician, ought to know it, that if one single point-blank proof exists that God ever employed one thing or substance out of which to make another (instead of making it out of *nothing*), then that remains an eternal definition of His method of creation! This proof exists in the explicit narrative of the creation of Adam's soul as well as his body. And how beautifully this truth harmonizes with Hebrews xi. 3, where the apostle distinctly teaches that *the worlds which are seen were framed by the word of God of things which do not appear!* And how admirably this agrees with John, first chapter, that "the *word was God*"—"*and the word* [God] *became flesh* and dwelt among us!"

And now, in conclusion, we beg of Bro. Ray for his own sake to give it up, like an honest Christian man, and publicly to apologize in the *Baptist Flag* for such an unkind departure from Christian charity as calling the author of the "Problem of Human Life" a *pantheist*, and his unpretentious volume an *infidel book*. If he will do this, his brethren, as well as our own readers, will forgive him. For ourself, we have not the slightest grudge against Bro. Ray. We rather like him, but would think much more of him were he a good Substantialist. As it is, we thank him sincerely for giving us this magnificent occasion for setting himself and the *Flag* right before the public.

THE HYDROSTATIC PARADOX.

THE "NATIONAL BUILDER" AS A CRITIC.

BY THE EDITOR.

WE have been writing for the public now these many years, and we have during this lapse of time had almost innumerable occasions to examine the scientific, philosophical, and mechanical criticisms of claimed experts in the various departments of investigation to which they belong; we have seen, in these

various attempts to criticise, many of what we regarded as inexcusable blunders, oversights, miscalculations, etc.; but for bald incapacity and matchless ignorance in the very profession in which he assumes to act as an expert, we have never seen the equal of George O. Garnsey, architectural editor of *Hill's National Builder*, 103 State Street, Chicago, Ill. We thus give the address of the paper that those who may be interested in verifying the points of our reply can send for a copy, should they so desire.

Mr. Garnsey attempts to call in question the correctness of our solution of the so-called hydrostatic paradox, as propounded by Dr. Mott, and as answered by us, at length, in the November number of THE ARENA, Vol. I., page 89. He approaches his assumed task in a pompous and quite condescending manner, as if he was paying a high compliment to THE ARENA in thus setting its stupid editor right upon a fallacy almost too absurd to need criticism. He says of this editor:

"However lucidly he may attempt to provide an answer to questions touching the philosophy of Substantialism, he is evidently out of his latitude in the discussion of problems affecting the well-known practical rules governing mechanics."

After such an introductory sentence, one would naturally look for something very accurate in the criticisms to follow, showing unmistakable errors in our solution. Yet, surprising as it may be to the reader, every paragraph of his pretended correction of our supposed errors, contains the most laughable mechanical bulls we have ever examined, and which could not be more palpably grotesque had they been written as a deliberate caricature on science itself. To show this assertion to be true, we need only instance a few practical illustrations from his own statements, to make every intelligent reader heave a sigh of sympathy for the unfortunate architect of the *Builder* who has wandered so far "out of his latitude."

For example, he attacks our illustration of a string of spring balances hooked together, concerning which we stated that a pound attached to the lower balance would register a pound on each and every balance in the series. But Garnsey, the expert mechanic and architectural editor of the great builders' journal of Chicago, says that only two, the lower and upper balances in the string, will be affected or caused to register the pound weight, and that all the others will remain *nil!* We also stated in our solution that if this string of balances were to be laid down horizontally on a frictionless table, and if a pound pull were given to one end balance with the other end secured, it would likewise cause each balance in the string to register the same pound. But our building editor denies this also, asserting that only the two end balances will be seen to register, the same as if they should be connected by a straight, rigid wire rod!

The funny part of this denial is, he prefaces it with a labored protest against our illustration, denying that there could be such a thing as a "*frictionless* table," and therefore the proposition based on an impossible supposition must necessarily be absurd and false in philosophy.

This reminds us of an old-time negro minstrel show we once witnessed. *Bones*, preparing for a stunning conundrum, says: "Suppose there are three birds sitting on a limb, and I shoot one of them, how many would be left?" *Banjo* jumps to his feet and indignantly protests against such a proposition, declaring vehemently: "There are no birds sitting on a limb," looking wildly around the room to see the birds, "and the supposition being based on false premises, I submit, Mr. Johnson, that Bones has stultified himself in supposing a thing that is not so. And besides, if there were any birds sitting on a limb, Bones hasn't got any gun, and how can he shoot birds that do not exist without any gun?" Bones persists that as he was merely supposing a case he ought to be allowed to proceed. "There must be no supposition in the case," responds Banjo. "If there are no birds sitting on a limb, how can you suppose there are?" Of course the conundrum broke up in a row.

So it is with our ambitious architectural editor of the *Builder*. He raises a scientific rumpus with us because we supposed a "*frictionless* table," when this whimsical *row* had nothing essentially to do with the mechanical principle of philosophy involved. If he objected to our supposition of a "frictionless table," why did he not assume a certain amount of friction (say, one-fourth or one-tenth of the pull) and then allow for it in the result? But as the same string of balances, suspended from the top one hitched to a nail, operates practically without friction, and gives the same result as we supposed, any one but an imbecile would have confined himself to the principle of mechanics under discussion, and not have raised a ridiculous side issue, which explains nothing.

What a pity that some hardware merchant in Chicago who knows this young architect and wishes well to the *Builder*, would not run over to the office with half-a-dozen spring balances, hooked into a string, and thus save the unfortunate editor from disgracing himself and his paper further. A single test would convince him that every balance in the series will register the same amount, as the two end ones, when a pound pull, is given at either end of the string.

Why, reader, this young architect who has by some inexplicable freak of circumstances obtained an editorial position on a leading trade journal, even goes so far in his reckless attack upon THE ARENA article as to deny *in toto* the well-known law of liquid-pressure, acting equally in all directions upon the inner wall of a closed vessel, a principle of mechanics so well understood that the smallest boy in a philosophy class would be ashamed to face his teacher and express even a doubt concerning it. We are sure our readers will not feel inclined to believe this charge unless we quote his exact words. Here they are. Speaking of the well-known experiment of pressing an inch piston into a closed tank filled with water by applying to the piston a pound weight, that editor says:

"The proper method of obtaining a correct answer to the problem is to divide the one pound pressure on the piston by the number of superficial inches contained in the walls of the tank, and the product thus obtained will be the only correct pressure per inch (superficial) on the walls of the tank, thus: Number of superficial inches 2000; divided by one pound pressure, equals 1-2000 part of a pound pressure per superficial inch on the tank." !!!

Now to avoid the journalistic disgrace of making the *National Builder* the laughing-stock of the whole nation, we suggest to Mr. Hill to compel his architectural editor either to verify his teaching by a simple experiment on a keg of water, or else leave the office as unfit for such a responsible position. Let him be required to insert a dozen nicely fitting pistons into the head of a keg filled with water, said pistons to be of the same size, say one inch in diameter, and free to move in or out with as little friction as possible. Let him then adjust a common spring pressure gauge over each of these pistons save one. Now let him press down on the twelfth piston one pound, plus the friction of all the pistons, and as sure as he is the distinguished architectural editor of the *National Builder*, he will see the entire eleven pistons each rise one-eleventh as high as he presses the twelfth one down, *showing an actual pressure of one pound on each of the eleven pressure gauges instead of one-eleventh of a pound as he so foolishly asserts.*

That an educated engineer—a college graduate—making any pretension to scientific attainment, could perpetrate such a deplorable blunder in elementary mechanics as here ciphered out by Mr. Garnsey, is an educational calamity to the whole country, and sets back the cause of education to the extent of his influence, which we suppose to be about *nil.*

But the instances named are only a sample of his maladroit blundering. He denies positively that in pressing one pound on the lid of a book there is one pound of pressure produced between each two of the book's leaves, claiming as he does, that only a single pound of pressure occurs against the top lid and then against the table on which the book lies. He reasons in this childish manner: If THE ARENA is right and if the pound of pressure is repeated between each two of the hundred leaves of the book, then it must amount to one hundred pounds of *weight* when the pressure has passed through the book and has reached the table! The innocent architect thus makes no true distinction between *pressure* and *weight*. Each repetition of the pound pressure downward, which occurs between any two leaves of the book, as he ought to know, is simply counteracted or balanced by the reacting pressure upward of the leaf below, thus absolutely preventing these multiplied pressures from conversion into weight.

If our architect has not the mental capacity to comprehend this simple fact of mechanics, let him place half a dozen thin wooden blocks, instead of the leaves of the book, upon the table in a pile. Now let him place a small cube of elastic rubber between each pair of these blocks, and also one between the lower block and the table. Then let him press one pound upon the upper block of the pile, and he will observe, if he keeps his eyes open, that each of the six rubber cubes will be flattened precisely to the same degree (plus the trifling weight of the wooden blocks above it) from the highest to the lowest.

If he shall still think, in his ridiculous infatuation, that there is no pressure between all the different blocks of the pile, but only at the top where the pound is applied, and then at the table under the lowest block, let him insert a couple of his fingers between any two pairs of the blocks he may select, and then allow some sympathizing friend to press down a hundred pounds on the top of the pile, and you may depend upon it that an involuntary howl of pain from this doubting Thomas of the *Builder* will be all the evidence required of his abrupt conversion to THE ARENA.

He will thus not only learn that there is the full pressure which is applied to the top of the pile of blocks repeated between each pair of these blocks downward, but that even in pressing a pound upon a *solid block of wood*, this pressure will be repeated upon every infinitesimal layer of the block downward, action and reaction, millions of times from its upper surface till it reaches the table, and then on through the table to the floor on which the person stands who makes the pressure, when the action and reaction will end in reciprocal equilibrium.

In conclusion, we concede one of his statements to be correct. We have not the slightest doubt but Mr. Garnsey could "with little effort," as he says, demolish Substantialism, if in the line of his architectural pursuits, "*with the same facility and ease*" that he has shown in demolishing our solution of the hydrostatic paradox. We should always have regretted had we been unable to agree with the promising young architect in one single statement of his carefully-written two-page article.

THE SUBSTANTIAL PHILOSOPHY.

Its Most Surprising Aspect.

BY ROBERT ROGERS, OFFICE EDITOR.

I HAVE given much thought to the multitudinous wonders legitimately involved in Substantialism. These wonders are so manifold and far-reaching that this single aspect alone of the new philosophy, in my estimation, must, in time, form the fruitful theme of many essays of readable import as well as of numerous popular lectures of interest to discriminating audiences.

The term "Substantialism" is no mere fanciful designation given to some whimsical notion of a philosophical crank, nor is it a revamping of several old phases of philosophy clothed in new scientific terminology and rhetorical toggery, by which to disguise its hereditary descent, and thereby change the character of its specific affinities. It is a system of thought *sui generis*, and though new to the world, it combines the intrinsic elements of science, philosophy, and religion in their primordial simplicity as well as in their broadest catholicity as they never were combined before.

The Substantial Philosophy in its very initial announcements, as portrayed in the second chapter of the "Problem of Human Life," disdained to place its sacred feet upon any soil that had been trodden by the familiar sandals of any previous system of natural belief. Its motto was, that a philosophical system which is not substantially new is not worth announcing to the public. Why make another book, was the common-sense reflection of the author, when the world is full already of books that are never read, unless you have something which is intrinsically new to present, and as true as it is novel?

Believing, as did the founder and propounder of the Substantial Philosophy, that he had a system of scientific and philosophical doctrine to propose and unfold, involving principles as salutary to mankind as they were revolutionary to the present theories of the schools, he let loose his three hundred frightened foxes, with their coupled tails laden with the firebrands of truth, into the standing corn of the uncircumcised scholastic Philistines, thereby producing such devastation among their shocks and hedge-fences that they have ever since been wishing to put out his eyes. But no perfidious Delilah has been able to lure him to sleep, or to find out wherein his great strength as well as his great sagacity lies, whereby he might be overpowered. It was surely not in his knowledge of modern books, nor was it in his scholastic lore, for he had never seen the inside of a college class-room, nor had he ever read a single text-book on physics when he began to write the "Problem of Human Life." Neither did the secret of his great strength lie in his seven unshorn locks, for he was bald-headed. Yet no scientific lion has dared to roar at him in his way to Timnath without the risk of being torn in pieces as if he were a kid, and of having his carcass left by the wayside to serve the useful purpose of a beehive. So potent has been this secret strength that cords of philosophical flax, however new, and hickory withes of modern science, however green, have proved in his fingers as wisps of tow when it had been touched by the fire.

At length the world has made the discovery that the strength shown by the author of the "Problem" lay simply in the fact that he looked directly into God's open book of Nature as no philosopher had ever looked into it before, and therefore he was enabled to discover and to unfold truths of science and principles of philosophy which sages had long desired to see, but had died without the sight.

And now that these great principles of Substantialism have thus been evolved from the safe-deposit vaults of Nature's ever-accessible archives, it becomes the patent wonder of every scientific thinker who intelligently grasps this philosophy, that all its complex parts should be so harmoniously consistent in their bearing upon each other, as well as in their diverse relations to all other facts and principles of true science and true philosophy, wherever they may be found. The most crucial tests have been applied to Substantialism, and the most puzzling problems of physical nature have been subjected to its analysis, with the same uniform and infallible results of satisfactory solution.

The founder of that system of formulated truth challenges the world, in modest defiance, to suggest or imagine a physical or metaphysical problem (which does not encroach upon the infinite) that the philosophy of Substantialism will not satisfactorily solve.

As a student of this system of doctrine under the critical tuition of its founder for nearly half a dozen years, I have suggested and heard others suggest the most puzzling difficulties that could be imagined, apparently lying in the very way of the new philosophy, but with no other effect than to confirm its uniform adaptability to every conceivable phase of physical law.

But the most surprising aspect of the Substantial Philosophy remains to be set forth. It is the marvelous fact that a system of physical and metaphysical laws and principles, so ramifying in their character, so consistent with each other, so universal in their application, so transcendent in their moral effects, and so essential to the solution of nature's mysterious problems everywhere obstructing our progress, *had not been discovered before.*

It is even now the admitted wonder of the nineteenth century among thoughtful readers that any plainly accessible law of physical science could have passed undiscovered and unannounced through the searching scrutiny which has been brought to bear by the giant intellects of the past two hundred years. But instead of a single new law of physics or new principle of philosophy, the wonder is magnified a hundred-fold, when the scientific world is confronted with a complete and comprehensive system of philosophy bristling with facts, laws, and principles of science entirely new to either ancient or modern investigators. And what still enhances the marvel of this truthful statement of the case, is the fact that such a system of practical and applied philosophy, thus passed unnoticed by all former physicists, should be picked up, demonstrated, set in order, and proclaimed to mankind by a single unscholastic investigator, without a soul to aid him in the search, and with as few essential errors to his credit as have occurred in its formulation.

This phase of Substantialism, above all its other aspects, I believe the world will yet acknowledge (when personal envy shall have given way to calm reason) to be the marvel of marvels of this marvelous age. I am proud to be a Substantialist, but still prouder to have been the personal friend and student of such a master.

THE "ZETETIC PHILOSOPHY."

ST. LOUIS, MO., June 13th.

Editor of the Scientific Arena:

DEAR SIR,—I have been surprised at the persistence with which believers in the "flat-earth" theory hold and urge the views of "Parallax." Is it possible that an intelligent, scientific thinker, at the present day, can be satisfied with the notion that all the apparent movements of sun, moon, planets and stars are but the results of the well-known law of *perspective*, and that the apparent sinking or setting of all these heavenly bodies out of sight, is merely the reduction of the angle of vision which is subtended between these bodies and the flat earth by simple increased distance? From conversations I have recently held with otherwise apparently intelligent and educated men, I have been forced to believe that this view is seriously entertained as the true explanation of the rising and setting of the sun by the advocates of zeteticism. Will you inform your readers if there is any doubt as to this being the sole explanation of celestial phenomena according to the "flat theory?"

Very truly yours,

HENRY. S. WILSON.

REMARKS BY THE EDITOR.

There is not the slightest doubt upon the subject. Our correspondent should read the December number of the first volume of THE ARENA, in which the very question he raises is discussed and the matter in question forever settled. In those discussions we quote liberally from "Parallax," and other advocates of the flat-theory of the earth, to show that they all agree, and with perfect unanimity, that the sun apparently sets or sinks out of sight, alone by increasing its distance from us while circling round the North Pole over a perfectly flat or plane earth, and that its apparent settling below the surface of this plane is merely the narrowing of the subtended angle of vision between it and the earth's surface by this well-known law of *perspective.*

We do not wonder that our correspondent is surprised that any set of men outside of an insane asylum should entertain such a view. It is not for them, therefore, that we answer this inquiry by again briefly exposing the superlative shallowness of such a monstrous *perspective* plea; for those men are already proved to be incapable of drawing a logical conclusion relating to this question; but it is for the sake of others who may chance, like our correspondent, to encounter the advocates of the flat theory, and may not be able, at the moment, to answer them, owing to the fact that they are sure to have the arguments of "Parallax" at their tongues' ends. We simply say to all concerned that this one absolutely essential "perspective" phase of their theory is all the proof that is needed to annihilate it; for, if they can't make the sun and moon rise and set by *perspective*, themselves being judges, then manifestly the earth is a *revolving globe*, thus bringing the sun above its surface at sunrise, and carrying it below at sunset, by turning on its axis. "Parallax," Hampden, Carpenter, and every writer on the subject admit the truth of this statement. Two brief quotations will be sufficient. "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 noon-day 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.*" Page 124.

Carpenter in his 84th pretended "*proof* that the earth is not a globe," where he tries to show that the receding heavenly bodies appear to approach the earth by the law of *perspective*, illustrates it as follows:

"84. If we move away from an elevated object on or over a plain or a prairie the height of the object will apparently diminish as we do so. Now that which is sufficient to produce this effect on a small scale, is sufficient on a large one; and traveling from an elevated object, no matter how high over the surface, no matter how far, will cause the appearance in question—the lowering of the object."

Now all this is true enough of objects near to the earth's surface, and this very fact, of a *perspective* lowering of such elevated objects as the distance between them and the observer increases, destroys the perspective theory of the rising and setting of the sun

and moon, and for this reason alone, *that the elevated object itself becomes smaller just in proportion as the distance between it and the prairie diminishes, and both of them result from the action of the very same well-known law of perspective!* Yet the sun and moon will go on thousands of miles away from us over the so-called *flat ocean* according to this lucid theory, annihilating hundreds of miles of space between them and the flat water, alone by this bogus "perspective," *while these very orbs themselves do not diminish in their apparent size the smallest fraction of an inch!*

"Parallax" tells us that the sun is but "700 miles above the earth;" still this magnificent law of "perspective," in taking the sun 1000 miles farther away from us, actually wipes out these 700 miles of space, causing sunset, *while it neglects to diminish the diameter of the sun itself a perceptible hair's breadth!* Yet Carpenter and Hampden, with this annihilating fact crushing their "perspective" theory out of existence, will still keep up their senseless flat-earth bravado as if there were not the slightest difficulty in their way.

But how simply and beautifully is this apparent setting of the sun below the earth's surface, while not diminishing its apparent size, explained according to the Copernican system of astronomy, and by viewing the earth as a revolving globe! Take the simple fact that the sun, instead of being "700 miles" away, as this puerile theory of "Parallax" insists, is more than 90,000,000 miles away, and we can at once understand why and how it is that it can go even thousands of miles farther away, as when viewed from the Arctic regions, without preceptibly reducing its apparent size, though really acted on proportionately by the same law of perspective which reduces a six-foot circle to the apparent size of an inch, when our distance from it is three miles. An increase of a thousand miles additional distance on the part of the sun, would no more perceptibly change its apparent size, than would an ordinary church, viewed a mile away, be reduced in size, should our distance from it be increased *one inch more.*

But now look at the problem in the light of "Parallax," with the sun only 700 miles above the *flat earth* when directly overhead, and apparently but *two feet* in diameter; it ought to be reduced by perspective to the size of the smallest fixed star, a mere point of light—in receding 1000 miles further away. This would be the effect of the true law of perspective, and not the bastard law—the zetetic monstrosity—advocated by "Parallax" and Carpenter.

According to this true law a bright object 100 feet in diameter and with a clear view will be reduced to a mere speck when about sixty miles removed from the observer. But, to illustrate zeteticism, suppose this bright object, 100 feet in diameter, to be placed 1000 feet above the flat prairie, and then imagine a "law of perspective" which in our passing sixty miles away from it would utterly wipe out these 1000 feet between it and the earth, *but would still allow the object itself to remain* 100 *feet in apparent diameter*, and you have exactly what zeteticism proclaims to the world as the law of "perspective" which satisfactorily accounts for the rising and setting of the sun! Let a well-posted child, half-a-dozen years old, throw this single argument into the teeth of Carpenter, who is now boring astronomers with his flat nonsense, and he will be very apt to fold his zetetic tent and silently steal away.

Artificial sponge, made of cotton, rendered absorbent and treated with antiseptics, has been introduced in England. A piece the size of a small plum has absorbed water until it reached the size of a cocoa-nut. It is so cheap that it need be used but once.

TAXIDERMY.

BY THE EDITOR.

ONE of the most beautiful, interesting, and æsthetic arts of the higher civilization of this age is that indicated by the heading of this article, namely, the art of preparing the skins of animals, especially those of birds, to represent their natural appearance in life. There are but few persons, all told, who have attained to any degree of perfection in this delicate and difficult work, and we believe we had the privilege a few days ago of a personal examination of the laboratory and cabinet of the taxidermist who stands at the very head of his profession, either in this country or in Europe.

We refer to the venerable Prof. John G. Bell, of Sparkill, N. Y., some fifteen miles from this city. By special invitation from the Professor, we, in company with the other members of the editorial staff of THE ARENA, including Mr. Elmendorf, a neighbor of Prof. Bell, paid a visit to the great taxidermist's establishment, situated romantically among the hills of Rockland County, whose picturesqueness well accords in beauty with the hundreds—yes, thousands—of the most exquisite specimens of nature's loveliness there, showing the marvelous handiwork of his wonderful art.

We were not prepared for the intellectual and artistic treat the Professor had in store for our entertainment. From his world-wide reputation, even among the crowned heads of Europe, as the first taxidermist of the age, we naturally looked for innumerable things of beauty; but our wildest imagination could not have painted more than a small fraction of what we saw.

On arriving at his residence our party were led by the Professor into the parlor, where cases of the most resplendent beauty in all directions met our gaze. These cases contained such varieties of birds of gorgeous and variegated plumage, so life-like in their mounting on miniature trees, and so entirely natural in their attitudes, that we stood spell-bound at the magnificent view.

From the parlor the Professor conducted us through library, halls, and drawing-rooms, up-stairs and down, all resembling enchanted grottoes, where all the songsters of creation had apparently assembled for a grand jubilee.

The specimens thus on exhibition represent many thousands of species and varieties, collected from every country of the inhabited earth. As an illustration the Professor showed us nearly two hundred different species of humming-birds alone, no two of which looked alike, until at last our eyes became tired of the interminable enchantment of hues, tints, shades, and variety of colors, and we abruptly refused to look any longer.

Our party, younger than the editor, kept on in the crusade of inspection for an hour after we had become totally satiated with the inimitable beauty and gorgeousness of the scene.

Prof. Bell is now an old man, living in the very spot where he was born between seventy and eighty years ago. He must soon give up the prosecution of his art to other and younger hands, when his cabinet of wonders will doubtless be scattered. Cannot some wealthy man immortalize himself and benefit his race by securing this entire collection, and donating it to some suitable institution? Such a gift would be a priceless endowment.

THEOLOGY versus COMMON HONESTY.

BY THE ASSOCIATE EDITOR.

THE founders of the Andover Theological Seminary held an idea that in their judgment embodied the truth, which they formulated into a statement or summary. So happy were they in the conviction that the idea was an eternal truth, and so confident were they that their chosen formula exactly expressed that truth, that they set apart a sum of money, the income of which should be devoted only to the promulgation of the truth uttered in and by their adopted formula. And to insure against the restless waves of the theological sea encroaching upon their favorite idea, they provided that the expositors of that doctrine should solemnly subscribe to that particular formula, at least once in each five years. That was their right. Thus far no obligation has been assumed, only created.

But now the Congregational polity finds the idea so consonant with their views of the truth that they accept the obligation and assume the conditions. Years pass; the very circumstances provided against arise. The sands of theology shift, and Congregationalism finds it pressingly desirable to shift with the sand. When, lo! Frantic efforts are made to pull up this weather-beaten formula and set it in line with "modern ideas." But the founders had driven it too deep for dislodgement. Something must be done, and the frugal theologians decided that if the standard must be abandoned, they would yet preserve the *cash box* that was attached to it. And the removal was cheerfully accomplished on that basis. No one seemed to question but what that was good theology, but many doubted whether it was "good honesty." Now Theologians gravely theorize, Trustees piously trust. Visitors wisely visit, and "reflectors" go on reflecting—that the abandoned formula was the chosen custodian, *in perpetuum* of the idea adopted by the founders; and whatever idea that particular statement of doctrine expressed *at the time* it was incorporated in their purpose, *that idea* remains intact in the formula *now.*

The Congregational Church was not obliged to accept that idea and assume the responsibility attached thereto; nor is it obliged to continue either the acceptance or the assumption. But since they were accepted together, *both should be abandoned together.* The work undertaken must be performed, or the money attached to it be left untouched. If this is poor theology it is "good honesty," which is far better. Did the founders of the Andover Trust provide for the renewed subscription to that formula simply to determine how far each succeeding five years had drifted the professors away from it, or to mark their fitness to continue as its expositors by ascertaining their unchanged adherence to it? It is not questioned whether that formula or the idea it expresses is right, or ever was right. It is questioned whether the parties receiving the funds set apart to secure the faithful teaching of that idea are not teaching quite another idea, and expressed by another formula. If the professors do not accept it they should not teach it; but if they do not teach it, neither should they be maintained by its funds. By what divine right may theology steal the coppers off the eyes of dead men, and not become a vile robber?

Does it need a long process of law, a violent, bitter controversy, an angry, permanent division of the pious instructors of our future teachers of righteousness and peace, to determine this matter? If the Congregational polity can no longer express the truth as they hold it, by a careful adherence to and a faithful use of that formula, why not abandon both the formula and the money left in trust to perpetuate it? Such a course would not raise the question of consistent honesty, even among the dishonest heathen that the Congregational Church is supposed to labor to convert. The Church (whatever may be understood by that term) can afford to lose a thousand theological seminaries, but it cannot afford to lose the simplest principle of *honesty.*

"NEARER, MY GOD, TO THEE."

(*Continued from page 24.*)

"He that hath ears to hear, let him hear." There are voices from heaven wooing us in sweetest accents, but unless we attune the chords of the soul, so that they will vibrate in symphony with this divine music, we will never hear it. It is because the vibrating chords of humanity's soul are accorded to the material—to the unreal—that "having ears it hears not" these loftier voices in nature. There is nothing supernatural in getting nearer to God; it is effected through human effort acting in accordance with natural law. The elemental faculties through which we discover and appropriate moral, spiritual, and intellectual truth are the divine legacy to man. The universe, with all of its unbounded and inexhaustible forces, are the food to supply these faculties; they are created with a definite relation to these forces—but the labor of securing this food and appropriating it is man's.

It is just as fixed and determinate a law of nature, that man shall labor for his moral and spiritual food as for his intellectual and physical. In all of God's processes and workings throughout the universe of mind and matter we find order and harmony. We recognize the law of mentality—that in order to develop the intellectual, social, æsthetic, or executive faculties, they must, through man's own volition, be brought into action; that through continuous normal action they become stronger in their grasp, keener in their penetration, more acute in their intuitions, and with a correspondingly increased power to discover truth that is related to them. Since this is the God-ordained method of growth and inspirational insight for these faculties, it must be the same for each and every faculty of soul. It antagonizes all our innate and acquired cognition of consistency, of order and harmony, of logical intuition, to conceive of Creative Wisdom instituting one law of growth and inspiration for some faculties of mind, and one entirely different for that of others. Although the elemental faculties of soul are individualized in their desire and action, they are nevertheless correlated in their influence, and governed by the same law. Hence, if we know the process of growth in one faculty of mind—the method through which it discovers and appropriates truth, then we know that of all the faculties of mind. And what is this law of growth of inspiration? Simply normal, persistent effort.

Through this effort, the faculty increases in size, strength, and subtilty of perception; and thus develops power to grasp that supply element in the universal storehouse to which it is constitutionally related, and transforms it to its own substance. It is opposed to everything revealed to us of God's workings, for abrupt or opposite changes in the mode of operation of elemental forces that are correlated in their nature and influence. Why then should we suppose one law for intellectual development and inspiration, and one diametrically opposite for spiritual development and inspiration? Such a supposition is contrary to reason, to all demonstrated principles of logic and philosophy, of order and harmony.

It is because this false theory has become so thoroughly ingrafted into the mind of humanity that there has been such slow growth in moral and spiritual life—a growth in no degree commensurate with that of intellectual life.

The indoctrinating of the idea that man has no inherent capacity to develop his spiritual nature—or to discover spiritual truth—that an exterior agency only can effect this, has had a paralyzing influence upon his spiritual energies.

How much progress think you would have been made in the intellectual world, if humanity had been taught that it was, of itself, impotent to develop or to discover truth—that all growth—all its insight into truth, must come through supernatural aid.

Faith in our inherent powers is absolutely essential for development. Without the energizing power of faith, no effort will be made, and consequently no growth. Inspire the soul with faith in its inborn moral and spiritual capabilities, convince it of the truth, that through a normal and persistent exercise of these capacities they will unfold, and discover moral and spiritual truth—that just in proportion to the labor expended will be the reward, and a glorious era in moral and spiritual advance will be inaugurated. The inspiration of faith in inborn spiritual power will open up to man a new earth and a new heaven; for through precisely the same heaven-born law that the intellectual faculties unfold and gain inspirational insight, can the moral and spiritual faculties secure the same result.

"Knock, and it shall be opened unto you; seek, and ye shall find," are injunctions indicating the Eternal plan for securing that which will supply the spiritual wants. We cannot grow into a higher moral and spiritual life, we cannot discover and appropriate moral and spiritual truth without constant and energetic effort; and an effort in consonance with the law engraved in the soul's being by the finger of God.

Labor—continuous, concentrated labor—is the irrevocable decree for the unfolding of every faculty, and power of soul. And this law of labor is one of supreme beneficence, for only through labor can we secure the highest and purest enjoyment.

In thus endowing man with the ability to discover and appropriate truth of every kind through his own efforts, Creative Wisdom has crowned him with capabilities that are God-like in their power; and in this—and this alone—has he made man in his own image.

The soul's instinctive desire to grow nearer to God is the index of implanted power, for there is no inborn desire without the complementary power to secure that desire.

It is frequently suggested of late that the "presidential bee" is buzzing in the bonnet of the Hon. Chauncey M. Depew. Certain it is that this versatile gentleman is constantly before public attention by a very carefully edited report of his sayings and doings. However, it may be in justice said that his utterances are often wise and well-timed. The following extract is from his recent oration at Saratoga, N. Y.:

"Thirty years ago Macaulay wrote a letter to an eminent citizen of this state which carries to the reader the shock of an electric battery. In it he declares that our institutions are not strong enough to stand the strain of crowded populations and social distress, and that our public lands furnish the only escape from anarchy. With the opening of the next century, thirteen years hence, they will all be occupied, and at the first industrial disturbance which throws large masses of men out of employment we must meet the prediction of the famous historian. . . . The exhaustion of the public domain and the disappearance forever of the unbought homestead present part of Macaulay's problem. The ranks of anarchy and riot number no Americans. The leaders boldly proclaim that they can come here, not to enjoy the blessings of our liberty and to sustain our institutions, but to destroy our government and dethrone our laws, to cut our throats and divide our property. Dissatisfied labor furnishes the opportunity to preach their doctrines and mobs to try their tactics. The immigrants of the past have been of incalculable benefit to a country which needed settlers for its lands, and skilled and unskilled labor for its towns, and among them have been men who have filled and adorned the highest position of power and trust. The officers of the government report that there is a falling off of over seventy per cent. of farmers, mechanics, and trained workers, and their places are occupied by elements which must drift into and demoralize labor centers already overstocked and congested, or fill the highways and poorhouses. We do not wish to prohibit immigration; our laws should be rigidly revised so that we may at least have some voice in the selection of our guests. We cannot afford to become the dumping-ground of the world for its vicious or ignorant or worthless or diseased. We will welcome, as always, all patriots fleeing from oppression, all who will contribute to the strength of our government and the development of our resources, and we will freely grant to all who become citizens equal rights and privileges under the laws, but no more. There is room in this country for only one flag, and 'Old Glory' must head the procession or it cannot march."

The *Mail and Express* of New York deserves commendation. It is carefully edited, and sustains the claim made for it as being "a paper the Christian man can safely take home to his family." The following extract is from an editorial comment upon a recent address of CHAUNCEY M. DEPEW:

"The one great lesson that comes from the Union army reunions is that the history of the war must live in the minds and fill the hearts of the people. A people that, in one generation or in a century, could forget or ignore the teachings of the Divine Providence that permitted such a tremendous fact as our civil war, would not be fit to live under free institutions and would fall the easy prey of their own follies, selfishness and inevitable disintegrating passions. It is true, as Mr. Depew says, that 'the best and bravest thinkers of the South gladly proclaim that the superb development which has been the outgrowth of their defeat is worth all its losses, its sacrifices and humiliations. As torrents of living waters flowed from the rock smitten by Moses in the desert, so from the touch of liberty has come an industrial revolution full of prosperity and promise."

The many friends of the Rev. Dr. J. H. Vincent in this country will be greatly pleased to know of the prompt recognition with which he has been welcomed in England, both at the beginning and now at the conclusion of his tour in Europe. From the *Sunday-School Chronicle*, of London, we learn of the cordial reception with which a great body of English teachers listened to his sermon on the "Power of the Word." He addressed the Wesleyan Preacher's Meeting, and delivered a lecture in City Road Chapel on the Oxford League. He has also preached the dedicatory sermon of the Stratford (London) Wesleyan Chapel. He was among the guests invited by Dr. Parker to meet Mr. Gladstone; and the editor of the *Contemporary Review* had a special entertainment, where the doctor was invited to meet several distinguished English educators, including Dr. Percivale, Head Master of Rugby School. The doctor's notable article on "Chautauqua," in the *Contemporary Review*, has introduced him to a large number of new friends.

The Springfield *Union* sensibly suggests that "the wisest possible memorial of Dr. Mark Hopkins would be an endowment of $150,000 for the general work of Williams College." So, in the same spirit, we would suggest that the fittest and most worthy memorial of Dr. Hitchcock would be the raising of a $250,000 "Hitchcock Memorial Fund," for the general purposes of Union Theological Seminary.

Literary "Molecules."

An interesting exhibition of insect life is to be seen at the office of the Sheffield Farm Dairy, Ninety-second Street and Ninth Avenue. A large show case surrounds a section of a fine old American cheese. Its taste is sharp and full-flavored, and its aromaequal to that of the poetic Limburger. To a naturalist, however, it possesses more than gastronomic attractions. A colony of skippers have preempted and are busy at work. They frequently fall to the bottom of the case. Drawing up their bodies they form rings by holding their tails firmly in their mouths. A rapid vibratory motion follows, and a lightning like spring is made to get back on to the cheese again. Their movements are so quick that it requires a sharp eye to follow them. The average height of their jumps is from five to seven inches. One of them, however, succeeded in bounding over the cheese, a clear jump of nearly two feet, much to the astonishment of those who were observing them.—*Evening Sun, June* 23.

Recently a large meeting was held in Columbia College to provide for the coming to New York in August next of the "American Association for the Advancement of Science." Dr. Newberry made an address, in which he said that Dr. Brush, the head of the Sheffield Scientific School, said that the clerical trustees were much more liberal toward science in the institution than the lay members. This is an interesting statement. It is well known that various complaints were made a few years ago against the clerical members of the Yale corporation. An *alumnus*—undoubtedly a clergyman—calls attention to the above statement of Dr. Newberry in a letter to the New York *Times*. The fact is that the Protestant clergy, as a class, are liberal to a fault to everything that does not directly attack their denominational principles.—N. Y. *Christian Advocate.*

The birthday of Miss Jennie Cassidy was June 9, and was celebrated in twenty-six States and three Territories with religious services in hospitals, infirmaries, and prisons, at which time a bouquet of flowers, to which is attached a text of Scripture, and tied with a white ribbon, goes to each inmate of the institution. The purpose is not to give flowers to convicts, but by them to open the way for the Gospel. Miss Cassidy, whose home is in Louisville, Ky., is a sister of Ben Cassidy, once connected with the Louisville *Courier-Journal.* She has been a helpless invalid for twenty years, and for eight years has not been lifted from her couch. She is the Superintendent of Flower Missions of the Woman's Christian Temperance Union.

An exchange, which speaks of a recent case of poisoning, says: "There is too much chemistry creeping into the kitchens in these days." That is true. Of this sort of knowledge, a little, if it be fundamental, is not dangerous in the kitchen. Let the head of the house know what kind of food to select, and let the cook know how to cook it; that is the beginning, middle, and end of good living. "What do you live on at your house that keeps you all so well?" "Good bread, good butter, fresh milk and vegetables, good beef, mutton, and poultry, and we boil all the water we drink, and eat all the ripe fruit we can get." If they had a good cook, it is no wonder they were all well with that regimen.

Prof. Henry Drummond, of Edinburgh, the famous author of "Natural Law in the Spiritual World," will be present and lecture at Mr. Moody's Summer School for college students in Northfield, Mass., June 30—July 12. In response to Mr. Moody's first invitation, Prof. Drummond declared that he could not visit America, whereupon the generalissimo of evangelists sent word that he *must* come. The Scotch scientist yielded, laughingly remarking that Mr. Moody was the only man in the world who could command him, and he supposed he must obey.

A valuable work relating to the art and antiquities of Greece, has been recently issued in "Bohn's Classical Library." It is a translation, in two volumes, of "Pausanias," by A. R. Shilleto. This book is really a guide to the cities and temples of Greece, as they existed in the second century of our era. Great interest attaches to the description of cities, offerings and statues that have perished; also to the records of myths and sacred chapters. The only existing translation, prior to Mr. Shilleto's, was the one by Thomas Taylor, the Platonist, published in 1794.

Ehrenberg states that in a slaty strata, near Berlin, the remains of certain infinitely small animalculæ were discovered. A cubic line, of which there are 1728 in a cubic inch, contained about 23,000,000; so that a cubic inch would hold, on an average, 51,000,000,000. On weighing a cubic inch of the mass it was found to be about 220 grains. Thus 187,000,000 of the minute creatures made up a grain, showing that the silicous shield of each animalculæ weighed about one hundred and eighty-seven millionth of a grain.

A bore hole made two years ago to a depth of fifty-two meters into the older Devonian strata near Burgbrohl-on-the-Rhine yields a large and steady supply of carbonic acid gas, with water, which is utilized in various ways. Last autumn, the supply of gas having proved constant, a compressing apparatus was constructed directly over the bore.

The practicability of working coal at much greater depths than hitherto has been generally thought possible and been ably advocated by Mr. W. E. Garforth at a meeting of the members of the Manchester Geological Society. The last generation of colliery managers had expressed doubts about mining coal at 500 yards.

Salmon, said at one time to be so plentiful in New Jersey waters, that the farmers used them as a common food for their laborers, have been certainly very scarce within the memory of the oldest inhabitant. A fish of that species was, however, recently caught in Raritan Bay, which weighed twenty-four pounds.

D. G. Doane gives a beautiful, simple experiment which may interest the amateur with the microscope. Upon a slip of glass put a drop of liquid auric chloride or argentic nitrate, with half a grain of metallic zinc in the auric chloride, and copper in the silver. A growth of exquisite gold and silver ferns will grow beneath the eye.

Experiments recently made in France have shown that nickel may be effectively rolled upon soft steel plates, which are thus made as valuable for lamp reflectors and other purposes as silvered copper.

A bar of iron, worth $5, worked into horseshoes, is worth $10.50; made into needles it is worth $355; into Esterbrook steel pens, $267; into pen-knife blades, it is worth $3,285; into balance-springs of watches, it is worth $2500.

This is Ruskin's latest: "You hear a great deal of nonsense about the best hundred books. A Scotchman, next to his Bible, has but one book—his native land; but one language—his native tongue, sweetest of European dialects. Study your Burns, Scott, and Carlyle."

In the province of Namur, Belgium, in the grotto of Biche-aux-Roches, near Spy, two human skeletons, the remains of the elephant and a species of deer, together with flint weapons showing traces of use, have been discovered.

M. Marcel Deprez lately succeeded in transmitting an energy equivalent to 40-horse power by means of electricity a distance of 56 kilometers, 50 per cent. of the original power being utilized.

"Christianity is personal friendship with Christ."

DR. WILFORD HALL'S SCIENTIFIC LIBRARY.

THE principles of the Substantial Philosophy, with their collateral bearings, which are unfolded in Dr. Hall's writings, have cost him more than ten years of unremitting labor, such as few men besides himself have ever performed. The results of this tireless scientific and philosophical research, as therein elaborated and set forth, can be found in no other library of books on earth; and those who fail of the present opportunity to secure these unique works, at the trifling cost proposed by his publishers, will realize a missing link in their chain of knowledge, which they may always regret and may never be able to supply.

EIGHT VOLUMES THAT WILL LIVE.

THIS library consists of the "Problem of Human Life" ($2), the five volumes of THE MICROCOSM, bound in cloth ($7.50, or $1.50 each); the first volume of THE SCIENTIFIC ARENA, bound in cloth ($1), and the "Text-Book on Sound" (50c.), amounting in all to $11.

By special request of Dr. Hall this entire library will be sent to any person by express on receipt of $5, if ordered soon, or before the plates shall pass into other hands—an event probably not far distant. If sent by mail the postage, $1.25, must be added. Should the person sending $5 on this special offer already have either of the above eight volumes some other book may be substituted, if in our list of publications found elsewhere on this page.

No person who has tasted the fruits of this comforting and elevating system of doctrine, as set forth in those volumes, should allow this opportunity to go by for leaving to his children an heirloom which may prove an almost priceless memento in coming generations. Bear in mind that this library can only be obtained by addressing Hall & Co., publishers, 23 Park Row, New York.

BORDERING UPON IDOLATRY.

THE philosophy of Substantialism, which advanced thinkers now agree is destined to revolutionize the present science of our schools, possibly before this generation shall pass away, took its rise less than a decade of years ago, in the "Problem of Human Life," a work which has been hailed with commendations from the press of the civilized world, such as no book has ever before received. The publishers of this work have filed away hundreds of such notices, many of which are too laudatory and too nearly bordering on idolatry to be printed. Indeed, the publishers of THE ARENA are constantly receiving contributions from enthusiastic admirers, well written, but so full of flattering praise of the editor's work, that he feels obliged not to allow them to be printed. The following, however, is a mere specimen of such press-notices of the "Problem," a book of 524 octavo pages, and of which between 60,000 and 70,000 copies have already been sold without a dollar's worth of advertising:

A SAMPLE OUT OF 240 NOTICES.

[*From the Christian News, Glasgow, Scotland.*]

"One of the most trenchant and masterly opponents of this theory (Darwinism) is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled 'The Problem of Human Life,' in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them."

[*From the Methodist Protestant, Baltimore, Md.*]

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

[*From the Illustrated Christian Weekly, N. Y.*]

"A very remarkable book has come under our notice, 'The Problem of Human Life,' which we have examined with some care, in which the author reviews most successfully the works of Darwin, Huxley, Tyndall, Haeckel, Helmholtz and Mayer, demonstrating, as we think, the utter fallacy of scientific materialism."

[*From the Brethren at Work. Mt. Morris, Ill.*]

"It is unquestionably the most startling and revolutionary book published in a century. There is no escape from the massive accumulation of facts, and the overpowering application of principles in which the work abounds from lid to lid. It marks an epoch in the centuries. It is a work of Providence and will not accomplish its mission in a generation. It unfolds truths that will stay as long as Christ is preached. Although strictly scientific, its one aim is the demonstration of a personal God, and a hereafter for humanity. We never tire reading it. It is an exhaustless mine of Christian truth. It is the literary *chef d'œuvre* of the age. It is worth its weight in diamonds."

[*From the Presbyterian Weekly, Baltimore, Md.*]

"The trenchant criticism, logical force, scientific attainments, and the clear, popular style of the author, have combined in producing in 'The Problem of Human Life' a volume that meets a pressing want, and one that will be warmly welcomed."

[*From the Dominion Churchman, Toronto.*]

"We most cordially concede to 'The Problem of Human Life' the well-earned title—*the book of the age.* Doubtless the God of Providence has raised up the author to meet the wants of the Church in this time of need."

[*From the New Covenant, Chicago.*]

"We can truly say that we are amazed at the originality, thoroughness, and marvelous ability of the author of this work."

[*From the Amer. Christian Review, Cin., O.*]

"The author, a man of acknowledged genius, and confessedly the brightest scientific star of modern times, has startled the religious world into transports of joy and praise. No religio-scientific work has received both from the secular and religious press such willing and unqualified praise as the 'Problem of Human Life.' It is the death-blow of atheistic science."

[*From the Journal and Messenger, Cincinnati, O.*]

"'The Problem of Human Life' is a very unexpected contribution to scientific polemics, which, if its reasonings shall be justified, on thorough investigation, will prove to be one of the loftiest achievements of this age, and effect one of the mightiest scientific revolutions ever seen."

[*From the Christian Standard, Cincinnati, O.*]

"The scientists who have dealt so flippantly with the solemn questions of spiritual and divine existence, and talked so vauntingly of their scientific demonstrations, will find that they have caught a Tartar. We cordially commend this work to our readers for earnest study."

APPLETON'S ENCYCLOPEDIA—A MOST EXTRAORDINARY OPPORTUNITY TO OBTAIN IT.

THE reading public have been surprised and thrown under renewed obligations to Hall & Co., publishers, of 23 Park Row, for arranging with the agents of Appleton & Co., by which they are now offering full sets of the sixteen volumes of this greatest of encyclopedias (second-hand, but practically as good as new for the student) at a small fraction of their original cost. Indeed, they offer to give a set free to any one who will purchase at one time a given number of their own books. Here is their remarkable offer, as printed in different numbers of THE SCIENTIFIC ARENA:

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The following is the list of books referred to by Hall & Co. above, and published by them, with the regular retail prices, from which selections are to be made in order to secure a set of encyclopedia free:

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Scientific Arena

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WHOLE SERIES, VOL. VII., No. 3.
NEW SERIES, VOL. II., No. 3.

NEW YORK, AUGUST, 1887.

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SKETCH OF PROF. G. R. HAND, A. M., C.E.

BY THE EDITOR.

THE subject of our sketch, whose portrait appears herewith, is a native "Buckeye," was born in Clermont Co., O., Sept. 2, 1812, to which country, then the "far west," his parents had emigrated from Philadelphia in the fall of 1805. He has therefore passed four years beyond the allotted "three score and ten," but is still blessed with the mental and physical vigor of earlier years. This is, perhaps, partly owing to his self-control, even temper, and uniform habits; for he can say with satisfaction, that in boyhood or manhood, he never used tobacco in any form, nor intoxicating drink as a beverage; nor has he ever allowed himself to use profane language. His natural thirst for knowledge early led him into the habit of looking into the reason of things, which habit has not yet deserted him.

He made it a point in his school-boy days to be always prepared with his lessons, and never miss, and aimed to stand at the head of his class, and seldom fell short of his aim. In those early days, when the "spelling class" led the van, he has—after spelling down "the other side"—been put forward by the teacher, against the whole school, and spelled them all down.

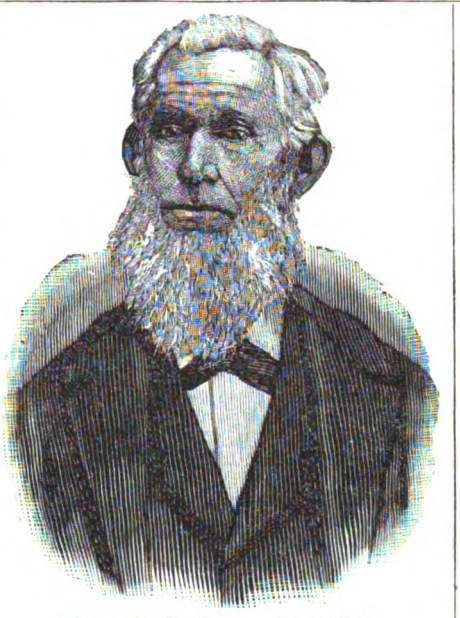
He early learned to work at the carpenter business with his father, who was a master builder, and superintended the building of the Court House in Batavia, the county seat of Clermont Co., O., in 1828.

In 1829 he removed with his parents to Cincinnati, O., where he continued to work with his father in the erection of some of the finest buildings then in the city. This gave him the opportunity to gratify his taste, and a little pride, in doing the finest work in the best style, and also of studying architectural drawing. He made it a point to know everything in the erection of every building that his father superintended, with full confidence that he could himself superintend the building of another.

His literary and scientific education was obtained, partly in the Cincinnati College, and partly at South Hanover College, Ind., and partly by independent study. While pursuing his studies at South Hanover College he was a member of the Union Literary Society, and also of the Oratorical Society.

His love of Natural Science and Chemistry led him to join with a class of young men in Cincinnati, for mutual instruction and investigation, with apparatus and experiments, in what was known as the "Chemical Class," in the old Cincinnati College building, and under the generous assistance of Dr. Lock, who was at one time Professor of Chemistry in the Ohio Medical College. In this class the subject of this sketch took his turns with the others, in lecturing and performing the experiments before the class, and occasionally in a public lecture.

He adopted the profession of teaching in 1835, and taught seventeen years in Cincinnati. Commencing in the public schools, he determined to soon acquire the experience to place



PROF. G. R. HAND, A.M., C.E.

himself in the front rank of the teacher's profession, as he makes it a point to stand in the same rank of any calling or profession in which he engages. His first step to elevate the standard of teaching was to call a meeting of the city teachers, and organize a Teachers' Association, in which all proposed improvements in education were discussed. This became a permanent feature of the Cincinnati schools, and the subject of this sketch was selected to deliver the address at the first anniversary of the association, in the hall of Cincinnati College. Teachers' Institutes followed, and educational meetings, monthly, quarterly and annually, in city, county and State, in all which he took an active and leading part.

He took an active part also in the College of Teachers, which convened during the first week in October, annually, at Cincinnati, and was composed of representative educators from nearly all the States in the Union; and for some years he was secretary of that body. He was also a member of the National Educational Society.

As a member of the Cincinnati "Society for the Promotion of Useful Knowledge," he was on the section of the "Exact and Mixed Sciences," with astronomer O. M. Mitchel, from which section sprung the society that built the Cincinnati Observatory, and his name was the third on the subscription list for that enterprise, Judge J. Burnet being the first, and O. M. Mitchel the second though the prime mover.

The largest public school in the city grew up under the supervision of the subject of this sketch, of which he was principal eight years, and till he resigned on his removal from the city. In the meantime the school had increased till he had two male assistants, and seventeen female assistants, and a thoroughly graded school of more than a thousand scholars.

During four years of his professional services in Cincinnati he taught in the Woodward College, in connection with Dr. Ray, the author of Ray's Algebras and Arithmetics.

On removing from the city, Prof. Hand received the compliment of a letter from his esteemed friend and fellow laborer, which he still preserves in the beautiful handwriting of the doctor, a copy of which is herewith presented:

"CINCINNATI, *January* 20, 1853.

"I have been acquainted with Mr. George R. Hand for several years, first as a member of the Faculty of Woodward College, and since that as principal of one of our largest and most flourishing public schools.

"Having repeatedly witnessed his methods of instruction—having heard his classes examined, and also assisted in examining them, I can bear the most decided testimony to his superior abilities as a thorough, efficient, and successful instructor.

"Mr. Hand has also for many years been associated with all the important educational movements in this city and part of the State, and has always been a zealous and leading friend of all improvements in education.

"Considering his sound scholarship—his long and successful experience as an instructor—and his devotion to the great cause of education, Mr. Hand cannot but be considered as a great acquisition to any community in which he may be located.

"JOSEPH RAY."

While teaching in the Woodward College, Prof. Hand was a member of the City Board of Examiners, to examine teachers for the city schools.

He graduated in the civil engineering department of the Cincinnati College, under the instruction of astronomer O. M. Mitchel, and received a diploma from the college, conferring upon him the degree of civil engineer. The parchment bears date June 24, 1840. On the public presentation of the diplomas in the college hall, it was stated that this was the first class that ever received the degree of civil engineer, making that a profession.

Finding that the Church of Christ, known as the Christian Church, took the New Testament scriptures as the manual of faith and practice, without the addition of any uninspired symbol of faith, and acknowledged no name but Christian, as given in that Bible, Prof. Hand united with that church in Cincinnati in 1840, and then and there made the resolution never to shrink from any duty he might be called upon to perform, and has faithfully maintained that resolution.

Having had some years of experience as a public lecturer on scientific and educational subjects, and before teachers' institutes, his speaking talent was at once appreciated by the church, and brought into the service; and the armor once put on, he has never taken it off nor allowed it to grow rusty.

The transition from the profession of teaching to that of the ministry seemed to be inevi-

table and irresistible; and Prof. H. has for many years stood shoulder to shoulder, in the front rank, with those battling against sin.

He has preached in Ohio, Indiana, Illinois, Kentucky, Missouri, Iowa, Kansas, Nebraska, and California, and has been successful as an evangelist. As one of the State Evangelists in Missouri, in a term of nine months, he reported 239 additions to the churches where he preached; and in another engagement of eight months, he reported 317 additions. For some years he was president of the annual conventions of the Missouri preachers and churches, for the preaching and discussion of Scriptural topics.

His diary shows that, for some years before removing to California, he averaged more than one discourse a day the year round, rising in 1871 to 408 sermons in the twelve months.

He was frequently invited to a distance to deliver a series of Lectures on Science and Revelation; and once, on invitation of State officers and members of the Legislature, visited Jefferson City, the State capital, during the session of the Legislature, and lectured in the hall of the House of Representatives.

In April, 1872, he removed from his thirteen years' labor in Missouri to the Golden State, and preached the first year in the State capital, since which he has preached with most of the leading churches, and in most of the counties in the State, along the railroad lines, from almost the extreme north to the most southern county, sometimes locating with a church for a year, and sometimes traveling as an evangelist, and organizing new churches.

Some years ago the professor accidentally stumbled upon a stray copy of the "Problem of Human Life," and at once became enamored of its revolutionary doctrines. The ripeness of his intellect in scientific and philosophical investigations, and especially in the profession of the class-room, had well fitted him for appreciating the radical criticisms of that book, and the novel scientific positions therein maintained. He at once abandoned the wave-theory of sound, the undulatory theory of light, and the doctrine of heat as a mode of motion, accepting the general principles of the substantial philosophy, namely, that every force or phenomena-producing cause in nature is a real substantial entity, or objective thing. He is now one of the brightest and most reliable substantialists in the West, as his numerous articles in the *Microcosm and Scientific Arena* will abundantly attest.

He was appointed to deliver an address on Substantialism at the Annual State Meeting of the Churches of California, in 1884, which address was by unanimous vote requested for publication, and appeared in the *Microcosm* of February and March, 1885.

Prof. Hand has been for many years almost a constant writer, and a regular or frequent contributor to the columns of various weekly, monthly and quarterly periodicals, and is the author of two published volumes, one entitled "Text-Book Exposed," and one entitled "The Gospel Delineator and Survey." He is at present located with the Church at Santa Anna, California.

It may be added that he did not ignore the sacred claims of matrimony, but married an educated Christian lady in Cincinnati in 1840, and raised and educated a family of two daughters and two sons, all of whom became members of the church. But the wife, two daughters, and one son have passed over the river; and the remaining son is raising a family to perpetuate the name.

It has always been firmly maintained by Prof. H. that the *father*, the *mother*, and the *wife*, sustain a relationship too sacred to be disturbed by cross words, or even an excited altercation, and the practical result is, that he can conscientiously say that he never spoke a cross word to his father, his mother, or his wife, and he expects to carry that consolation with him to the end of his voyage.

God takes men's hearty desires and will instead of the deed, where they have not the power to fulfill it; but he never took the bare deed instead of the will.

SPONTANEOUS GENERATION.

No. 2.

BY REV. J. J. SMITH, D. D.

THE advocates of Abiogenesis, or spontaneous generation of life from inert and lifeless matter, attempt to account for the manifest absurdity of this visionary hypothesis by affirming that there is a law in nature that works out, and produces, not only all organic forms which swarm on every side of us, but which originates life itself by its own inherent energy. The fallacy of this proposition is apparent, when it is remembered that a *law* of nature is not, and cannot possibly be the agent, or the instrument, or cause of anything. A law is simply of *rule* of action. Hence it is in no sense an *actor*, or *doer*, but a *mode of doing*. Therefore, to affirm that this, or that, or the other physical process of nature, is the result of established law, or laws of nature, as many do, is not only to talk unscientifically but to talk nonsensically.

An established order of facts may be called a law, but action, force, or casuality never. An order of facts may reveal a law, and thereby show its character, but a law never originates, or establishes, or produces the facts themselves. Therefore, a law of nature so far from accounting for anything, or causing anything, it absolutely affects nothing, and explains nothing, as it is in no sense an agent, but only the plan, or the method, or rule by which an agent acts. So it is plainly manifest that this supposed law of nature cannot possibly account for these life-forms and that they must necessarily have their genesis in something beside natural law, and in something infinitely higher than mere matter. In speaking of the utter helplessness and impotency of matter, Faraday has justly said, "There is one wonderful condition of matter, perhaps its only true indication, namely *inertia*." (Correlation and Conservation of Forces, p. 24).

That the vital force, as it is sometimes denominated, is an entity distinct from matter and superior to it is evident from the fact that this vitality organizes, controls, and moulds with the most skilful and artistic hand all the physical forms of the animal kingdom, and consequently as soon as life ceases in any one of these organized forms it returns to its original unorganized state. The Duke of Argyll, when speaking on the distinction that must be observed between mere matter *per se* and the vital force, or life, says:

"Because a particular substance called protoplasm is found to be present in all living organisms, an endeavor follows to get rid of life as a separate conception, and to reduce it to the physical property of this material. The fallacy involved in this endeavor needs no other exposure than the fact that, as the appearance and the composition of this material is the same whether it be dead or living, the protoplasm of which such transcendental properties are affirmed has always to be described as 'living' protoplasm. But no light can be thrown upon the facts by telling us that life is a property of that which lives. . . . We cannot suppose life to be a substance [material] supported by another. Neither can we suppose it to be like a chemical element in combination with another. It seems rather like a force of energy which first works up the inorganic materials into the form of protoplasm, and then continues to exert itself through that combination when achieved. . . . It is common now to speak of things widely separated in rank and function as being 'the same,' only 'differentiated' or 'variously conditioned.' In these, and in all similar cases, the differences which are unseen, or which, if seen, are set aside, are often of infinitely greater importance than the similarities which are selected as characteristics chiefly worthy of regard.

"If, for example, in the albumen of an egg there be no discernible differences, either of structure or of chemical composition, but if, nevertheless, by the mere application of a little heat, part of it is 'differentiated' into blood, another part of it into flesh, another part into bones, another part into feathers, and the whole into one perfect organic structure, it is clear that any purely chemical definition of this albumen, or any purely mechanical definition of it, would not merely fail of being complete, but would absolutely pass by and pass over the one essential characteristic of vitality which makes it what it is, and determines what it is to be in the system of nature." (Unity of Nature, pp. 34-40.)

"No matter how complex the protoplasmic molecules may be," says Dr. Drysdale, "its atoms are still nothing but matter and must share its properties for good or evil, and among these *inertia*. Hence it cannot change its state of motion or rest, without the influence of some force from without. *True spontaneity* of movement, therefore, is just as impossible to it as to what we call *dead matter*." (Protoplasmic Theory of Life, p. 199.)

And yet we are asked by these evolutionists to give up the only rational theory of the origin of all things as stated by Moses, and to believe that inorganic matter which was absolutely *lifeless*, *inert*, and *helpless*, actually put forth *power* and *energy* which it did not possess, and which it could not by any means acquire, except by exercising them before acquiring them, which was an absolute impossibility, and therefore, while without a particle of energy, did actually put forth the herculean, the omnipotent force of actually producing or creating something out of nothing, or in other words, of evolving life with all its varied forms and wonderful possibilities out of death.

TOMPKINS COVE, N. Y.

MACHINE-FILLED VACUUMS.

BY PREST. J. M. SPANGLER, A. M.

IN the days of Galileo people accounted for the flow of water through an air-exhaust piston pump by declaring that "Nature abhors a vacuum." But Galileo, who was so far above the people that they could not, or through jealousy would not, understand him, and who was constantly frowned upon, insulted and abused, found some comfort in retorting to his tormentors that "Nature abhors a vacuum when it is not too high." He might have fittingly added, "But would-be philosophers and scientists in general abhor all vacuums of the cranium, and furnish filling by the yard." For it is certain that every little two-by-four pretender of the land, whose mentality savored of "Teufeldsrockh's Spirit of Clothes," rose up against him, and no matter what pretentions to learning and greatness were made by his critics, instead of allowing reason to possess them, and of being guided by justness and generosity, they permitted their minds to remain absolutely blank, to be filled by the prescribed thought of the day. Have we, during the long intervening years, improved in these matters? Have we? Is not almost every high school, college or university of the land a *prescribing machine*, with spoon and apothecary balance in hand to dish up and weigh out the stuff that must be called science, and size the doses to be taken? To illustrate: despite the fact that eight or ten years ago Dr. Hall gave the world the most striking and convincing proof that Prof. Tyndall's book-tinhorn light experiment—was the *thinnest thing that ever went through a horn*, there are thousands of text books extant to day containing printed pictures showing the long tin horn, with the blaze of the tallow candle at the little end, and the man clapping the books at the big end to allow the sound to put out the light. The whole thing reminds me of the nursery tale describing the "House that Jack built," and we might well say that, This is the dose that Jack gave; this is the book that contains the dose that Jack gave; this the house that printed the book that contains the dose that Jack gave; and this is the school that teaches by rule that a man is a fool who questions the book that prescribes the dose that Jack gave, etc., etc.

It is but a few weeks since I spent a very pleasant half-day visiting the schools of a good sized town in California. The head teacher is a man of good standing, a graduate of Depau

University, and has impressed the people among whom he labors as being highly educated and cultured. A class in elements of philosophy were reciting—the subject was *Sound*. The text-book used contained a cut illustrating the tin-horn experiment as made by Prof. Tyndall. I offered Dr. Hall's criticism. I showed the school and the Professor plainly that nothing but *wind* or a "puff of air" could put out the light. The Professor admitted that it all looked reasonable enough, "but," said he, "*I cannot possibly accept the criticism because my teacher of Natural Sciences was a man of great ability, and he never questioned the truthfulness of these experiments as given in this very book.*"

This is progress with a vengeance, and gives room for some coming Carlyle to write a withering satire on modern greatness *de esprit horne*. But my experience with this machine-filled Professor, who is so well stuffed with the weighed-out and measured-out doses of accepted science as to leave no room in his little cranium for a ghost of thought independent, is entirely in keeping with that of many similar experiences. It is but a short time since I approached one of the leading ministers of the Gospel in a large city and offered him a copy of the *Problem of Human Life*. "Thanks," he said, "but I have no time to read it." "Ah, but you must take time," I replied, "for this is one of the most revolutionary works ever written, and furnishes the Christian Scientist such a basis for solid argument that no materialist, no atheist, can stand before it."

"I don't know that," replied the minister.

"Take the book and read it, and be convinced."

"No," he replied; "*I have seen no favorable notice of it in my church paper, or in any other good literary journal, and until I do I shall not read it.*" This man is a graduate of a college and of a theological seminary, occupies a pulpit that pays him two thousand dollars a year, and is well-beloved by his flock as a creditable leader.

My endeavors to spread Substantialism have met with the same kind of rebuffs, in numerous instances, from school and college professors and from ministers of the Gospel. In the language of Bro. Jasper, I declare that the "world, as well as the sun, do move," and that all good orthodox scientists, as well as nature, "hate a vacuum."

MAGNETISM AND SUBSTANTIALISM.

NUMBER I.

BY J. W. LOWBER, S'C. D., PH. D.

THERE is an old story that a shepherd once laid down his crook by a stone, and when he lifted it up it stuck fast to the rock. This is doubtless a legend, but it is quite certain that the Greeks and most of the ancient nations knew that the loadstone attracted iron. A piece of loadstone is called a magnet, from the Greek word *magnes*, because it is supposed first to have been found at Magnesia in Asia Minor. A piece of iron rubbed on a loadstone becomes itself a magnet, and it will attract other pieces of iron. A peculiarity in a piece of magnetized iron led Gioja to his inventing the mariner's compass. He learned that a magnet when suspended by a string would always turn so that one end would point to the north and the other to the south. He, then, tried the following experiment, which proved a complete success: he placed a magnetized needle upon a round card marked north, south, east, west; he fastened the card to a piece of cork and floated it in a basin of water. Whichever way he turned the basin the needle turned the card, and pointed north and south. Thus was invented the mariner's compass.

There has been much dispute as to who first invented the compass, for it was certainly known to the Chinese in very early times. It is generally agreed, however, that Gioja invented it independently, and he was the first to make practical use of it in a ship. It was a great invention, and did much to advance modern civilization. In early times, sailors were guided entirely by the stars, and as these lights could not always be seen, they had to keep near the shore. The compass has entirely obviated this difficulty, and now they can sail the roughest sea, and when in a storm it is better to be far away from land than near it. The briny deep is now literally covered with ships, and the commerce of the nations is carried to the most distant parts of the earth. Christian civilization has reached nations that were for centuries entirely isolated. God has thus providentally prepared the way for the evangelization of the world.

The loadstone is a brown mass, and in general appearance does not differ much from the rude masses around it; but when tested, it has power to draw particles of iron toward it. A magnet, whether artificial or the original stone, when placed upon a pane of glass and iron filings thrown around it, draws these filings in regular and beautiful curves. They are especially drawn to each end of the magnet, for magnetic force is not equally distributed to all parts of the magnet, but is found concentrated chiefly at the ends. The law of the attraction and repulsion of magnets is that the unlike poles attract, and the like repel. The special cause of this, I presume, is known alone to the Infinite Mind.

A bar of steel can become magnetized by rubbing it with a loadstone, and in other ways. Magnetism does not appear to be transferred, but simply induced or developed by the loadstone. A loadstone can be used in making many magnets, and it does not lose any of its original force. We may break a magnet, and we will then have two magnets, each with its positive and negative poles. Whatever may be the nature of this wonderful force, it is almost universal in the kingdoms of nature. Prof. Hunt says that there is no substance in nature to be found independent of magnetic power. It, however, influences bodies in different ways, some it attracts, and others it repels. There are magnetic bodies, and dia-magnetic; while the magnetic arrange themselves along the line of magnetic force, the dia-magnetic place themselves at right angles to this line. Every substance in nature is thought to be in one or the other of these conditions. Its directive power is apparent in every particle of ore, and it formed the beautiful crystal. Magnetic phenomena are not limited to the inorganic world, but extend also to the organic. The leaf, the flower, the fruit of a tree, the flesh, bone and blood of the animal, and even gases and vapors, are affected by an all-pervading magnetism. The poet thus expresses it:

> That power which, like a potent spirit, guides
> The sea-wide wanderers over distant tides,
> Inspiring confidence where'er they roam
> By indicating still the pathway home;
> Through Nature, quickened by the solar beam,
> Invests each atom with a force supreme,
> Directs the caverned crystal in its birth,
> And frames the mightiest mountains of the earth;
> Each leaf and flower by its strong law restrains,
> And man, the monarch, binds in iron chains.

The nature of magnetism is not generally understood. Many regard it as a mode of molecular motion; but molecular motion is a fiction in science, and more difficult to understand than magnetism itself. There is a close relationship between magnetism and electricity, but magnetism differs from electricity from the fact that it produces no direct effect upon our senses. We only know its effects by the way it moves certain other bodies. It certainly would not be a misfortune to any scientist to study this mysterious force in the light of the Substantial Philosophy.

The Substantial Philosophy claims that all the real entities in Nature are either material or immaterial substances. Magnetism is certainly not a material substance; then it must be immaterial. I believe it is generally admitted that no material substance can pass through platinum or glass; yet these substances are no bar to magnetism. A magnet may be corked and sealed in one bottle; iron filings may be placed in the same way in another, yet the magnet will attract the iron. This experiment teaches us that magnetism has a very close relationship to the Spiritual. May it not yet be the means of solving the difficult problem of the relation of the spiritual to the material world?

PADUCAH, Ky.

THE TWO EXISTENCES.

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

PERHAPS the phrase heading this paper may strike the reader as too comprehensive and aggressive, as if a universe of existences were about to be reduced to two individuals. I suggest, however, that the limitation does not look to individuality so much as to character or class. Perhaps an exhaustive classification of all existences may be expressed thus: *Substantial Entities and Substantial Energies.*

Stand off and look at it. Think a little. Can you construct another class that will not come under one of these heads? Can you think of any one thing that exists which is neither a substantial entity nor a substantial energy?

But there may be need of clear definition in this classification. It may be objected that, according to Substantialism, the energies are also real entities, and consequently my classes are both substantial entities; which leaves us with but one class. Well, that looks plausible. But still for active work in the ongoings of this universe, I may be permitted to make the classification.

By substantial *entities* I mean those *objective* entities that are capable of being acted upon by the energies or forces, or phenomena producing potencies of nature.

By substantial *energies* I mean those *subjective* forces, or phenomena-producing agencies, that act upon or move the *objective* entities.

With the classification thus defined, I go out into nature for illustrations.

First. I go down to the basic structure, the mineral kingdom, and find visible and tangible entities, acted upon by invisible and intangible forces; and I recognize my two classes.

(a) The invisible and intangible force known as gravitation reaches out at long range and draws material substances together into masses, as planets, etc. If the particles are in the liquid form and free to move, the attraction of aggregation brings them into a spherical form, as the drops of melted lead falling down the shot tower or the spheres in the solar system. In all this I find a case illustrating the interaction of the two classes of substantial entities and substantial energies.

(b) I find an invisible force known as the attraction of cohesion, acting at shorter range, holding the particles of material bodies together in the solid form. Here a subjective force acts upon an objective entity to keep it in its place; and I recognize the substantial energy as a strong man, keeping guard over the substantial entity to prevent his house from falling to pieces.

(c) But while this strong man guards the house, we sometimes see "a stronger than he come upon him and overcome him, and take from him all his armor wherein he trusted and divide his spoils." And this stronger man is another of the substantial energies, antagonizing the attraction of cohesion, the proprietor and occupant of the house, and hitherto master of the situation.

(d) Let caloric, the heat force, be the new aggressive energy, the stronger man stepping in to bind the strong man, cohesion, and "divide the spoils," dissolving the now incoherent structure.

1. Try it on a piece of ice at a temperature below zero. Put the ice in any shape you please, and subject it to the action of the various substantial energies, mechanical force excepted.

(1). Let gravitation wrestle with it, and it falls from the precipice, it rolls down the mountain side, it slides down the ice-clad inclined plane; you may hurl it with a catapult high into the air, and though gravitation brings it back to terra firma, it fails to bind the "strong man," cohesion, who, through all this wrestling, maintains his supremacy. He may even call to his assistance the aid of water upon its surface to coax away the congealed particles, but at that temperature the strong man, cohesion, guards his castle, and captures all the aqueous particles that come in contact with the surface, and increases his goods. See icicles.

(2). Next apply magnetism, a potency that, in a close hand-to-hand fight, has been known to trip up the stability of gravitation, but in conflict with cohesion is utterly powerless.

(3). Then let the substantial energy, light, in a flood direct from the sun, try its effect upon the ice, and wrapped in a mantel of light and permeated in its transparency, it laughs at the powerless environment, and maintains its crystaline solidity; and cohesion maintains his supremacy.

(4). Apply the potency of sound; and the sound pulses, in deafening peals of ear splitting confusion, or the sonorous swelling of sweet anthems, may be hurled against the surface of the ice, and returned in reverberating echoes and still the ice remains as firm and unmoved as a deaf man at a musical concert; and cohesion remains master of the situation.

(5). Having seen these potencies become impotent in a conflict with cohesion, we may now return to caloric, and see how soon, as the "strongest man," it neutralizes the power of cohesion, and takes possession of his fortress, and scatters it in dissolving elements. Caloric commences with his heat armor of small calibre, and the temperature of twenty or thirty degrees below zero begins to warm up. He brings on heavier guns, steadily reinforcing his battery, till finally he plants his *thirty-two* pounders, and opens fire; and the strong man, cohesion, is no longer able to "hold the fort," and surrenders at discretion, and his accounts go into liquidation.

2. Put the metals into the crucible and witness the attack of caloric upon the regnant potency, cohesion, and we find that its hold upon some metals is much stronger than in others, or that the fusibility is quite different in different metals.

(1). Take mercury at a temperature of more than forty degrees below zero, and it is a solid; and you may melt it and run it into bullets, and shoot with it in the arctic regions, and cohesion rules the mass. But let caloric put on his summer clothes, and wrap the mass in a temperature lower than forty below zero, and cohesion surrenders, and you have a liquid mass of mercury.

(2). Place lead in the crucible, and the thirty-two pounder of caloric force that brought ice to terms, will be powerless. But caloric brings a heavier force and becomes master of the situation.

(3). Let iron, copper, silver, gold, and other metals be tried, and each can be reduced to a fluid mass, though at different degrees of heat. And thus caloric becomes the "stronger" man, or energy, that drives the regnant potency, cohesion, from the field.

(e). We may find another of the substantial energies in what is known as chemical attraction, which will act upon two substances different from each other, and combine them in chemical compound, and make a third substance, differing from each of the original ingredients. Then again these have their antidotes or counter potencies that will decompose and separate these compounds, and recompound them with others.

Second. I come up to a higher plane, and look into the vegetable kingdom, where we find entities acted upon by energies in a way peculiar to that kingdom. Thus far we have met with inorganic compounds; but now we shall find organic structures, expanding under the forces of vegetable life. The germ or vegetable protoplasm, a substantial energy, reaches down to the lower plane of the mineral kingdom, and draws materials up to the higher plane, and organizes them into forms of vegetable life.

Under the transforming power of this vital energy of vegetable life, carbon is compounded with oxygen, and hydrogen, and nitrogen, and other substances; and as if by magic, trees and shrubs, and plants, and leaves, and blossoms, and fruits, spring forth to please the eye, satisfy the taste, and minister to our necessities.

Thus substantial energies, acting upon substantial entities, select and combine the materials, mingle the tints and shades on the petals of the many colored flowers, combine the nutrition and stimulous in the culinary vegetable department, and control the compounding of the confectionery in the pomological department.

These again have their antagonisms or counter potencies.

(1.) Atmospheric agencies, such as frost and freezing, or dry, hot winds from the desert, may blast the opening flowers and forming fruit or extract the moisture from the maturing cereals, and render crops abortive.

(2). Aquatic agencies may overflow, choke down, suppress and kill the growing vegetables.

(3). Igneous agencies may cause rapid destruction in the decomposition of the organic structures we have seen coming together under the action of vital energies. The flames may sweep over the prairies, and visit with swift destruction the matured grass or the ripened grain. The fiery element sweeping over the forest may denude the trees of their foliage and decompose their trunks into their original elements, and set the carbon free to float in the atmosphere, in the form of carbonic acid gas.

Third. I take a step higher to the plane of the animal kingdom. Here again in all the manipulations of the animal economy, we meet with substantial energies, acting upon substantial entities.

Vital energy in the animal protoplasm reaches down to the plane below and draws up vegetable matter to the plane of animal life in the animal kingdom.

Matter cannot make the leap from the lower to a higher plane, as from the mineral to the vegetable, or vegetable to the animal. It requires power from above to reach down and draw it up in every such instance.

Vital energy controls the compounding of the various elements into the multitudinous forms in which animal life appears.

Here again there are opposing energies, antagonizing potencies, deorganizing agencies, standing ready to take away animal life.

Among these we might name or class Atmospheric, Aquatic, Igneous, and Medicinal, notwithstanding these are health sustaining sources.

(1). The atmosphere we inhale may be too hot or too cold, or charged with malaria, or with carbonic acid gas, or deoxygenized, and produce disease or death.

(2). The water may overflow the land, may drown us, or may produce too much humidity in the air we breathe.

(3). The fire may destroy the texture of our organic structure, and produce deorganization, dissolution and death.

(4). The virus of mineral, vegetable, or animal poison, may be introduced and permeate the system, and antagonizes the healthy functions of the physical organism, and end in dissolution.

Fourth. I take another step up, to the psychological and spiritual plane. The animal nature of man is included in our last. We now come to the higher nature of man, and find a substantial energy rising above any we have thus far noticed in the mineral, vegetable, or animal kingdom.

Man has a spirit within him, an intelligence that thinks and reasons. This conscious ego in man looks out upon the visible creation, takes cognizance of the entities and ongoings that make up the panorama of creation, reasoning upon the themes of animal and rational existence, and wrestling with the problem of existence or non-existence. The old question, "Am I, or am I not?" is sprung and cogitated, with the conclusion of the old Latin logicians: "Cogito, ergo sum." Yes, the premise, "I think," is founded on consciousness; he knows that he thinks. Then settled upon that firm base, he reaches out for another connection and reasons thus: Since I know that "I think," it is positively certain that I exist or that "I am;" hence I know that I am because I think. And his logical conclusion, in plain English, assumes the form: "I think; therefore I am."

Then this conscious ego in man, this thinking substantial energy, scrutinizes the works of creation in all its vast machinery, in mineral, vegetable and animal kingdoms, and in the solar and sideral systems. He sees adaptation in everything, and all the parts in the aggregate or minutia, evidently designed for the place and purpose it fills, pointing unmistakably to teleology, or evidence of design. Then if there is design in the works of creation, there must be a designer, for design necessarily implies a designer.

Then, applying his logic of "Cogito, ergo sum," he concludes that if thinking implies a thinker, then design in creation implies a designer; and design in creation implies a designing or intelligent creator. The conclusion is inevitable: It was created; therefore there is a creator.

Now the reasoning substantial energy, the intelligent existence, man, has reasoned himself right up to the penetralia of the antecedent intelligent existence, the Creator, who being without an antecedent, must be "the first cause," and therefore the "I AM," the self-existent energy, clothed with light, and panoplied with other immaterial substantial potencies.

Let us then reverently pull off the shoes from our feet, and draw near to the pavilion of dark clouds that obscure from mortal eyes the glory of the self-existent one, and from out his luminous manifestation accept the decision of the great intelligence himself as it issues in audible voice from out the visible shekina of his presence: "I AM THAT I AM." And having introduced Himself, he delivers His commission to Moses, and says: "Thus shalt thou say unto the children of Israel: I AM hath sent me unto you."

And tongues of flame leaping from the luminous environment of the unconsumed bush bear testimony to the presence of the I AM.

The shepherd's rod, a substantial entity, cast upon the ground, and wriggling under the influence of an unseen substantial energy, chasing its former owner, adds its mute testimony to the presence of a higher controlling energy.

At the command of the I AM, the chase is reversed, and the fleeing serpent, caught by the tail, yields its improvised energy, and becomes a passive entity in the hands of its captor, thus intensifying in his hands the evidence to be carried into Egypt to convince those far away, whose eyes had not seen the strange phenomenon, of the unconsuming flame, nor ears heard the voice of the I AM from out the glowing foliage of the burning, yet unconsumed bush.

The virus of that fearful incurable leprosy, suddenly improvised by some unseen potency, taking possession of the hand that so recently took the serpent by the tail, strikes terror to the heart of him who had thrust that hand into his bosom and withdrawn it, by the direction of the I AM, gives additional evidence of the imminence of his all-pervading presence.

That hand again thrust into the bosom and withdrawn by divine instruction, is held forth perfectly freed from the malady, and capable of recording with the pen an additional evidence of the superior intelligent power.

As the evidence becomes accumulative, with which this messenger is to convince the captive Israelites, of his divine message, another sign is added, in which a divinely bestowed energy enters the serene possessions of the potencies of Chemical Affinity, and disturbs the equilibrium, in which oxygen and hydrogen are dwelling together in the sacred river Nile, and to the consternation and disgust of the beholders offers them blood to drink instead of water, while the dry land, all thirsting for water, is served with blood.

With this accumulated evidence already at command, while a fearful supply is held in reserve for the Egyptians, the captive people were visited by the Lord's messengers, and their faith and confidence confirmed. "And the people believed; and when they heard that the Lord had visited the children of Israel, and that he had looked upon their affliction, then they bowed their heads and worshipped." Ex. 4-31.

Evidence of the superior intelligence overruling the action of subjective energies upon objective entities accumulates all along the strange meanderings of that forty years' journey that led captive Israel from bondage in Egypt, through submarine tunnel and parched desert, with gilt-lined cloud as guide and shade, and improvised material from the at-

mosphere furnishing them "day by day their daily bread," and finally through an improvised national passage across the swollen Jordan, whose bed was laid bare, as the reverent waters, stood at a respectful distance, with suspended gravitation, triumphantly into freedom in the land of Canaan.

SANTA ANNA, CAL.

THE NAME ABOVE EVERY OTHER NAME.

BY C. H. BALSBAUGH, M. D.

THE Christ has many names, even hundreds, and all vitally significant. All are given for objective reasons except one. He has an intrinsically essential Name, old and deep and manifold as His Being—"I AM." Because He is what He is, He can be all that his *many* Names import. I AM is his great *first* Name, that reaches *forward* over all the others. JESUS is His great *last* Name, which reaches *back* over all that went before. He is Alpha and Omega.

Jesus is a Name Divinely given, prophetic, pertinent. Parents sometimes give great names to their children, utterly unworthy of them. Some are even named after God Himself, while the whole life belongs to the Devil. Every name that includes EL is significant of some hope or purpose or fact that links with Deity. Jesus is great and good and Divine enough to LIVE the full-meaning of His Name. Had His character and life fallen short of His Name, His preaching would have been delusion and His death a sham. No Easter, no Pentecost, unless the Name and the Person are synonymous.

As Jesus was in the world prior to His Incarnation, inaugurating and directing all dispensations, so His Name is also found, prophetic of His Personal Advent. The son of Nun, the successor of Moses, was originally called Hoshea—*saving*. But Moses, being full of the wisdom of the Divine Mind, called Him *Jehoshua—Jehovah, my salvation*. This full Gospel Name was afterward contracted into Joshua, and at last into Jesus—Num. 13 : 6, Heb. 4 : 8.

We will know the grandeur and glory and ecstasy and power of this Name just in proportion as its meaning becomes our personal experience. Sin is a short monosyllable, but has in it all the pollution and murder and falsehood and hatefulness and guilt of the Devil, and the very essence of Hell. Body, soul, and spirit are steeped and soaked in the lava of corruption and damnation. Sin means *missing the mark*; and what the mark is, and how wide the missing, we learn in Philpp. 3 14, 1 John 1 : 5, 7, and 2 : 6. It was no small matter which Christ undertook when He assumed our nature and liabilities. The history of the world proves it. Unrighteousness and impurity and ungodliness and moral insensibility and misery have made this planet the very portico of Hell. It takes all the resources of Infinite Wisdom and Omnipotent Love to pluck these brands from the burning. All filthy imaginations and unhallowed self-exaltations, and all thinking must be cast down and put into perfect accord with the mind of Christ. See 2 Cor. 10 : 5, and 7 : 1, and Philpp. 2 : 5. This is a "great salvation," indeed, and "few there be that find it." Less than this is to miss "the high calling of God in Christ Jesus." It is I AM that makes Heaven, and He became flesh and, as MAN, was "holy, harmless, undefiled, separate from sinners."

Not only the spirit but the soul cries out for salvation. That mysterious pivot which lies between body and spirit, cutting off our sympathy and intercourse with God lusting after and partaking of the interdicted fruit, and descending into the service and enjoyment of the flesh, must have all its longings and clingings reversed. Instead of walking with God, like Enoch, the soul is prone to self-gratification, either in its own proper realm, or in the brute sphere. Jesus saves from all refined pride, from all low desires and fellowships, and puts the soul into sweet and permanent unity with the higher attributes, and thus with God. Now we have no more pleas of reason for the "lust of the flesh, the lust of the eyes, and the pride of life." The reason of God is now the reason of the soul: it is saved from sin, and Christ is enthroned. God manifest in the flesh sweeps the inner domain with the besom of Golgotha, and garnishes this mortal tabernacle with all the Holy Furniture of the Upper Sanctuary.

As a matter of course, the body follows in the upward movement. Its instincts and passions and appetites and propensities are now under Divine control. Eating and drinking now become sacramental, marriage is no longer the unbridled opportunity to gratify animal desires, but the very gate of the kingdom of God, consummating its high function in the interests of the Divine Incarnation. Dress will no longer mean ridiculous and death-courting fashion, but holiness to the Lord. "Here is Christ, there is Christ," "Lord, Lord," "Baal, hear us," "Vanity of vanity! all is vanity and vexation of spirit."

The Substantial Philosophy stops not short of Substantial Religion, and that means God in the flesh, *our* flesh, individually.

DIAMONDS—WHAT THEY ARE!

BY JAMES SCHONBERG.

EVERY newspaper in the land has had something to say regarding the recent sale in Paris of the Imperial jewels. The next greatest pleasure to possessing valuables of any description is in talking about them.

Eugenie never had half the anxiety about the crown jewels of France that many women have felt, for there has been a fever of excitement all over the civilized world regarding their final disposition.

What is a diamond?

A feminine chorus seems to rise, crying: "It is just too lovely for anything!" The fervor of admiration is to be admired, but can scarcely be regarded as a matter-of-fact answer to a common-place question.

A diamond was called by the Greeks *adamas*, the unconquerable. But the ancients had very strange notions about the geni; although they fully knew its intrinsic value, and freely paid homage to its beauty. Of its properties, is where they had strange ideas. Pliny said: "There is such a disagreement between the diamond and the loadstone that it will not suffer the iron to be attracted, or if the loadstone take hold of it *it will pull it away*." In other words, iron, even when magnetized, had no show against a diamond when attractiveness was in question. Diamond-powder was also said, by the old authorities, to be poisonous. Well, a diamond powder sandwich would be, to say the least of it, exceedingly gritty, if not positively deleterious, yet mice, in a spirit of gormandizing, have been known to eat it mixed with grease without being the worse for the repast. One old writer, Sir Thomas Browne, not deeming a diamond hard enough, suggested that it might be steeped in goat's blood. That would not harden the gem, but it might adamantinize the blood of the goat. Some admirers of the diamond stoutly denied that it could be crushed, but we, who know, can easily do that in a steel mortar, and it is a well demonstrated fact that a fine steel-point inserted between the lamine will quickly separate most of them, altho' some small round gems refuse thus to be divided.

The alchemists consecrated it to all that was pure, but believed it to be indestructible.

Sir Isaac Newton very wisely concluded from its great density and high refractive power that it was combustible. A diamond can be rapidly consumed in an electric or an oxy-hydrogen flame. Cosmo III., Grand Duke of Tuscany, caused a diamond to be burned by means of the focus of the great lens—at least it is said so—but neither Tyndall nor Huxley attach much value to that story, yet the lens is still in the laboratory of the Grand Duke. The demonstration of Professor Tennant, who burned up one in a red-hot tube, is more of a fact, seeing that he employed melted nitre as the resolvent.

Yet, when a diamond has been thus burned it becomes simply *graphite*, precisely the same material, minus a little wax, which is used for lead pencils, the market price of which on a Fulton street wheelbarrow is about fifteen cents a dozen.

For all that has been done to reduce the diamond to a low estate, it is still a marvelous factor in many mundane matters. Kings have struggled for its possession, and Queens have intrigued to own it. Murders have been committed in order that it might change owners. Men and women, otherwise noble, have descended to the lowest and vilest practices to clutch it; human feelings and kindly sympathies have been ruthlessly sacrificed for its possession; misers have been made out of generous natures so that it might be added to useless hoards: in short, no cruelty and no crime has been regarded as too great by some of God's creatures when once the coveted treasure had to be secured. The annals of history teem with narratives, blood-stained and heart-sickening, having as their objective points the securing and holding of this alluring bauble. In our own times the criminal record shows a full list all for its sake, and, with some natures, the mere exhibition of its glittering presence will evoke the worst passions.

Bright, brilliant, sparkling, flashing and wondrous as it is—pure white, as it seems, its inner nature is of the hue of blood.

THE APPLICABILITY OF SUBSTANTIALISM.

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

REV. L. W. BATES, D. D., is regarded by the founder of the Substantial Philosophy as one of the first fully-fledged converts to that rich and revolutionary system of radical truth. He seems to be entirely convinced that it contains a God-given principle, and that it has a divinely ordained mission in the world. Thoroughly imbued with this conviction, he is not disposed to hide its light under the bed of cowardly compromise, or store it away in the popular bushel of false expediency. He places the brilliant taper upon the candlestick. He talks it right out in the public assembly, and sows its seeds in private conversation. His motto is that a good thing is good to talk about and tell to others. It seems to be one of the highest objects of his ambition to strengthen the brethren in the faith, and to bring the materialistic Gentiles to see and acknowledge the superior excellency of this great philosophy, which in other ages was not made known to the sons of men, as it is now revealed to those who are able to perceive the invisible entities of God's great universe.

Dr. Bates recently made a visit to Tiffin, Ohio. While there it was providentially arranged for him to fall into company with some of the faculty of Heidelberg College. Now, some of the professors of that institution are more noble than they of some other schools of learning. Like the Bereans, they welcome the truth with an openness of mind, and search the scriptures of Substantialism daily to ascertain for themselves as to "whether these things are so." They were, therefore, more anxious to see and hear Dr. Bates, of whom they had already heard through the *Microcosm and Arena* as one of the able champions of this rising system of philosophy. It was our privilege to follow Dr. Bates in his mission at Tiffin, and hear the echoings of the sentiments which he so consistently held, so boldly defended, and so logically applied. No apology is here offered for the freedom we take in quoting the substance of only one of his bold and truthful utterances. If he should differ from us as to the propriety of using this liberty, let him speak, for him we have offended.

If correctly represented, Dr. Bates, while at Tiffin, made a statement essentially as follows: "Should Substantialism, with its bold enunciation of a revolutionary truth, upon a final examination be found correct as to its basic principle and fundamental constituents, and, as a consequence, be generally acknowledged as such throughout the learned world, it will do more in furthering the proper acceptance and final triumph of Christianity, than the advent of any other movement upon our planet

since the day of Pentecost. Why not? Who will dare to question the truthfulness of the assertion? There is no man on earth who will dare to step into the arena of honorable controversy, and brandish his blade over anything so unqualifiedly correct." Neither is Dr. Bates alone in holding such a position. His utterance contains an expression of a truth which finds a hearty approval in the legitimate experience of every well-informed Christian man, and must ultimately be justified in the unprejudiced verdict of every intelligent and thoughtful student of our great philosophy.

We do not say that Christianity rests upon or is destined to triumph by anything on the outside of its own organic constitution; neither does its authentication to the world depend primarily upon some extrinsic testimony entirely outside of its proper periphery. Christianity involves, of necessity, the fundamental principle that lies at the bottom of this newly announced system. No system of truth depends upon the possibility of its being demonstrated. The truth of mathematics was before the invention of any of its methods. For example, "the product of the means equals the product of the extremes" was a truth old and venerable with an eternity of existence, before it was proven such by the use of figures. So everywhere, from the substratum of finite being to the pinnacle of Jehovah's throne, and even to the essence of His person, which no man can as yet approach unto.

For the present it ought to be sufficiently satisfactory to our most rational inquiry to know, as has been amply shown by the most stalwart philosophical reasonings of the age, that there is not only a continuity of law, but also and rather a regular and continuous gradation of different forms of one primordial substance, constantly making themselves apparent to us through our several and respective organs of perception, according to such laws of continuity. Christianity, therefore, if it be anything more than a glittering delusion or sweetened poetry, is an order or form of force in the world—the highest form of finite force of which man can have any cognizance by either sensation, rational induction, or spiritual experience. If Christianity as now concretely present in the world is such an order of force or power of God, it is also of internal necessity a form of entitative substance. As a substance of a higher grade in the same ascending scale of all being, it is not governed by some radically new law out of continuity with that golden thread upon which are strung, with a unity of the Divine purpose, all atoms, orders, worlds, and systems in the *one* comprehensive universe of all being.

It is, therefore, simply silly to admit the soundness of Substantialism, and then seek to confine its basic principal to the limited domain of physics. Prof. Drummond is right and unanswerable in that portion of his masterly book, in which he claims that there is natural law in the spiritual world; but he was either too blind to see, or too much under the reign of Scotch scholasticism in science, to contend for the natural forces constitutionally present in the same spiritual world, permeating and manipulating the other elements thereof in accordance with the wise designs and intelligent workings of Him who is able to subordinate all things to his own glory, in the eternal happiness of all who are rational co-workers with him in the solution of this central and ultimate problem of the universe. Under this view it can appear as only shortsightedness for any one to insinuate that Substantialism is running into transcendental airiness, when the foregoing claim is made in behalf of the applicability of its fundamental principle to the Christian religion. No, gentlemen, you need not attempt to apply the brakes of false conservatism to the theological turn given to the Substantial Philosophy in some of the most vigorous reasoning and excellent literature which that system has yet produced. You need not receive the theology if you are not of that religious bent of mind, but you must either accept of the conclusions reached by such application of your own avowed principles, or throw your boasted premises to the dogs.

The case may be briefly stated in something like the following formula or agreement: Science and the Scriptures of Revealed truth, while they are distinct modes of God's utterances to man, are nevertheless inseparable and complemental in serving the one grand, central, and ultimate purpose of the universe—the glory of the Creator in the highest attainable perfection and happiness of the rational creation. If these two distinct forms of Divine Self-utterance mutually harmonize in their respective teachings, these teachings, when bearing upon the same point, or moving in the same line of evidence, must be mutually corroboratory of each other. We name a single representative case, and call the witnesses. It is proposed to prove in open court of general assizes: 1. That there are some entities invisible and immaterial in veritable being. 2. That they are less phenomenal and more enduring than the things which are seen. Christianity, or Revelation, which culminates therein, teaches most positively that only the things which are unseen are eternal, and that the only rational endurance in well-being is by seeing the invisible. From the equally truthful lips of the other witness comes in the corroboratory testimony of science? Matter is real, but still it is only matter. The deductions of logical reasoning have shown conclusively during the last decade of years that there *must* be—that there IS, another order or form of being which is not matter, but equally substantial—that in this immaterial substance are hidden, by the ordination of a personal God, all the treasures of Nature's dynamic storehouse. Thus, Nature and the Bible teach the same thing when the lines of their concurrent testimony are focussed upon the same point. This was the standpoint and starting point of the revolutionary movement known and soon to be universally made known, as the Substantial Philosophy. The first point proposed to be gained is to clear up and settle the point so long in dispute between the advocates of unscientific Christianity and the champions of un-Christian Science. That point was satisfactorily settled for the unprejudiced readers thereof upon the appearance of the "Problem of Human Life." The discoveries it announced were opportune and important for the world. The combat of sham battles had deepened until the day was well nigh spent. The sun of Joshua was about to go down behind the world's most sombrous cloud of learned hopelessness, with the materialistic Amorites in boasted possession of the field, and the Israel of Almighty God cooped up in the moonshine of Ajelon. At that point in the distressing hour of suspense, the fullness of time was here for the advent of great deliverance. Substantialism arose upon Gibeon with hope and healing in its wings. It proclaimed the entitative existence of things immaterial; It swept the antiquated cobwebs of delusive sophistry from the dingy walls of classic nonsense; It ordained a halt in the circular treadmill of bookful blockheadism; It arrested the attention of manly independence, and directed the earnest inquiries of vigorous intellects to the manifold forces and facts of Nature as they continually epiphanize themselves in the different departments of God's great handiwork; It pointed its eager yet cautious disciples to the marvelous agreement between the teachings of the New Philosophy and the teachings of the New Testament, until scientific men and Christian scholars began to open each other's eyes, and link arms in a new hope of endurance unto the glorious realization of the heart's most sacred and legitimate yearnings.

No wonder that Dr. Bates grew enthusiastic in his eloquent talks at Tiffin. No wonder that his recent utterances caused the classic halls of Heidelberg to echo with the majestic tread of a newly-discovered truth. Substantialism is not Christianity, but correlative thereto. They must be seen in this reciprocal relation by him who aspires to be both a true philosopher and an intelligent Christian. God had put them together in the organic constitution and essential relation of things. Let no separatory Bartimeus put them asunder. The truth half told is a lie. To teach the presence of invisible entities in the religion of the Bible, and deny their existence in the constitution of Nature, is to play into the hands of the infidel, and furnish weapons of destructive warfare for the cruel hand of the atheist. To beat back these Vandal hordes of falsehood by holding things in their proper relation to each other, is a part of the future mission of the Substantial Philosophy. Let its friends take their proper places in this line of battle. Let the invincible phalanx move forward to victory. Let the standard of this revolutionary truth be raised in every valley of the earth, and its flaming beacon blaze out on every hill-top of our error-bedarkened planet.

FREMONT, OHIO.

THE CONDITION OF THE UNIVERSE

CAN ONLY BE REASONABLY ACCOUNTED FOR BY A BELIEF IN THE EXISTENCE OF A SUPERVISING INTELLIGENT POWER.

BY JOHN C. DUVAL.

IN reading the works of Darwin, Spencer, Huxley, Tyndall and other materialists, notwithstanding the plausibility and ingeniousness of their theories, the impression is invariably left upon my mind that there is something *radically* defective about them. They will pile Pelion on Ossa in the way of argument in a circuitous manner, to prove the truth of their theories, when their falsity is made evident by a *natural* and direct method of reasoning upon the question.

For instance, they attempt to prove that light is merely a mode of motion of material molecules, transmissible by means of some kind of an elastic ether. Now I ask any one if Dr. Hall's theory, that light is an *immaterial substance* itself, requiring the intervention of no medium for its action, but radiating by a fixed law of conduction like electricity, is not much more simple and satisfactory? Certainly it is much easier to believe that light is an immaterial substance than it is to believe that it is *nothing*, or the mere *effect* of the molecular movements of atoms, acting through some elastic ether, of the existence of which there is no proof whatever, unless the *necessity* for the existence of this elastic ether to prove the molecular theory of light may be so considered. Why seek for a complicated and indirect way of accounting for phenomena when a simple and direct one is much more reasonable?

Materialists assert that matter is "all potent" of itself, and does not require the aid of controlling intelligence to bring about the present orderly and apparently *designed* arrangement of the universe; but they signally fail to give any reason for the faith that is in them; on the contrary they are compelled to admit that all matter, in its normal condition, is totally devoid of anything like intelligence—that intelligence does not exist in oxygen, hydrogen, carbon, earths, salts, &c.—nor in any of their material combinations, unassociated with vitality. Then from whence or from what source did it derive this intelligence? To this question they always give their stereotyped reply, that it was so eternally, and, of course, it must be so now," which does not by any means lessen the difficulty we find in understanding how it is that matter, without intelligence, should act intelligently not in *one instance*, but in *everything* we investigate. To this they reply that design is only *apparent*, and does not in reality exist—that water, for instance, the most essential of all things to life, *happened* to be abundant—*happened* to be so constituted as to be readily converted into vapor lighter than the atmosphere by which it is carried to all parts of the globe, and then fortunately *happening* to be easily reconverted into water by certain changes taking place at times in that atmosphere, it became subject again to the force of gravity and fell to the earth in refreshing showers. To "a man up a tree," it certainly looks as if there was a design in all this to a specific end, to-wit, the watering of the earth. And if this design be but *apparent*, as these materialists claim, it is just as difficult for me to believe that matter acts *systematicly* in all cases with *apparent design*

as it is to believe that it acts designedly. According to the doctrine of chances, apparent design should fail to be apparent in fifty cases out of a hundred, and yet it appears in all the phenomena we investigate.

Take the germination and growth of an oak, for instance. The acorn falls upon the ground, and by a series of causes, all co-operating towards a specific end, a miniature oak shoots up (not a pine, a hickory, or a cypress,) and during the centuries it expands and grows continuously until at length it becomes the monarch of the forest. Is there no intelligence manifested in this process? Assuredly there is—much more than is shown by the completed steam engine. There must be an intelligence *somewhere* that supervises and controls the germination and growth of the oak, and as we know it cannot exist in the insensate atoms of the acorn, which have no more *will or power* to grow up an oak than they have to become a horse-chestnut or a poplar, or in fact to germinate at all, we must, perforce, seek elsewhere for this controlling intelligence. The material, senseless atoms of the acorn simply obey the laws of vitality or the life-force connected with them, and as these laws compel them to act intelligently to a determinate end, they must of course proceed from some intelligent lawmaker.

But these materialists tell us there is no such thing as law in the realm of nature,—that what we call law is merely a result which our experience and observation teaches us always follows a certain cause. We know, they say, that a stone when thrown up will invariably return to the earth, not because of any law compelling it to do so, but simply because it has done so *always*, and *therefore* it must continue to act in that way forever. Well, as far as I can see, the term "law" when thus applied to gravity will do as well as any other to express the fact that a stone when thrown up is always and invariably dragged back to the earth by *something*, or some force applied to it, exterior and apart from the inanimate atoms of the stone itself, which have no tendency of themselves to move at all, and never would move unless force of some kind be applied to them. I have no turn for hair splitting, and it seems to me the term "law" in this case is as good as any we can use.

It is a well known chemical fact that if two substances combined are brought into contact with another substance, for which one of them has a greater "affinity" than it has for the one with which it is combined, it will dissolve its old co-partnership and enter into a new combination with the third substance. But the term "affinity" is a very indefinite one and explains nothing. Either the atoms of these substances in their action obey the fiat of some power controlling them, or operate in accordance with some law established by such power, or else, as materialists assert, they act thus systematically and invariably by some quality inherent in themselves and matter generally. Now I contend that it is much easier and far more reasonable to suppose that they are *governed* in their action by some intelligent power, than it is to suppose that the dead, senseless atoms of these substances actually have their dislikes and preferences like sentient beings, which must be the case if they act thus of themselves without the direction of any law.

When we look around upon the world we inhabit, and perceive innumerable cause producing innumerable effects, all co-operating and tending toward the formation of an orderly, harmonious and systematic whole, as completely and perfectly as if they had been *designed* to do so by some intelligent power, have we not good reason to believe in the existence of such a power—the more especially as there is nothing in dead matter whatever that would lead us to suppose it to be capable under any circumstances of developing vitality or intelligence? Surely the tax on my credulity is not as great in the one case as the other.

There are two facts that in my opinion are alone sufficient to overturn any theory that attempts to account for the condition of the universe without recognizing the existence of intelligent controlling power outside of material atoms—the mode in which water is distributed over the earth, and the adaptability of all animals to their peculiar surroundings and manner of life. The status of the universe *can not* be rationally and satisfactorily explained by any theory not even excepting that dogma of materialists, "the all potency of matter," that denies the existence of such a supreme intelligence. Only those who believe in the existence of an intelligent power—a God who said "let there be light and there was light"—will ever be able to solve the problem of the universe.

EL PASO, TEXAS.

THE TRUE PHILOSOPHY OF LABOR.

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

THE very able letter of Bishop Nulty to the clergy and laity of his diocese can with propriety be addressed to the inhabitants of the whole civilized world; for the basic principles he announces are universal in their application; they are founded upon the physical, social and moral constitution of man and his relations to the external world. But there are one or two assertions he makes which are certainly erroneous; and while these assertions do not militate against the principles he advocates, yet the inculcations of such ideas have ever had a deleterious influence upon individual and social life.

One assertion to which we refer is this: "The effort or exertion demanded by labor is irksome, distasteful and repulsive to that indolence and self-indulgence which is natural to us."

We deny totally that indolence is the natural proclivity of the human race, or that physical exertion—labor—is repulsive to the natural instincts.

The principle that man is innately averse to labor—to the exercise of those powers through which his natural wants must be supplied—is contrary to all that we know of the workings of God's processes and laws. The earth with all its resources can only be made to subserve the requirements of man for his full development through the agency of physical and mental effort. Man is, through his corporeal and mental energies, constitutionally related to the earth, and being thus related, the exercise of these energies is a fixed and determinate condition of his growth, and consequently of his happiness.

The natural or normal exercise of every faculty of mind and function of body is essentially one of pleasure, and this pleasure is the legitimate concomitant of the God-ordained law of labor—the incentive to action Exercise is the law inherent in man's organization; it is the absolute condition of health and vigor—of development, and without development there can be no genuine satisfaction or happiness. Through labor has the human race been lifted from a condition of infantile helplessness to that of intelligent power, second only to the Omnific energy of God. It is labor alone which dignifies and exalts—which evolves that sheet-anchor of the soul—*self-respect*. An individual who lives without labor is a parasite—a pauper, and in view of the God-implanted law of his being, a criminal at the bar of justice. No individual has a moral right to subsist upon the fruits of other people's labor, and live in indolence. Every human being is under moral tribute to exert his physical and mental powers for his own sustenance and growth, and to contribute his quota of labor for the onward progress of the race.

The decree that "man shall earn his bread by the sweat of his brow," applies to the whole human family; it was not a curse inflicted, but simply the enunciation of a design which the very organization of man's physical and mental economy demanded; it was but the expression of the relation which existed between man's constitution and that of the external world, and therefore every individual member of the human family is indissolubly bound to obey this law or suffer the penalty; for no individual can violate or ignore any law of his being without suffering a corresponding injury. If then, man's organization is such that a certain amount of physical exertion is absolutely essential for his highest health and vigor, then the fiat to earn his "bread by the sweat of his brow" was one of pure beneficence. We recognize all God's decrees as just and wise; and therefore of necessity they must be beneficent; for it is impossible to conceive of Creative wisdom inseparable from benevolence.

The normal exercise of every faculty of mind and function of body is always accompanied by a feeling of satisfaction and enjoyment; and this enjoyment is the divinely-instituted reward of labor; in fact, it is an essential element of this law. And the more vigorous—within normal limits—is this labor, the greater the enjoyment. An individual who finds no enjoyment in healthful, vigorous exercise of body, is in abnormal conditions; and no amount of wealth, no social position, no influence or power, can purchase that pure and dignified satisfaction which comes as the result of physical exercise.

Mental effort alone cannot secure the mind's fullest fruition; for mental vigor and power of enjoyment depend upon vigor and health of body. This is the requisite for the highest mental activity, and this condition of body can only be secured through a well-regulated amount and kind of physical exercise. A repugnance to labor is either born of a weak and diseased body or else is the result of the false education of society. If legislative law and the law of social life secured to each and every individual the freedom to exercise his God-given rights if one class of society did not usurp privileges and monopolize those gifts of nature which are the common inheritance of all, then all needful labor would be but as a pleasant recreation to man. In all ages of civilization the major part of the human family have been compelled to perform excessive physical labor—to exercise beyond the point of pleasure and benefit—to expend so much vital force that outraged nature has uttered her protest through the sense of weariness and pain, and thus educated the mind to feel a dislike, a repugnance, to physical exertion, and to regard labor as a drudgery or necessary evil. But it is only the abuse of labor, not its normal use, that brings degrading conditions. When mankind has become sufficiently enlightened in the laws of physiology and psychology—when it acquires enough dignity and greatness of soul to break the shackles of an ignorant and degrading social theory and custom, and practically recognize the beneficent design of physical exertion, then labor will be exalted to its true position and invested with that honor which nature intended—then will the race begin to lay a foundation for physical, mental, moral and social progress which will have the condition of permanency.

It would be the severest reflection upon creative wisdom and beneficence to suppose that the exercise of powers which are absolutely indispensable in securing the material for man's necessities, is antagonistic to his native instincts. Given a race of beings with physical and mental wants, it follows as an absolute necessity of justice, that this labor must accord with natural instinct and happiness.

Recognizing these basic laws of health and life and growth, we must conclude that when the relations of life, imposed by social and political conditions, are such that any class of human beings are compelled to labor beyond the instinctive desires of nature, that those conditions are unjust, tyrannical, and distinctly opposed to Creative design. But the injustice, the injury, does not fall wholly upon those condemned to excessive physical labor. Injustice is always retroactive. That class of people who, through these unjust regulations, can live without the necessity of physical exertion, suffer the penalty in lack of physical tone and functional vigor of the vital organs, and very often are afflicted with diseased conditions. Health and vigor of body absolutely demand exercise of the voluntary powers, and no artificial creations of society can cause nature to deviate in the least from her decrees. Nature is no respecter of persons; her demands are impartial and inexorable. She marches with a majestic and imperial tread and scorn-

fully sweeps aside all social distinctions and barriers; every integral factor of the human family must submit to her laws or suffer the penalty. The only way for the individual to secure her blessing is to place himself in harmony with her laws. Obey is the constitutional provision, and the reward is health, vigor, growth, happiness.

That the instinct for physical exertion is natural is shown in the unceasing activity of childhood and youth, and also in the fact that those whom wealth exempts from the necessity of labor, find an outlet for this instinct in the fashionable and polite exercise of travel, in climbing mountains, in boat-racing, in base ball games, tennis, croquet, dancing, etc.—exercises which frequently call out a much greater expenditure of vitality than that exhausted in the ordinary vocation of the common laborer.

The false and deeply-rooted sentiment of society which debases the human soul until it worships and fawns at the behest of wealth—which surrounds the possessor of wealth with a halo of reverence and superiority—like all false sentiment, has its basis in ignorance. But all the honor and glory thus thrown around the moneyed aristocrat who lives without labor cannot alter the fact that he is a pauper. The eternal principles of justice—the unalterable laws of nature—declare him such. Nature imperatively demands that every member of the human family shall, through physical and mental labor, earn his sustenance. God has given him the physical and mental capacity for this labor, with a corresponding instinct to perform it, and he has given the earth with all her inexhaustible treasures as a complemental force, and if man does not use these capacities and fulfill the creative intent, he becomes a moral outlaw—a pauper—living upon wealth created by the labor of others.

When man acquires that knowledge of his physical and mental organization which will impel him to fulfill these demands of nature—when he attains that moral greatness and nobility and grandeur of soul which scorns the position of pauper, then and not till then will earth's millenium be inaugurated.

NEWBURGH, N. Y.

SELECTIONS FROM "CREDO."

Messrs. Lee & Shephard, of Boston, did the world a service in publishing Prof. L. S. Townsend's "CREDO." We take pleasure in giving in these columns the following extracts from the section of the volume treating of the Bible as "A Supernatural Book:"

"The inspired Word will live forever. God has guarded the Scriptures in the past, and will guard them in the future, as the apple of His eye. They have suffered from no essential addition or diminution. They have been stereotyped by Providence." Page 18.

"In some respects the Old and New prophets were similar. They felt they were called to their work not by the authority of the church, not by the exigencies of the times, but by the voice of God and of Christ. They often shrank from entering upon their mission, and sometimes trembled and wept while uttering their prophecies." Page 19.

"The teachings of the prophets are not, and never can be, antiquated. Truths which have ever flowed down into all the crevices of thought and society, and which have crystallized into gems, into gold, into diamonds, prove a most exalted authorship." Page 21.

"In this one sentence from Volney, beginning with 'the temples are thrown down,' without the necessary addition or alteration of a single word, he has clearly, though unconsciously, shown the fulfillment of no less than six definite and distinct predictions. Though he entered Palestine without a pilgrim's spirit, have not his long sojourn in it. his careful researches and his published works, made him of more value to the church than would have been the journey thither of a thousand ordinary though sincere pilgrims?.....Like Gibbon in some of his statements, seemingly self-forgetful, he is borne on to conclusions utterly subversive of his own principles, reiterating, almost word for word, the prophecies with which he is not familiar, knowing of them only to hate them." Page 35.

"Sceptics are our allies.....As they weigh the natural sciences against revelation, accumulating evidence and piling up the results of their erudite researches into what they think and declare will be dark and formidable pyramids in the Christian world—have we not ample reason to believe that, as in the past, so in the future they will continue unwittingly to render the church effective aid." Page 36.

"The cursing or blessing of prophecy, whether immediate or remote, is subject, in every instance, to the voluntary choice of the individual or the nation. Men can occasion or prevent, hasten or retard, any given moral or spiritual event." ..... It is one thing to reveal an evil and quite another to sanction it. ... .The foreknowledge or the foretelling of a future event has nothing to do with its moral character." Pages 39, 42.

"The world is moving rapidly toward thrilling events. The Jews, as a body, are on the verge of acknowledging that Jesus was the Messiah." Page 68.

"Were the moisture in the forty miles of atmosphere above us condensed by the proper climatic changes, or were the electricity discharged from it to the earth, there would be an amount of water which, in connection with that in the fifty miles of the earth's crust beneath us, could easily produce, without a miracle of creation, the drift-flood or the flood of Noah." Page 107.

During the most violent portion of the storm of Sunday, July 4th, about 1 o'clock, P. M., something resembling a meteorite struck the sidewalk in Brooklyn, at Troy and Fulton Avenues. The substance is of a bright vivid green and porous. When first procured it was soft and plastic, taking the impress of the fingers. After remaining over a day it became brittle and friable. It resembles precisely in appearance the green deposit left on a battery. At first it was thought that the lightning had struck a copper wire or roof, had melted portions of it, and, oxidizing it, had carried it to a great distance. Analysis showed its probable meteoric source, as it gave with the reagents and the blowpipe unmistakable evidence of the presence of cobalt and nickel, which twin metals are always found in meteorites. There were no traces of copper, and faint indications of iron. From the quantity of the material it is thought that the ball when intact must have weighed twenty pounds. Portions have been sent to the Smithsonian Institution.—*N. Y. Times.*

In boring a well on the farm of Mrs. Sarah Williams, some five miles south of Colusa, J. C. Frazier struck a piece of wood at a depth of 170 feet. The wood brought up by the auger was in an excellent state of preservation and was pronounced "all oak." The place is only fifty feet above the sea-level, so that the wood is 120 feet below the ocean's surface. If it was sunk there when this valley was a lake or an arm of the bay it was in pretty deep water. How long since this piece of wood was in a growing tree? The valley, of course, has grown, but without some convulsion of nature the growth has been slow, not, perhaps, over one foot per century. Then has it been 17,000 years since this oak tree grew? In the shadow of the Infinite this is not long, but measured by the history of man it is indeed a long space. —*Colusa (Cal.) Sun.*

A coin is in itself a history. There was once a lost city which owes its place to a coin. For over a thousand years no one knew where Pandosia was. History told us that at Pandosia King Pyrrhus collected those forces with which he overran Italy, and that he established a mint there; but no one could put their finger on Pandosia. Eight years ago a coin came under the sharp eyes of a numismatist. There were the letters Pandosia inscribed on it: but, what was better, there was an emblem indicative of a well-known river, the Crathis. Then everything was revealed with the same certainty as if the piece of money had been an atlas, and Pandosia, the mythical city, was at once given its proper position in Bruttium. Now, a coin may be valuable for artistic merit, but when it elucidates a doubtful point in history or geography, its worth is very much enhanced. This silver coin, which did not weigh more than a shilling, because it cleared up the mystery of Pandosia, was worth to the British Museum £200, the price they paid for it.

Many who in early life have studied the Bible as a duty, when they would rather engage in other pursuits, have in later life derived far greater satisfaction from reading the Scriptures than from almost any other source. Young friend, never neglect your Bible because you do not enjoy reading it as you desire, but search the Scriptures dilligently, if it need be as a duty, and the time will come that you will long for the comfort and joy that nothing else can afford, like reading over and over the same promises and Scripture comforts that no other book or human agency can produce.

Of all the jubilee offerings which Her Majesty has been asked to accept none have been simpler than two new-laid eggs which a poor Irishwoman sent to the Queen by a Bishop. Hearing that the Bishop of the diocese was going to London in the jubilee week this Irish loyalist asked him if the Queen would accept two eggs for her breakfast from an Irish widow. The Bishop brought them across St. George's Channel and transmitted them to Windsor, with a description of the donor's poverty and loyalty, and they were accepted by the Queen, who is making inquiries as to what would be the most useful present she might send to her Irish subject in return.—*London World.*

IN Paso del Norte there is a cathedral 325 years old, built by Spanish Jesuits. It is not that the general plan is elaborate; on the contrary, it is one of beautiful appropriateness and simplicity. offering in this respect a lesson in the moderns. The walls are of adobe, plain and straight, and neither the walls nor the massive timbers are any the worse for their three centuries of wear. But the heavy woodwork everywhere is beautifully carved. In the cathedral are records of great historic value, reaching back hundreds of years. Some of the decorations and religious emblems are presents from the monarchs of Spain. The old church is well worth a visit from any tourist, particularly the student of art and history.

"I know how very nearly
I draw unto those realms;
I know that it is merely
A film which overwhelms
These eyes from rapturous seeing,
The ears from rapturous sound,
This self from God-like being,
This life from broken bound.
Melt O thou film-flake, faster:
Rend, thou thin gauze in two;
Eternal heaven, o'ermaster!
Break in effulgence through!
O, sacred day, o erflow thee!
Rush Sabbaths into one,
That earth and heaven may know
The eternal rest begun!"

REV. WM. M. BAKER, D.D.

Miss Alice B. Freeman will resign the Presidency of Wellesly College and become the wife of Prof. George Palmer, of Harvard University. The lady was disposed to keep the position, but Prof. Palmer would not consent to the organization of a domestic faculty of which the party of the second part was to be President. He held that so long as he was not President the family could get along without one, and he had his way.—*Troy Press.*

If thou dost more rely upon thine own reason than upon Jesus Christ, late, if ever shalt thou become illuminated.

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

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

PASTOR HENRY B. HUDSON, - - Associate Editor.

Whole Series, Vol. 7. New York, August, 1887. No. 3.

$1.00 a Year. Single Copies, 10 Cents.

For sale by American News Company and all leading newsdealers.

See Club Rates.

Subscribers should begin with the Volume, but may begin with No. 7. Give FULL NAME and POST OFFICE of each subscriber, and in ordering a change of address, the *old* should be given with the *new* address.

All communications intended for the pages of THE ARENA to be sent to the Editor.

RATES OF ADVERTISING:

15 cents per line. $2.00 per inch. Over One Column, 10 per cent. Discount.

Remit by express, money order, draft, P. O. order, registered letter, or postal note addressed to

D. K. ELMENDORF & CO., PUBLISHERS,
38 PARK ROW, N. Y.

AVERAGE CIRCULATION LAST VOLUME, 15,000 MONTHLY.

(For "PUBLISHER'S NOTES" see page 47, and first and second pages of cover.)

THE SCIENTIFIC ARENA will continue to be the official organ of the Substantial Philosophy. Dr. A. Wilford Hall, Ph.D., LL.D., will remain editor-in-chief. Rev. H. B. Hudson continues associate editor. They, with the publisher, will exercise every proper means to add to the already large list of distinguished writers who contribue to the columns of THE ARENA.

While thus assuring to our readers the original contributions of the best thinkers in the ranks of both clergy and laity, an effort will be made to provide subject matter for the home circle, and we hope to make THE ARENA a welcome vistitant to many more thousands of families, as "our family paper."

COMPRESSED AND RAREFIED AIR.

ITS RELATIONS TO HEAT AND COLD.

BY THE EDITOR.

The teachings of science, and especially mechanics, are very vague and indefinite on the subject of compressed and rarefied air and its relation to changes of temperature. Indeed, these teachings, when fully analyzed, are all wrong from beginning to end, as exemplified by every text-book on the subject, and as we have taken pains to show in our second answer to the queries of Robert Rogers' *Microcosm*, Vol. v., page 160.

The universal teaching of physicists, based on the received doctrine of the schools that heat is a "mode of motion" of ether-particles, is, that by the process of compressing the air and rendering it more dense, the mechanical energy thus expended is converted directly into heat; and therefore that the air thus compressed becomes hotter just in proportion to the energy employed by which to cause such increased density. A more manifest scientific fallacy does not exist, when the question is fairly considered in the light of reason and facts.

If the energy employed in compressing the air into less volume is converted directly into the heat observed in the air thus condensed, why is not this energy so converted where it first comes into play and before it reaches the air at all? This, we venture to assert, is a problem which neither Tyndall nor any other mode-of-motion theorist has ever dreamt of. Why, for example, when we press down the piston of an air-condensing cylinder, does not the *hand* itself rise in temperature just as much as does the air under compression? Surely the energy which first comes into action in the hand should there be first converted into heat before waiting to get to the confined air below the piston, if there is the least truth in this doctrine of "heat as a mode of motion," as taught in Prof. Tyndall's great work by that name—a standard text-book, by the way, in all the schools of the country?

The truth is, that elaborate work is substantially based on the fundamental error in physics, here for the first time pointed out, namely, that the heat observed in air under compression, and which increases in exact proportion as the quantity of air diminishes in bulk, *is due alone to the direct conversion of the mechanical force thus employed into heat!* Eliminate this basic error from that massive volume, with all the collateral errors which are legitimately connected with it, and there will be nothing left between its two lids worth printing.

The founder and elaborator of that mode-of-motion theory, whoever he was, never thought of the fact that the piston leading into the cylinder, and through which all the compressing energy from the hand has to travel before reaching the confined air, does not rise in temperature the slightest fraction of a degree Fahrenheit, even when the air is reduced a hundred fold in volume and thereby raised to a degree of heat corresponding precisely to this increased density of the air. Plainly, if there were the least truth in the theory of the direct conversion of the energy expended into heat, the piston-rod itself should become red hot by the sudden compression of air in a cylinder sufficiently to ignite amadou, as is frequently done by experimenters.

Physicists who teach this mode-of-motion doctrine seem to have blindly accepted it without exercising the most ordinary mental precaution against error, otherwise they would long ago have discovered the self-evident fallacy it involves. One would have supposed that a mind with the least grain of originality would naturally have guessed that the confined air of a given temperature, containing, as it does, a given quantity of heat, upon being suddenly reduced by compression to one-half its bulk, would also reduce the bulk of the contained heat in like proportion, and thus double its intensity, just as the density of the air itself is doubled. But no such common-sense shrewdness has been exercised. Suppose, for example, the air experimented upon to have been surcharged with aqueous vapor, and suppose these learned physicists on compressing it one-half its volume, had observed that this vapor also doubled in like manner in density, would they have been such mechanical dolts as to infer that this was the result of the conversion of the energy employed into *aqueous vapor?* No. Their intuition would no doubt have led them to infer that the vapor, which was already in the air, was increased in density simply by being reduced to a less volume, the same as the air itself. But it seems that no such logical method of reasoning came to their assistance when they observed the sudden increase of heat-intensity produced precisely in the same way—by reducing its volume!

Suppose that the mass of air to be compressed had been surcharged with *odor*, and that after compression Prof. Tyndall had observed that the odor had increased in intensity just in proportion as the air had been reduced in volume, would he have concluded that the mechanical force employed had been converted into odor? There would have been just as much sound science and good sense in so doing as to teach that the increased intensity of heat observed, by reducing the volume of the air containing it, results from that cause.

So far from grasping the simple, natural and beautiful explanation of the problem involved, as for the first time announced to the world in the fifth volume of the *Microcosm*, that learned philosopher had his pet "mode-of-motion" theory to carry out and defend, although that same theory, with all that it aids and abets in undulatory misapprehension, would at once, in the light of this true explanation, have been relegated to the rayless limbo of exploded fallacies the moment this true solution of the problem of increased heat in compressed air had been reached.

We do not pretend to intimate that Prof. Tyndall ever caught a glimpse of this solution, and that he purposely evaded it to bolster up his mode-of-motion theory of heat. On the contrary, we believe that he was honestly of the opinion that the heat observed in suddenly compressed air was really the result of the direct conversion of the mechanical energy employed in doing the work of compression, as he everywhere teaches in his "Heat as a Mode of Motion." We believe further that had he been the fortunate discoverer of this true solution of all the various heat problems he encountered in compressing and expanding air, as now based on the substantial nature of all the forces which Substantialism was first to proclaim, he would have thrown the manuscript of his book into the fire, and have seized upon the new discovery as the true passport to his triumphant and immediate immortality as a discoverer in science. And we are proud to feel assured that there is not a fair-minded scientist in this land, who has carefully read up the Substantial Philosophy, who does not believe in his heart that had Prof. Tyndall been the first to discover and announce this broad departure from the beaten path of science, it would have been hailed with acclaims of applause and joy all over the world, and that it would now be taught as settled science in every college and university in Christendom.

The solution we are here unfolding (namely, that the substantial heat observed in compressed air was already in the air before compression began, being only condensed the same as the air itself to a less volume) beautifully but incidentally shows the difference between *material* and *immaterial* substances, on which Substantialism is based. As air, or its contained aqueous vapor, is a material entity, it necessarily doubles its *density* when reduced to

one-half its original volume; but *heat*, being an immaterial entity, cannot increase in density or weight if concentrated or reduced in volume a thousandfold, since no density, inertia, or weight is predicable of any immaterial entity whatever. Thus, *intensity* bears the same relation to immaterial substances, that *density* bears to material substances such as our supposed aqueous vapor; and hence, an intense heat, as when a body becomes incandescent, is simply a greater quantity of substantial heat-force reduced enormously in volume or bulk.

The same is true of all other forms of substantial force, such as sound, light, gravity, magnetism, electricity, and even cohesion. If one sound is louder than another, it is not, as Prof. Tyndall says, because there is a greater motion of the air-particles of the room (though that may also take place as an incidental circumstance), but because there is present in the room substantial sound-force highly concentrated, and thereby increased in intensity in like proportion.

All these forms of force named, though they are immaterial substances, are exactly illustrated by odor as the most enormously attenuated material substance in existence, and lying, as it does, on the very border-land of immateriality. No one for a moment questions but that an intense *odor* is due entirely to the presence of a larger quantity of the odorous substance concentrated into diminished volume or smaller bulk, thus augmenting its intensity, and probably also its density (being material), could enough of it be concentrated into a pellet, and weighed with scales sufficiently delicate.

Even cohesive force, which holds the particles of all material bodies together, comes under the same universal law here laid down, namely, that intensity increases with the concentration of this immaterial substance into a smaller volume or bulk. Thus the diamond, which is the hardest of bodies, and platinum, which is the most infusible of metals, contain the substantial force of cohesion in greater concentration than do those bodies such as chalk and lead, which are so easily crushed and so readily melted.

How consistent, harmonious, and reasonable, then, that heat, as an immaterial entity, should concentrate in intensity (rise in temperature) in suddenly compressed air, on this general law that a larger quantity of the substantial heat-force is present in proportion to the space occupied, having been reduced to a smaller bulk or volume.

The grand mistake of physicists upon this phase of science has ever been in overlooking the simple fact that, when air is suddenly compressed, all the increased heat observed was in the air before compression took place, as much so as after, and that this rarefied or expanded condition of heat, not sensible to our observation before compression, is made sensible by the reduction of its volume, and thereby the augmentation of its intensity, just as the concentrated odor contained in the grain of *ottar* was all spread out in the bushels of rose-leaves before the process of their reduction and concentration in bulk by distillation took place.

This universal law, explaining the true cause of the observed heat in compressed air, as before intimated, was first announced and placed on record in the *Microcosm*, and we are gratified to know that Dr. Mott and other unprejudiced scientists regard it as one of the most fundamental, far-reaching, and important physical laws of modern discovery. That recent subscribers may see this law, we quote it here verbatim as follows:

"That the heat observed, when a mass of air is suddenly condensed, is not 'generated' at all by such act of condensation, as the present theory teaches, but that it was already in the air and to the same amount precisely before the condensing operation was commenced, its apparent 'generation' being only the concentration of this substantial heat to a smaller space, thereby intensifying it in the same ratio as the air containing it was reduced in volume."

By the converse of this law, air, at ordinary density and temperature in summer, say, 65° F., if suddenly expanded to double its bulk, would be reduced in temperature to the same extent precisely that it would be increased in temperature by a reduction of bulk one-half by compression, and for the very same reason, namely, that the heat already in the air before expansion is also expanded with the air itself, and being distributed over more space its intensity is diminished in like proportion. Could anything be plainer than this?

How a law of physics so self-evident on its face, and so easily illustrated in so many ways, could have been overlooked for centuries, when the very problems involved were under experimentation, and were being discussed and rediscussed in many elaborate volumes, is a mystery to which the office editor refers so flatteringly last month, and which is now a puzzle to thoughtful investigators.

Let us add at this point one other simple illustration for the benefit of young students of Substantialism who have not before had their minds called to this question. Suppose a closed cylinder a foot long in which a piston is fitted to work air-tight. Then suppose this piston adjusted in the middle of this cylinder, half a foot from either end, and the cylinder to be filled with air at normal atmospheric pressure and temperature. Now we move the piston toward one end, and what is the effect? Manifestly the air in that part of the cylinder is compressed and heat is observed, while in the other part of the cylinder the air is expanded and cold, or what is the same, less heat, is observed in like proportion. Move the piston toward the other end a corresponding distance, and behold! the heat and cold instantly change ends exactly in proportion to the compression and rarefaction of the air on either side of the piston.

Now the puzzle is if the mode-of-motion theory be true, and if the mechanical energy exerted by the piston's motion be really converted into heat as it moves to and fro in the cylinder, how does it always happen that the air on the compression side of the piston is *heated* while that on the expansion side of the piston is cooled, and that, too, *when the air thus rapidly alternating in heat and cold is all the time in actual contact with the piston by which this conversion of energy into heat is produced?*

The astonishment in this whole matter is, as just hinted, that such physical investigators as Tyndall, Helmboltz, Sir William Thomson, Lord Rayleigh, Prof. Stokes, of Cambridge, Prof. Tait, of Edinburgh, and Professors Rood, Mayer and Stevens, of our own proud America, should have blundered along all these years without catching a glimpse of the only rational explanation of the problem possible, as our new law so clearly sets forth, and as Substantialism so fully confirms and illustrates in so many different ways. Yet this prodigious bungle, constituting the very spinal cord of the theory of "Heat as a Mode of Motion," is but one out of a score of similar faults which honeycomb that authoritative text-book from lid to lid, all of which would have been avoided by its author had he caught sight of the basic principle of Substantialism, which teaches that heat, as well as other forms of physical force, is an *immaterial substance*, and therefore subject to the same law of increased intensity by concentration into smaller space to which air itself is subject.

We are asked to explain what would be the effect of a thousand atmospheres pumped into a cylinder strong enough to contain them? Would they not make the cylinder red hot? Yes, if done instantly or by a single sudden stroke of the pump. But such sudden compression of so many atmospheres would be impracticable. More likely it would take hours, with the best mechanical contrivance that could be devised, to fill even a small cylinder with such a concentration of air; and as radiation of heat commences instantly on the temperature of a body rising above that of surrounding objects, it is plain that the cylinder would cool off about as fast as the air could be pumped in, so that in a short time after it was filled, even with 2,000 atmospheres, or 30,000 pounds to the square inch, it would be of the temperature of the surrounding room. Again, we are asked to explain what would be the effect on the temperature of the cylinder and of the normal atmosphere of the room should this compressed air be suddenly discharged? This is an important question, and needs a careful answer in view of certain discussions now going on before the scientific public. In the first place, the effect on the cylinder would be the same precisely, so far as change of temperature is concerned, as if it contained but a single atmosphere, and that atmosphere should instantly be pumped out, leaving the cylinder a vacuum. The interior would be intensely cold, but would instantly began to rise in temperature by the radiation of the heat of the cylinder inwardly, and by the radiation of the surrounding outside air to restore to the cylinder the heat thus radiated into the vacuum.

On the other hand, the effect on the air of the room by the sudden expansion of that much air into 2,000 volumes, would depend entirely upon the size of the room, its freedom from outlets, and the cubic contents of the cylinder itself. Suppose the room to be perfectly tight, and to be 20 feet square by 10 feet high; it would contain 4,000 cubic feet of air. Then suppose the contents of the cylinder to be one-half of a cubic foot, the effect would be to add just 500 cubic feet of air, containing no appreciable heat, to the normal air of the room, thus leaving the temperature of the room precisely the same as before, but having an atmospheric pressure or density of one-eighth above normal. This is perfectly plain, because the addition of one-eighth to the air of a closed room would merely compress the air one-eighth, including its normal heat, which would instantly distribute itself by radiation, making no change whatever in the general temperature.

But should the room be open or full of outlets, the effect of this sudden addition of 500 cubic feet of air, deprived of its heat, would be to reduce the temperature of the room about one-eighth, as the air nearest the walls and containing the normal proportion of heat, would most probably first escape to the outside, leaving the volume of air the same, with its temperature, as before stated, lowered for the instant one-eighth, or until, from outside radiation, it should be restored to equilibrium.

We are also asked, in case of the discharge of small quantities of such highly-compressed air, would it not freeze the aqueous vapor of the normal air of the room into ice, close around the orifice of the cylinder where the air escaped? We answer no; because the jet of air so powerfully escaping, when near to the orifice, is about of the same density as before it left the cylinder, and consequently about of the same temperature. It does not change its temperature till it begins to expand, or until its contained heat is more widely distributed, and the greater the force behind it the farther will it shoot out from the cylinder before it will have time to expand appreciably. Hence, if the cylinder contained but three or four atmospheres, instead of 2,000, it might freeze ice around the orifice, since the expansion of the jet would occur that much closer to the cylinder. It therefore follows, paradoxical as it may seem, that the greater the condensation of the air in the cylinder, and the greater the amount of its expansion in the room when let out, the less will be its observable effects on the temperature near the outlet, because the farther will the jet be driven before it has time to expand appreciably. We thus see that many false notions prevail even among scientific men as regards the true relations of heat and cold to the compression and dilatation of the air; but we must live and learn.

UNCALLED-FOR MISAPPREHENSION.

BY THE EDITOR.

THERE is scarcely a week passes but we have convincing proof of the impropriety of attempting to criticise, and especially to condemn a given doctrine, theory, or system of belief without first becoming thoroughly acquainted with the matter to be controverted. A recent illustration of that kind of neglect on the part of a would-be critic was given to our readers in the April ARENA, vol. I, page 173, in the case of the unfortunate "Clarence," who so signally stultified himself in the *Disciple* by attempting to prove Substantialism to be "an old and long since exploded doctrine," when, in fact, as it turned out, he had not one correct idea as to what Substantialism taught. We have now before us another case almost precisely similar, in which one Richard Livsey, of Nebraska, attempts a labored series of criticisms of Substantialism with even more pitiable results, if possible, than those reached by "Clarence;" for while the latter was wrong in one point only (which embraced the entire nature of Substantialism) Mr. Livsey is equally at sea in a dozen separate details of the doctrine, showing that he has no more true knowledge of what the Substantial Philosophy teaches than had "Clarence." What makes the case worse for our Nebraska critic is, that he has been a subscriber for five years to the *Microcosm* and the ARENA as well as one of the earliest purchasers of the "Problem of Human Life." It seems that some men, who have been accustomed to thinking along a certain line of scientific teaching, become incapable of leaving those grooves of thought for new ones, however plain the principles involved, and however self-evident the demonstrations of their truth may be.

Mr. Livsey sets out with the cool information:

"I was discussing Substantialism on a plan of my own *ten years* before the birth of the *Problem of Human Life* or *Microcosm*, with the same object as that of Dr. Hall, and based on the same idea of substantial groundwork," &c.

Now it is a fact that we have had scores of men write us since the *Microcosm* was first issued, nearly seven years ago, claiming to have taught the Substantial Philosophy many years before the "Problem of Human Life" was published, but not one of them has been able to show a scrap of their claimed Philosophy of Substantialism in print of the date designated. When some of these claimants have been pressed by correspondence to write out succinctly the "plan" of Substantialism as they formerly taught it, behold! it has turned out as unlike the true philosophy as was the bastard Substantialism evolved from the brain of "Clarence." To see how near Mr. Livsey came to the real principles of the Substantial Philosophy in his early cogitations on the subject, let us look at a few specimens of his former teaching of that system "ten years before the birth of the *Problem of Human Life* or the *Microcosm*." Here are a few of his sentences quoted verbatim from his present letter describing that plan:

"There is nothing in Substantialism tying us down to the necessity of supposing we must give to each *phenomenon* of nature a separate *substance*. . . . . The fact is, space, including our atmosphere and gross bodies, are filled with the fine *substance* or *substances*, call it or them what we please, and when any blow is struck or concussion made, this fine *matter* is agitated *so as to be waved to the human ear*, and we call that *sound*. The action is purely *mechanical*, and needs no additional substance for *sound motion*. It is possible for sound to move air-waves 1120 feet per second, but it can't possibly go 1120 feet per second *without waves of some kind*."

Now this looks about as much like genuine Substantialism as a juniper-berry looks like a prickly-pear. The Nebraska critic simply makes all *substance matter*, and advocates the wave-motion theory of Tyndall as all there is of sound external to our sensations. And yet he taught this as "Substantialism on a *plan* of my [his] own ten years before the birth of the *Problem of Human Life* or the *Microcosm with the same object as that of Dr. Hall!*" What a "plan" that must have been upon which to teach Substantialism! Take another specimen, in which a little truth is mixed up with a much larger modicum of error:

"Let us examine the *fluid* we call *electricity*. In its unexcited movements it passes through our bodies without feeling and perception. Giving it more force, we feel it, but can't see it. A little more, we feel it and *see it pass in the form of light sparks to finger tips* to some more negative body. Put on more power still, we feel it in the form of *heat* and *see it as light*. We *see* it as *electricity, light* and in the electric arc; also in passing a large charge through a small wire. We *see it as all three* when lightning darts from the clouds and burns what it touches."

To a superficial thinker the foregoing paragraph might seem to be all right, but under proper analysis it will be found to be a jumble of terms and ideas without any proper regard to coherence or to the true relations existing between cause and effect. That special form of substantial force called electricity is neither heat nor light; but in performing work in the physical realm a portion of it may be changed or converted into either of these other forms of force as well as into sound. No man ever saw electricity, *per se*, but we have often seen the light into which electricity may be transformed by the well-recognized law of the interconvertibility of the forces. No man ever felt *light*, however intense its rays, but we have often felt the *heat* which accompanies an intense light, and which is generated by the conversion of such light-rays into heat. No man ever saw, felt, tasted or smelt a sound, *per se*. Sound is only to be *heard*, and should it act upon any other sense than that of hearing, it must be first transformed into some other form of physical force thus to act. It is as impossible to see electricity or feel light as it is to smell sound, hear odor, or taste heat.

Whenever Mr. Livsey shall study the correlation of the forces, their interconvertibility and conservation in the light of Substantialism, under a good instructor for a few months, he may then be able to grasp that philosophy of which no conception was possible previous to the classification of the various substances of the universe into *material* and *immaterial* entities, thus making every form of physical force or every phenomena-producing cause in nature an incorporeal substance. It is our purpose in the ARENA not to let up on these questions, but to give line upon line and precept upon precept till there shall be no rational excuse for any intelligent man's withholding his cheerful assent to Substantialism.

A NUT FOR WAVE-THEORISTS TO CRACK.

EDITOR OF THE ARENA:

THE advocates of the undulatory theory of light hold that all space is filled with a luminiferous ether, which is so attenuated that it fills even the very space occupied by all material bodies—"moving freely among the atoms of all bodies." This ether is the medium that conveys the waves of light to us even from the most distant visible stars. Now, according to their own theory, how can they account for the fact that light will not pass through all material bodies. This wonderful ether is certainly there, for SCIENCE says so, "moving freely among the very atoms." It is really provoking to think that the contrary stuff will vibrate sufficiently to carry waves of light through sheets of water or glass, five feet thick, which are almost devoid of pores, and then refuse to shake itself through a pine board one inch thick, or even through a piece of sponge one foot thick. It will even allow a delicate coat of paint on a window pane to stop its shivering and shaking that it has kept up all the way from old Jupiter to the earth. A little "light," please.

H. F. HAWKINS.

THE EDUCATIONAL ADVANCE.

WE take pleasure in copying into the ARENA the following indignant protest of a writer signing himself "Void," as it appears in the *Educational Advocate* of Mayfield, Ky. We are not a bit surprised that he should become vexed, and wish even to pull the nose of the idiot who should evince the hardihood to question a doctrine so ancient, respectable, and self-evident as the Wave-theory of Sound. But we will let "Void" speak for himself:—

A THEORY OF SOUND.

TO THE ADVANCE:

In the EDUCATIONAL ADVANCE for April, I see the following query propounded: "What is the true theory of sound?" The *Wave-Theory*, most certainly. Who says it is not? Has not this theory stood the test of 2,800 years? Is it not taught in every college in the broad land? I am utterly astonished that such a question could, by any means, find a place in a school journal. How did it happen? Has any one stultified himself by declaring that there is any inherent weakness in that time-honored old theory which dates from the time of Pythagoras? Shame on him, whoever he may be, who has dared to do so dastardly a thing as this; if, indeed, it has been done. Why, I should be tempted to pull the nose of any individual who should dare to call in question a theory so venerable as the one now under consideration. What other theory under the sun would attempt to account for the phenomenon of two live and well-developed sounds producing silence? Echo answers, "What other?" What other theory, in fact, could afford to say anything at all when asked to account for such an every-day occurrence as

that just alluded to? Again Echo chimes in, "What other?"

Verily, the wave-theory is the only theory extant. What other theory would even attempt to account for the fact—for it is a fact—that very short (theoretical) waves travel as rapidly as very (likewise theoretical) long waves, as exemplified in the *air waves* or, which is the same thing, sound-waves, proceeding from a brass band? Again, in dulcet notes, chimes in merry Echo, "What other?" Surely, there must have been a typographical error in your last issue, in the Query Department. If such was the case, please so state in your next, and thereby relieve many, including myself, of a great load of anxiety concerning a theory which must be kept intact, though all others sink into oblivion.

Respectfully,

Wingo, Ky. VOID.

A REAL PHYSICAL PROBLEM.

IT is an observed fact that in case of a magazine explosion the windows of houses near it are broken by the concussion; and in about nine instances out of ten the glass is broken outward instead of inward, and will be found in fragments on the sidewalks or in the yards rather than within the rooms.

We now submit this to our readers as a simple physical problem to be solved. Let those who attempt its solution be explicit and very brief, as it only requires a very short paragraph to tell the whole story so a child can grasp it. After we have heard from our readers, their solutions with our own will be given in the ARENA.

EDITOR.

SHOOTING-STARS.

BY PROF. W. H. H. MUSICK.

I DO not doubt that the star-showers known as April, August and November Meteors belong to, or proceed from, groups of bodies revolving round the Sun, as now taught by astronomers, and I submit the following propositions, none of which are entirely new, but which have never, as I have seen, been published connectively, nor all advocated by the same person.

1. The greater number of meteors (shooting-stars) which come within control of the earth's attraction, describe ellipses about the earth, and are retained therein as permanent satellites.

2. Shooting-stars are rendered luminous by light of the Sun.

3. The so-called Sporadic Meteors (those seen at various seasons of the year) mark the perihelia of elliptic orbits in which those bodies revolve round the Earth.

Mr. Lockyer says, in *Elements of Astronomy*, page 280, "That if we take two bodies, the Sun and our Earth, for instance, we may imagine all the gravitating energies of each to be concentrated at its centre, and that if the smaller one receives an impulse neither exactly toward nor from the larger, it will describe an orbit round the larger."

The meteoric bodies are supposed to move round the Sun in parallel orbits, each of which is, on an average, 450 miles distant from that of any other. It is easy to see how comparatively few of these bodies could be at the same time moving "directly toward" the Earth, and only these few would enter our atmosphere. It can hardly be doubted that a far greater number would be encountered at such angles, and with such velocities as to become permanent satellites of the Earth.

I think my second proposition is rendered at least probable by many recorded facts. One of the most thorough set of corresponding observations ever made, was conducted by M. Wartmann and associates at Geneva and Planchettes simultaneously, Aug. 10, 1838. The average height above the ground of the meteors observed by both parties was 550 miles. At the height of 50 miles the atmosphere is too attenuated to reflect the Sun's rays sufficiently to produce a sensible twilight. Although the luminous trains left by many meteors do suggest some degree of friction or resistance, it seems scarcely possible that at the height of 550 miles the atmosphere should be sufficiently dense to support combustion or to offer the resistance necessary to produce incandescence in the most rapidly moving body. At the time of year that M. Wartmann made his observations (Aug. 10th), the vertical midnight shadow of the Earth is, at Geneva, 475 miles in depth. At the height estimated, the meteors would have been lighted by the Sun, not only throughout the northern (celestial) hemisphere, but far to the south of the observers.

The height of the meteoric cloud, or radiant-point of the November star-showers of 1833 was said to be 2,238 miles. The vertical midnight shadow of the Earth on the 13th of November is, in our latitude, about 3,950 miles in depth, but the "cloud" would have been in the light of the Sun at any point 30 degrees north of the prime vertical. In discussing the subject of "Meteoric Showers," Prof. Ohnsted says: "The greatest display is everywhere at nearly the same time of night, namely, from three to four o'clock—a time about half way from midnight to sunrise." At this time, an object 2,238 miles in height would be in the light of the Sun, not only overhead, but far to the west.

In the winter, when the Earth's shadow is deepest, I have observed that early in the night, meteors are most numerous in the west; in the morning, they are oftenest seen in the east; and at the hour of midnight, they are rarely seen except in the constellations near the north star,—in each case, in the vicinity of the lightest shadow. About the middle of the night of November 1, 1883, I saw a very bright meteor rise in the east, and suddenly disappear in a clear sky. After a few seconds, a meteor of equal brilliancy appeared in the southwest, and descended to the horizon. If the two were not identical, the coincidence was remarkable, for each of these appeared half as large as the full moon, and meteors of this size are very unusual. If the two were identical, the inference is obvious,—the illumination was produced by sunlight, and the meteoric body was eclipsed during its passage through the shadow of the Earth.

I will not argue my third proposition, which is closely related to the two preceding, but add a few words on the subject of Detonating Meteors. From the apparent diameters of several meteors whose distances were ascertained, it is certain that they are bodies of considerable size. Our experiences of sympathetic magnetic storms would lead us to expect some atmospheric disturbance on the near approach of a considerable mass of matter whose electro-magnetic condition would, most likely, be different from that of the Earth. The report that succeeds the appearance of a very large meteor is, perhaps, a peal of thunder. Violent changes of weather have usually followed the great November star-showers.

VANDALIA, Mo.

REMARKS BY THE EDITOR.

WITH all deference and respect to the learned statement of Dr. Musick, we prefer the much simpler explanation of these annual meteoric showers, namely, that these sparks which flash out momentarily and then disappear, are the remnants of some comet's tail, or possibly the tails of different comets, which many years ago crossed the earth's orbit. These straggling sparks still continue in the comet's trail notwithstanding the long time which has elapsed since the nucleus passed, and that when the earth in its annual course around the sun passes through one of these old trails, the lagging specks of cometic matter, by friction with our atmosphere, become incandescent and in an instant from their vapory condition are consumed.

Every appearance seems to justify this view, and consequently that those calculations which place the meteoric showers above our atmosphere are mistakes. The truth is, the meteors which reach the earth in the shape of solid masses of iron ore intact, as so often observed and picked up, confirm this view of meteoric displays as caused by the friction of the air against some form of material particles. Those meteoric stones, however large, are never seen by the light of the sun in approaching our earth, as Dr. Musick's theory would warrant, but on the contrary are first seen the moment they touch our atmosphere, and so on grow brighter and brighter till they strike the earth.

BOOKS RECEIVED.

"Natural Law in the Spiritual World," by Henry Drummond, F. R. S. E., F. G. S. Published by James Pott & Co., 14 and 16 Astor Place, New York City. This book is well-timed in its appearance, and the international reputation of the author will enhance the interest felt upon the topics treated. We shall refer to it hereafter.

"Out of the Toils," by John W. Spear. Published by Phillips & Hunt, New York City; Cranston & Stone, Cincinnati. This is a further contribution to the increasing fund of temperance literature. The character of the publishers is guarantee of value in the publication.

MAGAZINES.

We have received "Scribner's Magazine" for August. Its contents are entertaining and instructive. The Thackeray Letters are continued. "The Instability of the Atmosphere," a paper by N. S. Shaler, contains much that will interest scientists as well as the general reader.

The "Popular Science Monthly," D. Appleton & Co., contains, among other papers, "Human Brain-Weights," by Joseph Sims, M. D.; "Earthquakes," by Prof. Darwin, and a very thoughtful article upon "Mental Differences of Men and Women," by Geo. J. Romanes. The "Editor's Table" is, as usual, full of good things.

Mrs. Martha J. Lamb's "Magazine of American History" is worthy of unstinted commendation. The leading article (with frontispiece) is devoted to the "Presentation of the Arctic ship Resolute by the United States to the Queen of England." "The Origin of the Federal Constitution," by Prof. Francis N. Thorpe, Ph. D., will repay reading. Miss Rose Elizabeth Cleveland is now associated in the editorial department of the magazine.

"Building—An Architectural Weekly," published by Wm. T. Comstock at 23 Warren street, New York City, contains much that is interesting and useful to the general reader; while to architects and builders it has an especial value.

ARTICLES AWAITING FUTURE NUMBERS.

Two from Rev. Dr. J. H. Lightbourn, on Cartesianism.
One from John C. Duval, on Materialism.
One from Rev. Dr. A. D. Potts.
One from Eld. Thomas Munnell.
One from Rev. Dr. John Crawford.
One from Reuben Hawkins, and many others

"NEARER MY GOD TO THEE."

ERRATUM: We regret very much that the beautifully written article with the above title, printed in last month's issue of the *Arena*, was credited by some unaccountable blunder of the types to Mrs. M S. *Morgan*, M. D. It was written by our only lady contributor, Mrs. M. S. Organ, M. D., and in her own admirable style.

Happiness is a mosaic set in beauty by the hand of love—love in little things, loving words, loving acts; and a large part of this work is in the home, where the greatest portion of our time, and for the best, should be spent.

PROF. JOHN G. BELL.

BY T. J. SHANKS.

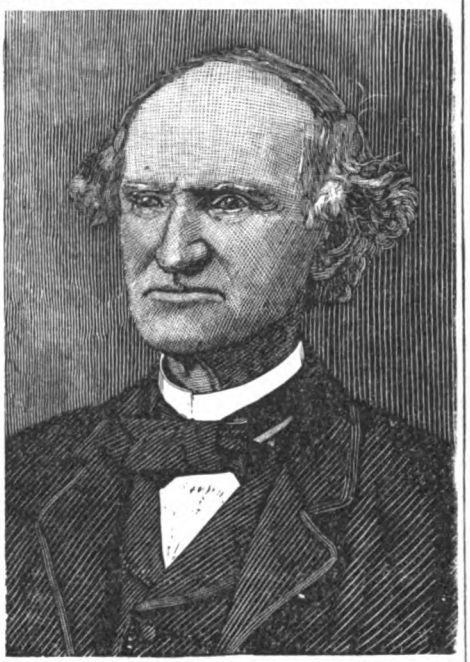
Prof. John G. Bell, the well-known American ornithologist and taxidermist, was born in Rockland County, New York, on the 12th of July, 1812. His father was a farmer. The incident which influenced him in his boyhood days to devote his life to the study of natural history, is interesting. He was working on a part of the farm about three-quarters of a mile from the house, when suddenly the excited barking of his dog attracted attention. Following the animal, he came to the hollow trunk of a tree, inside of which he found an old opossum and a litter of little ones, which he captured and carried home. Acting upon the suggestion of a neighbor, he took the collection to New York, intending to sell the animals at Washington market. Among the spectators at the market was Mrs. Peale, wife of the proprietor of the famous "Peale's Museum," who thought her husband might wish to purchase the curiosities. Going to the museum at Broadway and Murray street, the boy sold his opossums at what he considered a high price. At the same time he gladly availed himself of the opportunity to visit the various departments of the museum. Certain kinds of birds, he said, were familiar to him, and he could easily secure some good specimens if they were desired. Encouraged by Mr. Peale, he shot a great many birds, and sold them at good prices. The acquaintance thus formed led to a closer relation. He entered the museum as an apprentice, and remained there for about eight years. Mr. Peale was to him as a father, and aided him in acquiring that minute acquaintance with birds and animals which proved of great value in his subsequent studies.

In 1843, the young man accompanied Prof. J. J. Audubon on his expedition along the Upper Missouri. The only method of travel at that day was with a boat of the American Fur Company; and Prof. Bell seems almost to be young again as he gives a narrative of the numerous and interesting incidents of that trip through a country inhabited only by wild animals, tribes of uncivilized Indians, and adventuresome hunters. We wish we had here room for more detailed sketch of the Professor's observations, which would be basis for a very valuable magazine article.

We may here remark that, while among such eminent men as Audubon, Henry, Baird, Wilson, Elliott, and others in scientific circles, the great value of Prof. Bell's discoveries and aid were constantly recognized; yet, by the latter's innate diffidence and at his earnestly expressed wish, public allusions to his achievements as an original investigator and conscientious worker in his department of study were withheld: and thus the Professor has not received much credit to which he is justly entitled.

Settling down as a taxidermist, Prof. Bell soon established a reputation which brought him orders from far and near for preserved birds and animals. Among the patrons in foreign countries was Prince Paul William of Wirtemberg. King Victor Emanuel of Italy also gave him very valuable commissions at various times, and was so well pleased that he gave the Professor a special invitation to visit him at his palace in Rome, which invitation the Professor declined, he being "too busy." He, however, introduced a friend in the profession to the confidence of the king. This friend visited the royal patron, and was generously entertained and honored. Many New Yorkers will remember the establisment of Prof. Bell on Broadway. And many dwellings of leading families possess valued specimens of his skill in the art of taxidermy. In the Museum of Natural History in Central Park, at the Academy of Sciences in Philadelphia, and at the Smithsonian Institute at Washington, and other leading institutions throughout the country, are many of his well-preserved selections of birds and quadrupeds.

One might profitably spend days in examining the wonderful collections accumulated at Prof. Bell's residence at Sparkhill, N. Y. Approaching the house through grounds which resemble those of an English estate, and evidence the proprietor's love for rare and noble trees, and indeed for nature in every form, one is met and cordially greeted by the kindly old gentleman and his gracious wife. Inside the door, so many cases of birds confront you at every turn that the only embarrassment is to know which to examine first. Soon the Professor leads the way to his workshop, which is also the repository of his chief treasures. He takes special pride in a collection of humming birds, tray after tray of which he produces in bewildering variety. A number of very fine specimens of elk horns, mounted heads of antelope, buffalo, etc., etc., attest his fondness for American wild animals. Many years ago he was about to send a herd of live elks to Europe, when on account of the difficulty in shipping them he was obliged to hold them for a long time at his country place. This gave him an opportunity to study their peculiarities, and he observed, among other interesting facts, that about midwinter—during a period from the 1st of January to the 1st of March—the elk sheds his horns, which are replaced by new growth in about six months. He has also a beautiful specimen of the tail of the Lyre pheasant.



Prof. John G. Bell.

On the premises is a separate building used entirely as a repository of stuffed birds and quadrupeds. Moose, tiger, bear, deer, and great variety of other animals, large and small, stand or recline in strange proximity, so lifelike do they seem. Says the Professor: "People ask me what I have here. I have got from a moose to a mouse, and from an eagle to a humming-bird."

We regret that the space at command and intent of this article do not admit of more detail. The Professor's travels through the Western Territories in primitive days; his experiences as a miner in the "gold regions;" his trips hither and thither in pursuit of information upon questions of important scientific character; his stratagems to capture certain species of birds or animals, and to ascertain their habits; these alone constitute matters of interest enough to fill pages. Then the reminiscences of the various celebrities into whose companionship the professor's occupation and recognized abilities have thrown him, render his observations of much value. We may take the humorous narrative hereafter, and tell at least the story of the large snake at Peale's Museum which swallowed the bait of a chicken, with blankets, &c., &c.—a *true* story. And then we might renew the inquiry which agitated the public years ago as to the real facts about Barnum's "Mermaid," and in response possibly the Professor might tell what *he* knows about Mermaids.

KIND WORDS.

The Scientific Arena, a monthly journal devoted to the investigation of current philosophical teaching and its bearing upon the religious thought of the age, and edited by A. Wilford Hall, Ph.D., LL.D., editor, has passed into the hands of Mr. David K. Elmendorf as publisher. Mr. Elmendorf was for many years a trusted employee of the Methodist Book Concern. He is widely and favorably known to our ministers and members.—*New York Christian Advocate.*

The Scientific Arena for July comes laden with characteristic articles on scientific, philosophical and religious subjects, which are handled by profound thinkers in a bold and independent style. Price $1 a year. A. Wilford Hall, editor. Address, D. K. Elmendorf & Co., 38 Park Row, New York.—*Christian Leader,* Cinn., O.

The Scientific Arena, a monthly periodical devoted to the propagation of the Substantial Philosophy, has become the property of Mr. D. K. Elmendorf, the well-known advertising agent. The Substantial Philosophy is the exact opposite of the Ideal Philosophy, of which Hume and other thinkers in the last century were leading exponents. These doctrinaires held that the evidence of the senses is not trustworthy; that there can be no absolute proof that the world of matter exists; that, in fact, our impression of things around us may be purely ideal. The Substantial Philosophy upholds the antipodal extreme. Its teaching is that whatever can be conceived must exist. Thus not only may we be sure that what we see and hear and feel exists, but the existence of God, Heaven, angels, and the whole unseen and supernatural realm, is rationally proved. This, it is contended, is the only doctrine which meets infidelity on the intellectual plane. The Scientific Arena is well printed, and seems in every way adapted to its purpose. Dr. A. Wilford Hall continues to be the editor, and the Rev. H. B. Hudson, the former publisher, remains associate editor.—*New York Weekly Witness.*

The English language is spoken by 100,000,000 people, the French by 45,000,000, and the German by 60,000,000.

ONE LIFE'S INFLUENCE.

A little more than forty years ago there came to London a young apprentice. He was poor and friendless; he had but a single endowment—Christian faith. He took lodgings in St. Paul's Churchyard. He came to his room unknown, and there made a simple prayer of consecration alone. He felt the solitude of the city. Some eighty young men were employed in the same establishment as himself.

"I resolved," said a great reformer, "to have no friends by chance, but by choice, and to choose only such as would help me in my spiritual life."

The young apprentice had a like purpose. He found a few young men among his fellow-workmen whose lives had a moral aim and purpose. Some of these he invited to hold religious services with him in his room. These invited others to meet with them for the same purpose. The meetings grew in numbers. They multiplied. Young men's meetings for young men became a movement among the London trades, and in 1844 they led to the forming of the first Young Men's Christian Association.

The society spread. Its influence was felt throughout England; America took up the work; the islands of the Pacific; parts of Asia. Nearly three thousand associations were represented or reported at the tenth annual conference held in Berlin. Now the movement is found to meet the needs of colleges, and more than two hundred associations have been formed in colleges and schools.

The number of railroad accidents attributable to intemperance among employees, should arouse the public, whose safety is imperiled by such untrustworthy persons. No matter how careful and efficient in other particulars may be the official management of railroads, the fact remains that drunken subordinates constantly nullify efforts of their superiors. If it were possible to "boycott" thoroughfares which retain such employees, this form of pressure would secure some protection by revised regulations at least; and doubtless legal enactments would follow. These remarks are suggested by observations upon various lines, and are enforced by an interview with an employee upon the "Northern Railroad of New Jersey." This single track road, terminating at Nyack, N. Y., distant about 30 miles from Jersey City, has within a few weeks past been disgraced by several accidents occurring in broad day, and at hours when travel was the greatest. Much property was destroyed, several persons injured—valuable time of many hundreds of business men lost for hours, with the full list of "appointments" missed. However, it was further demonstrated that it is a physical impossibility for two trains, going in opposite directions, to pass on same track! But to the incident: The honest flagman, repelling the imputation that he was at fault in the case of the accident at Sparkill, quoted facts to the contrary, and remarked concerning the reprehensible party: "Sure, and it's no wonder, for he spends half his time at the *rum hole* yonder."

The complaint about the degeneracy of the human race is not new, but dates as far back as the time of Homer, at least; for the men of his day were not like the heroes of whom he sang. It is not confirmed, but is contradicted by all the tangible facts, and these are not a few. Human remains that are exhumed, after having reposed in the grave for many centuries, as in the Catacombs of Paris, have nothing gigantic about them. The armor, the cuirasses, and the casques of the warriors of the Middle Ages can be worn by modern soldiers; and many of the knights' suits would be too small for the cuirassiers of the European armies; yet they were worn by the selected men, who were better fed, stronger, and more robust than the rest of the population. The bones of the ancient Gauls, which are uncovered in the excavations of tumuli, while they are of large dimensions, are comparable with those of the existing populations of many places in France. The Egyptian mummies are the remains of persons of small or medium stature, as are also the Peruvian and Mexican mummies, and the mummies and bones found in the ancient monuments of India and Persia. And even the most ancient relics we possess of individuals of the human species, the bones of men who lived in the Tertiary Period, an epoch the remote antiquity of which goes back for hundreds of centuries, do not show any important differences in the sizes of the primitive and of the modern man.—M. Guyot Daubes, in *Popular Science Monthly.*

Mr. R. W. Gilder, in his recent address at Wesleyan University and Wells College, remarked that but few of the younger generation of writers in this country have been graduated at college. He doubted whether the public "yet realizes how little, comparatively, the college has done directly for our present literature. Stedman," he said, "was at Yale, but was not graduated; Bret Harte, James, Howells, Stoddard, Aldrich, Cable, Mark Twain, Joel Chandler, Harris, Burroughs, Bunner, Lathrop, Edward Eggleston, Julian Hawthorne, Janvier, Marion Crawford, Stockton—a few of these started upon, but not one of them finished, a college course, while most of them never even started. Nor have the women who are now prominent in American literature enjoyed the advantage of the higher collegiate education."

A copy of the famous "Breeches Bible" was picked up at a Boston sale a few days ago. The Bible, which was printed in 1594, takes its name from the following rendering of Genesis iii, 7: "And they sewed fig leaves together and made them breeches." It is also known as the "Barker" edition, and is exceedingly rare now. Speaking of Bibles, one was purchased in England not long ago for $20,000. This is the oldest printed edition, and came from Guttenberg's own press. It is called the "Mazarin."

For six or seven months numerous complaints have gone to Postmaster Shelley, of Kansas City, of the loss of letters containing money and postal notes, and for a long time special officers have been working on the case. They arrested L. I. Wilson, a clerk at Station A, at the Union Station. Wilson confessed having opened several letters containing money. He punctured letters with a bodkin, and by a microscope ascertained the contents. If no money or postal notes were seen the punctured places were obliterated by a rubber.

Venus is evening star. She reaches the point during the month of August, when she puts on her most glorious aspect as evening star. On the 15th, at noonday, she appears in her greatest brilliancy, being then about 40° east of the sun, and her diameter measuring 40″. When she became evening star last December her whole illuminated disk (like the full moon) was turned toward the earth, and, being at her greatest distance from us, her diameter was only 10″. She has ever since been traveling toward us and increasing in size and brilliancy. At the same time she has been turning less and less of her illuminated disk toward us, passing through the phases of the moon from full to new. Until the 15th the increasing size of the planet's disk has more than counterbalanced the lessening portion, which is illuminated, and as every observer must have noticed, the fair evening star has grown more brilliantly beautiful. After the 13th the illuminated crescent rapidly diminishes until it becomes exceedingly thin. The increasing size no longer counterbalances the lessening light, and the planet perceptibly wanes in brilliancy. There are two of these periods of greatest brilliancy, as they are called. The one like the present occurring 36 days before inferior conjunction when Venus is evening star, and the other occurring 36 days after inferior conjunction when Venus is morning star. Our planetary neighbor will be a charming object for celestial study during the whole month of August, increasing in splendor until the 15th, and approaching the sun from the month's commencement to its close.—*Providence Journal.*

A new building for use of the employees of the West Shore Railroad is to be erected at Weehawken, N. J., by the co-operation of the railroad authorities and the railroad branch of the Y. M. C. A. Association. We are pleased to note in a recent edition of the "Reporter" the statements of interest in religious work upon the part of the employees, and the consequent good results. One very practical effect is that the proprietor of a drinking saloon at New Durham, whose patronage had been wholly from railroad employees, has announced his withdrawal from business from lack of support. The writer of this is personally familiar with the initial incidents which inaugurated this work, and the equally important, though distinct department—the "Conductors' Room." The officials of the company heartily recognize the value of the experiment which created the latter; and the good feeling existent between employers and employed is significant, and a subject of favorable consideration in other corporations. The "Conductors' Room" at Weehawken is said to be the best appointed in the United States, if not in the world.

Secretary Endicott has sent a telegraphic acceptance to Samuel Bigstaff, of Newport, Ky., of his offer to sell the Bigstaff, Happensack, Bloom, and shore tracts of land for the new barracks to be built at that place. The price to be paid for the land is $41,000, leaving $19,000 of the appropriation of $60,000 for the erection of buildings. This site was found by Gen. Sheridan, during his recent visit to Cincinnati, to be the only one of the twelve offered at all suitable for a barracks. He recommended its purchase. The tracts comprise in the aggregate 111 acres, and are located near the river.

Dr. Charcot, the famous hypnotizer, has recently had a chance of examining immediately after decapitation one of the 4 per cent. of French murderers executed. His examination commenced two seconds after the knife of the guillotine had fallen; and the head even then had ceased to give any sign of life, though muscular movement continued in the neighborhood of the jaw until the sixth second. But the beating of the heart, caused by the influx of blood, actually continued for 60 minutes. The conclusion finally arrived at was that the death of the guillotined man had not been caused by asphyxia. The violent irritation of the nerves of the neck, it was decided, had reacted upon the heart and death followed the shock.

Pope Leo XIII. is 76 years old.
King Louis, of Portugal, is 49.
Christian IX., of Denmark, is 69.
Charles. King of Roumania, is 48.
Queen Victoria is 68 years of age.
Dom Pedro, Emperor of Brazil, is 62.
Emperor Francis Joseph, of Austria, is 57.
King William III., of the Netherlands, is 70.
Oscar II., King of Sweden and Norway, is 58.
Emperor William, of Germany, is 90 years old.
Nicolas I., Prince of Montenegro; Abdul Hamid, Sultan of Turkey; Humbert, King of Italy; Alexander, Czar of Russia, and King Leopold, of Belgium, are over 40.

The official report on the Russian Army lately published contains the following particulars: On the 1st of January, 1886, there were 824,762 men, including 8,000 volunteers, in the active army. The reserve amounted to 1.600.815 in addition, thus making a total of 2,425,577 soldiers whom Russia could bring into the field at need. In Germany the maximum of the regular army and the Landwehr combined is computed at 1,800,000 men. Moreover Russia has at its disposal 2,170,000 militia liable to be called upon in time of war to recruit the ranks of the regular army. The number of young men annually liable to the conscription is 852,000, of whom about one-half are exempted by lot. If the term of service were reduced from five to three years the State would in a short time be able to have 4,000,000 regular troops without having recourse to the militia reserves.

Literary "Molecules."

Mr. Edward Atkinson states that nearly the whole wool clip now comes to the market unwashed, and that out of the 320,000.000 pounds of domestic wool used there must be 25 per cent. at the least, or 80,000,000 pounds of a very valuable oil thrown into the rivers and wasted. When the "suint" is refined a thick, viscous oil is obtained, which is absolutely free from oxidation, and which is therefore the most valuable oil for curriers' use that can be found.

Thousands of New Yorkers who shuddered when they heard the name Five Points a few years ago would be amazed could they have seen the happy company there last night. Five Points has become Paradise Park. Charity and humanity have converted Five Points into not a very verdant Paradise, to be sure, but a place where happiness is possible, and that is more than years of terrors of the law was able to do for it.—*Evening Sun, July* 19.

A pleasant drink for the sick. Take a dessert teaspoonful of arrowroot and add a teaspoonful of milk; wet and rub in smooth. To this add a teaspoonful of powdered sugar. Heat a half pint of good rich milk and bring just up to the boil. Then, when it boils, stir in carefully the arrowroot and sugar. Allow it to boil three minutes, and give either warm or cold.

Those who regret ill-spoken words sometimes form resolutions of permanent silence. This, however, is only one of the numberless abortive attempts to substitute unnatural restrictions for self-control. God made man a speaking being, and never placed a yoke of silence upon any except those who in His mysterious providence are born dumb, or lose the form of speech.

M. P. Pourquier, from his researches on the attenuation of the virus of ovine variola, continued for a period of seven or eight years on the principles established by M. Pasteur, concludes that it is possible to attenuate this virus, to transform it into a true virus, and thus avoid the serious losses hitherto incurred by inoculating sheep against the disease.

The German Secretary of State has published statistics on the periodicals of the world, from which it appears that there are 34,000, with a distribution of 592,000,000 copies; 19,000 are published in Europe, 12,000 in North America, 775 in Asia, 809 in South America; 16,500 are in English, 7,800 in German, 3,850 in French, and 1,000 in Spanish.

Assistant Surgeon-Gen. Billing's experiments in composite photography of skulls have been printed at the Government Printing Office. Twenty different photographs, showing the process of photographing skulls, are given. Scientists regard the matter as highly important in securing the craniological types of different races.

A German engineer named Henkels has invented a window-pane through which a room can be ventilated without admitting a draught. To every square meter of glass there are 5,000 holes, conical in shape and widening toward the inside. These panes have been adopted in many of the German hospitals.

The holder of a valid policy of insurance on his own life may assign or dispose of the same as he may of any other case in action, if there is nothing in the terms of the policy to prevent, and the assignee may enforce it, although he has no insuperable interest in his life.—*Mississippi Supreme Court.*

Among the remarkable woods of South Africa is sneezewood (Pteroxylon utile) which, in durability, is said to surpass even lignum vitæ, producing machine bearings which have been known to outlast those of both brass and iron.

Genuine virtues are a silent and salutary force, working always in the direction of the general good, but when men parade their supposed virtues before the world, as did the ancient Pharisee, they need watching, for the accomplishment of some selfish purpose is their ulterior object.

An action lies, in behalf of an employee, against a person who has maliciously procured the employer to discharge such employee from employment in which he is engaged, under a legal contract, provided damage result to the employee from such discharge.—*Florida Supreme Court.*

A manufacturer of Aix-la-biax has invented a very curious application of electricity to looms. He adopts an indicator which strikes when a thread breaks, and thus saves the weaver from the close attention to the quickly moving threads which is so injurious to the sight.

An English engineer who is regarded with the highest esteem among railroad constructors has advanced the opinion that American bridge-builders are, for bridges of all ordinary sizes, completely cutting the English builders out of the market for Canada and other colonies.

The Bo-tree of Amarapoora, in Burmah, is about 2,170 years old, and it can be traced in historic documents as far back as 182 A. D. Other trees are believed to be older—African and California specimens being computed 5,000 years.

When men in public places have patronage to bestow, time-servers manifest much affection for them and call them great men; but if these public men fail, these time-servers call them small men and then run for their lives.

The law of the harvest is to reap more than you sow. Sow an act, and you reap a habit; sow a habit, and you reap a character; sow a character and you reap a destiny.

The largest clock known is that in the cathedral at Strasburg. It is 100 feet long, thirty (30) feet wide, and fourteen (14) feet deep, and has been in use 300 years.

"WANTED—HALF-COLUMN MORE COPY."

So WRITES our printer, as we are closing August issue of THE SCIENTIFIC ARENA. What shall we give? We think of the toast of a printer's apprentice we once heard:—"The Paste-pot and Scissors; the true friends of the country editor!" But, as neither implement is at hand, we have to be *original* in form of presentation; and availing ourself of the "molecular forces of the brain" (is that the term?) we hasten to evolve some items:—

1. Query. Is a railroad corporation responsible for damages by delays in transit of passengers when such delays are direct results of incompetency or carelessness of employees? This question has much force for over 1,000 business men and many other persons who, by accidents recently upon the Northern Railroad of New Jersey, at Sparkill, N. Y., and Norwood, N. J., were detained for hours, after narrowly escaping loss of life or limb. Criminal carelessness the cause. And when he arbitrary action of the Northern Railroad management toward its commuters is considered, the aggravations of mismanagement enforce the bitter complaints now constantly heard among travelers upon the "Northern."

2. "Twelve Days at Monsey," Rockland County, N, Y., for the Rockland County Temperance Encampment Services, beginning Aug. 24, on which day St. John, of Kansas, and Geo. W. Bain, of Kentucky, will speak. We notice that our friend Geo. R. Scott, of the *New York Witness*, is to speak Aug. 30. Success to the Encampment, and the cause it represents.

3. We give a memorized quotation from Dr. W. M. Baker's great book, the Ten Theopanies:—"God does nothing whatever for men until they have themselves done, and to the utmost, all it is possible for them to do. The Almighty waits, his omnipotence held in reserve, *along the line of the impossible;* not until that line is reached does He lift a finger for the help of any one." Again:—"Mohammedanism mourns its approaching doom at the hands of the Christian. The same is as true of every other false system. Mention one of them in any land on earth that is not perishing, by the confession of its own adherents,—and perishing before CHRISTIANITY, as night perishes before the ascending sun." Pages, 101, 172.

DR. WILFORD HALL'S SCIENTIFIC LIBRARY.

THE principles of the Substantial Philosophy, with their collateral bearings, which are unfolded in Dr. Hall's writings, have cost him more than ten years of unremitting labor, such as few men besides himself have ever performed. The results of this tireless scientific and philosophical research, as therein elaborated and set forth, can be found in no other library of books on earth; and those who fail of the present opportunity to secure these unique works, at the trifling cost proposed by his publishers, will realize a missing link in their chain of knowledge, which they may always regret and may never be able to supply.

EIGHT VOLUMES THAT WILL LIVE.

THIS library consists of the "Problem of Human Life" ($2), the five volumes of THE MICROCOSM, bound in cloth ($7.50, or $1.50 each); the first volume of THE SCIENTIFIC ARENA, bound in cloth ($1), and the "Text-Book on Sound" (50c.), amounting in all to $11.

By special request of Dr. Hall this entire library will be sent to any person by express on receipt of $5, if ordered soon, or before the plates shall pass into other hands—an event probably not far distant. If sent by mail the postage, $1.25, must be added. Should the person sending $5 on this special offer already have either of the above eight volumes some other book may be substituted, if in our list of publications found elsewhere on this page.

No person who has tasted the fruits of this comforting and elevating system of doctrine, as set forth in those volumes, should allow this opportunity to go by for leaving to his children an heirloom which may prove an almost priceless memento in coming generations. Bear in mind that this library can only be obtained by addressing Hall & Co., publishers, 23 Park Row, New York.

BORDERING UPON IDOLATRY.

THE philosophy of Substantialism, which advanced thinkers now agree is destined to revolutionize the present science of our schools, possibly before this generation shall pass away, took its rise less than a decade of years ago, in the "Problem of Human Life," a work which has been hailed with commendations from the press of the civilized world, such as no book has ever before received. The publishers of this work have filed away hundreds of such notices, many of which are too laudatory and too nearly bordering on idolatry to be printed. Indeed, the publishers of THE ARENA are constantly receiving contributions from enthusiastic admirers, well written, but so full of flattering praise of the editor's work, that he feels obliged not to allow them to be printed. The following, however, is a mere specimen of such press-notices of the "Problem," a book of 524 octavo pages, and of which between 60,000 and 70,000 copies have already been sold without a dollar's worth of advertising:

A SAMPLE OUT OF 240 NOTICES.

[*From the Christian News, Glasgow, Scotland.*]

"One of the most trenchant and masterly opponents of this theory (Darwinism) is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled 'The Problem of Human Life,' in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them."

[*From the Methodist Protestant, Baltimore, Md.*]

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

[*From the Illustrated Christian Weekly, N. Y.*]

"A very remarkable book has come under our notice, 'The Problem of Human Life,' which we have examined with some care, in which the author reviews most successfully the works of Darwin, Huxley, Tyndall, Haeckel, Helmholtz and Mayer, demonstrating, as we think, the utter fallacy of scientific materialism."

[*From the Brethren at Work, Mt. Morris, Ill.*]

"It is unquestionably the most startling and revolutionary book published in a century. There is no escape from the massive accumulation of facts, and the overpowering application of principles in which the work abounds from lid to lid. It marks an epoch in the centuries. It is a work of Providence and will not accomplish its mission in a generation. It unfolds truths that will stay as long as Christ is preached. Although strictly scientific, its one aim is the demonstration of a personal God, and a hereafter for humanity. We never tire reading it. It is an exhaustless mine of Christian truth. It is the literary *chef d'œuvre* of the age. It is worth its weight in diamonds."

[*From the Presbyterian Weekly, Baltimore, Md.*]

"The trenchant criticism, logical force, scientific attainments, and the clear, popular style of the author, have combined in producing in 'The Problem of Human Life' a volume that meets a pressing want, and one that will be warmly welcomed."

[*From the Dominion Churchman, Toronto.*]

"We most cordially concede to 'The Problem of Human Life' the well-earned title—*the book of the age.* Doubtless the God of Providence has raised up the author to meet the wants of the Church in this time of need."

[*From the New Covenant, Chicago.*]

"We can truly say that we are amazed at the originality, thoroughness, and marvelous ability of the author of this work."

[*From the Amer. Christian Review, Cin., O.*]

"The author, a man of acknowledged genius, and confessedly the brightest scientific star of modern times, has startled the religious world into transports of joy and praise. No religio-scientific work has received both from the secular and religious press such willing and unqualified praise as the 'Problem of Human Life.' It is the death-blow of atheistic science."

[*From the Journal and Messenger, Cincinnati, O.*]

"'The Problem of Human Life' is a very unexpected contribution to scientific polemics, which, if its reasonings shall be justified, on thorough investigation, will prove to be one of the loftiest achievements of this age, and effect one of the mightiest scientific revolutions ever seen."

[*From the Christian Standard, Cincinnati, O.*]

"The scientists who have dealt so flippantly with the solemn questions of spiritual and divine existence, and talked so vauntingly of their scientific demonstrations, will find that they have caught a Tartar. We cordially commend this work to our readers for earnest study."

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"We have, by the merest good fortune, secured a number of sets of the above-named leading encyclopedia of the world, of different styles of binding, which we will now sell at the extraordinarily low prices as follows:

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3. "Universalism Against Itself," the first book written by Dr. Hall—more than forty years ago. This book is pronounced a treasure of scriptural exegesis by ministers of all denominations. Price $1.
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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.

D. K. ELMENDORF & CO., Publishers,
POTTER BUILDING, 38 PARK ROW, N. Y.

Entered as second-class matter at the New York Post Office.

WHOLE SERIES, VOL. VII., No. 4.
NEW SERIES, VOL. II., No. 4.

NEW YORK, SEPTEMBER, 1887.

ONE DOLLAR A YEAR.
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SPENCER F. BAIRD.

BY THE PUBLISHER.

"PROFESSOR SPENCER F. BAIRD, head of the Smithsonian Institution, and the United States Fish Commission, died this afternoon at Wood's Holl, Mass., where he has been sick for some time." So reads a telegram from Washington D. C., August 19. When this dispatch was read to Prof. J. G. Bell (whose portrait appeared in the August issue of the SCIENTIFIC ARENA,) endearing memories of this departed friend and associate of so many years of trial and triumph, overmastered his self-restraint, and tears flowed freely. Professor Baird's friendship was *true*. He was, too, a man loving and lovable. We wish we could give reminiscences from the personal recollections of Prof. Baird as given us by Prof. Bell; but space cannot be here allotted for more than a general summary. Our portrait of Prof. Baird is pronounced to be a good presentation of the facial personality of the deceased scientist.

What a worthy quintette—Audubon, Henry, Baird, Wilson, Bell!

Spencer Fullerton Baird was of mixed Scotch, English, and German descent. His ancestors were preachers, surveyors, bankers, and lawyers of New Jersey and Pennsylvania. One of them was so effective a war preacher during the Revolution that a price was set upon his head by the British Government, and it was after this robust patriot, the Rev. Elihu Spencer, that Prof. Baird took his distinguishing name. The father of the dead scientist was a lawyer of Reading, Penn. He is described as a man of high culture and close observation, and an ardent lover of outdoor pursuits. His sons inherited his tastes.

At the age of 14, Baird with his elder brother William, commenced a collection of game birds found in Cumberland County, Penn., which afterward was made the nucleus of the present magnificent Smithsonian Museum. The brothers contributed papers to the Philadelphia Academy of Sciences, which received marked attention, and soon afterward the great ornithologist, Audubon, became interested in Spencer, and established a friendship with him which continued until Audubon's death, and did much to shape the future career of his gifted protégé. Audubon presented him with a large part of his collection of birds, and young Baird in return contributed many facts and specimens to aid in the production of Audubon's works.

Prof. Baird graduated from Dickinson College at the age of 17, and subsequently studied medicine in New York, although he never followed that profession. In 1845, when he was 22 years old, he was elected Professor of Natural History of the college at which he had graduated. Two years later he became associated with the distinguished Agassiz, and projected with him a work on the fresh water fishes of the United States, which was never completed. During all this period it was his habit to make extended pedestrian tours for the purpose of extending his knowledge and enlarging his natural history collections. So great were his powers of physical endurance that he had been known to cover nearly 60 miles on foot in one day between sunrise and rest.

SPENCER F. BAIRD.

In 1850 Prof. Baird was elected Assistant Secretary of the Smithsonian Institution, with which his name and fame have since been indissolubly connected. On the death of Prof. Henry he became the head of the institution. In 1871 he was appointed by President Grant United States Commissioner of Fisheries, an office which added largely to his responsibilities and nothing to his compensation. The services he rendered in this capacity in increasing the food supply of the world would alone justify a national monument to his memory.

But Prof. Baird's history is the history of the systematic zoology of the United States. A chronological catalogue of his works, prepared by order of the Smithsonian Institution and only carried down to 1882, includes over 1,000 titles. His services to science and natural history were rewarded by medals from the Acclimatization Societies of Australia, France, and Germany. He was a member of the leading scientific associations of England, Austria, France, Germany, Holland, Portugal, and New Zealand. Over 33 distinct genera and species in North, South, and Central America and the West Indies have been named in his honor.

Dr. G. Brown Goode, succeeds Professor Baird at the Smithsonian Institute. Dr. Goode is said to be fully competent; and as a pupil and friend of his predecessor, in sympathy with his plans, it is fair to presume that the important work inaugurated at the Smithsonian and its kindred interest will not be embarrassed. We hope, in a later issue of the ARENA, to give a sketch of Prof. Goode.

GOD AND HIS UNIVERSE.

BY REV. JOHN CRAWFORD, D.D.

IT is common, in the current text-book of science, to divide the Universe into but two departments—mind and matter. So Rev. Joseph Cook says, "Only matter and mind exist in the Universe." The error here implied is that no immaterial substance exists but what is spiritual or mental, such as the spirit in man and in brutes, and God the infinite Spirit.

By this two-fold division, all the *forces* of nature are either over-looked or recorded as subtle *material* substances, or else mere modes of motion, which are non-entities.

In this latter error the foundations of materialism are laid: And materialism is impregnable, so long as this foundation be admitted.

If sound, light, heat, magnetic or gravital attraction, and the other forces, be nothing in themselves, mere modes of motion, they, of course, cease to exist when the motion ceases. If sound, for instance, be but the *wavering* of atmospheric air, or other material substances, as soon as the waves subside, the sound has no further existence; for it never was anything but motion, and motion is no more than change of position in space, a non-entity.

If light be no more than waves of ether, when the waves cease, the light becomes extinct. Besides this, the ether is but a creature of the imagination, for whose existence there is not a particle of evidence, a mere bolster for the wave-theory of sound, or rather a mere offshoot from it.

Again, if attraction, whether gravital or magnetic, be nothing but the immediate effect of a certain imaginary motion of the atoms which compose the substance of the attracting body, it must itself be a non-entity.

This irrational and unscientific mode-of-motion-theory, being taught in all our schools, and generally received as science, how easy to advance one step farther in the same direction, and affirm that mind, which is also an immaterial substance, is but a phenomenon, the mere motion of the brain-atoms, but no entity; so that, when these atoms cease to move, the soul ceases to exist. This, to say the least, is as rational, and scientific, as that the internal atomic movement in the substance of the magnet acts upon a piece of iron, a foot distant, without the assistance of any intervening substance. This absurdity Dr. A. Wilford Hall has abundantly exposed.

Thus, by the mode of motion theories of the schools, every particle of *scientific* evidence for the entitative existence of spirit, whether brute, human, or divine, is swept away; and the most extravagant forms of materialism established.

But, if the mode of motion theory must be rejected, are we then obliged to adopt what may be called the *material* emission theory? such as that held by Newton, when he made light an emission of *material* substance, although of a very refined and subtle nature.

The absurdity of this theory is apparent, on the ground chiefly that light, travelling at the rate of millions of miles in a minute, would certainly, if a *material* substance, however sub-

tle or refined, destroy every eye into which it entered, with such enormous velocity!

Besides, if light be a *material* substance, its constant emission from the sun must, in the course of years, diminish the size of that body; whereas, we have no evidence that this great centre of light and heat has become any less, either in weight or bulk since the earth existed.

Now, if we are compelled to abandon both the mode of motion and *material* emission theories, there is no conceivable alternative but to regard light and sound as emissions of *immaterial* substances! In like manner, we are forced to regard the spirit in man and beast as an entity—an immaterial substance.

One would be almost led to think, when reading the biological lectures of Joseph Cook, and other works of the same class, that their authors imagined they had demolished materialism, as soon as they had brought into view, by the microscope, the working of the bioplasts. But these are, in themselves, no more than minute particles of *matter*, which death freezes into inert and solid substance. Is life, then, but the motion of these infinitesimal, material, atoms? Nay, verily, but the invisible immaterial life substance stands behind, and moves the material bioplasts!

We are now, in some measure, prepared to estimate the value of the Substantial Philosophy, and how much both science and theology are indebted to its founder, Dr. A. Wilford Hall. In future ages the valuable service which he has rendered to the world of thought will be fully understood, and duly appreciated!

This philosophy has entirely exploded these mode-of-motion, and *material*-emission, theories, which, at the best, are but a cover for scientific agnosticism. It has shown that all the forces of nature, such as sound, light, heat, chemism, electricity, and gravital, magnetic, and cohesive attraction, instead of being mere modes of motion, or subtle *material* substances, are real but *immaterial* substances: and, if all these forces have a real entitative existence, why may not the soul of man be also a real substantial entity, itself the power which gives motion to the brain, and which throws the bioplastic shuttles, in weaving it's own material covering, and then uses that material organism, as its instrument, in operating upon, and in receiving impressions from, the external world?

It is not my intention, however, in this article, either fully to expound, or defend, the Substantial Philosophy. For this I would simply direct the reader to the writings of its founder. My object is to turn the light of this philosophy upon material and immaterial things.

The material world is, in every part, absolutely without any innate force. In other words, it is inert; inertia being one of it's *essential* attributes. Its presence and it's changes of condition may indeed be the *occasion* of activity amongst both the force and life elements of nature, but matter itself can, in the proper sense of the term, act upon nothing. In every condition, it is passive, not active.

Besides the material universe, there is a universal force-element, an immaterial substance, pervading the entire universe, as omnipresent as God himself; for I cannot conceive of any portion of infinite space which is inhabited by the Infinite and Eternal, where there is not imminent with Him, and sustained by Him, this element of force through which he is pleased to act on all other substances, both material and immaterial.

I call it a force-element, in the *singular* number, because I regard it as but one element, although manifesting itself under a great variety of forms, such as light, sound, heat, electricity, magnetism, gravity, etc., and varying the nature of its manifestations, as the surrounding conditions, more especially of the material world, may require.

I am led to this conclusion, chiefly, by the fact that these manifestations of force are frequently transformed, by the mere change of conditions, into other manifestations. Electricity, for example, becomes light or heat; cohesion changes into chemism, and chemism into cohesion again, the form which this force-element assumes, depending entirely upon the conditions under which it exists, in relation to matter or mind, or to the other forms of force.

These forces, or more correctly, manifestations of force, may be divided into three classes. In the first division we may place those which radiate or are conducted from a centre, such as light, heat, and sound.

Then we have another class, streaming continuously *towards* some centre; and, when reaching that goal, seem to have completed their commission, and are immediately relegated into the universal fountain whence they came. To this class belong magnetism and gravity. The magnet, for instance, seems to have a continuous current of magnetic force, flowing toward it from the universal fountain of force, its volume being in proportion to the strength which draws it forth, or occasions its flow, carrying with it, in its current, any iron which may come within its sweep, because this iron is susceptible of the same magnetic influence.

I do not think it scientific to say that the magnet *first* sends out from its own substance this magnetic force, which, by a return movement, draws the iron back with it to the magnet. That it carries the iron with it, in its current toward the magnet, we have the fullest evidence; but that it first sallies out from the magnet on this errand we have no evidence whatever.

As light is continually radiating from the sun, or any other luminous body, until it is gradually absorbed, or taken back into the universal fountain of force, so magnetism is continually drawn, by the presence of the magnetized body, from the same universal fountain of elemental force, to be restored to it on the completion of its mission, that is, on its reaching its magnetic centre; and, as it flows toward that centre equally from all points, the amount of its force on the iron, at any particular distance, is inversely as the squares of its distance from the magnet, or centre of attraction.

Now, the same line of argument will apply to gravity. There seems to be a constant flow of gravital force toward every material substance, which is relegated to the fountain whence it came, as soon as it reaches that object. The strength of this current is not absolutely in proportion to the quantity of matter in the attracting substance, any more than the power of a magnet is invariably in proportion to its size and weight. This Dr. Hall has clearly shown, as in the case of glass, which is less porous than gold, and so possessing more matter, but less susceptible of gravital influence than gold; or, as we would say, possessing less weight.

In general, however, the more material there is in any body the stronger is the current of gravital force flowing toward it, exerting a corresponding power of attraction for other bodies; but lesser bodies have their currents of gravital force also, which, in proportion to their mass, tend to draw even larger bodies, or partially to neutralize their currents, just as the gravital force of copper or silver is in a manner neutralized by their coming within the magnetic current, as Dr. Hall has pointed out in the *Microcosm* in his criticism of Sir W. Thomson. Thus the earth's gravital current either attracts the sun, or proportionately neutralizes the force of its gravital current.*

Now, bearing in mind that one manifestation of force is frequently transformed into another, by a change of conditions, is it not possible, nay, probable, that, as soon as this current of gravital force has reached the sun, and has thus fulfilled its mission, it is transformed, by the material conditions of that body, into light and heat; and radiated back into space, to enlighten and warm the solar system. Besides being an *immaterial* substance, and not constituting any part of the material sun, this constant flow does not, in the smallest degree, detract from either the bulk or weight of that body.

The third, and last, class of forces, or manifestations of the force-element, embrace all those which inhere in any material substance. These are cohesion and chemism.

Cohesion proper is simply that force which holds the materials of a body together; and not only holds them together, but, as in the case of solids, holds their particles in the same relative position. Hence, in the case of elastic substances, if the relative position of their particles be partially deranged, cohesion, if not entirely overcome, will permit the stowed-up distorting force to bring them back to their former positions.

Elasticity, as Dr. Hall has clearly shown, is not a *force* of nature as so generally taught by science, but is a property of matter resulting from the action of cohesive force, by which any distorting mechanical force may be stored up among the material particles, and by reaction may restore such distorted body to its former shape.

When an elastic body is changed in form by force applied, that force partially overpowers cohesion, and stores itself up with it among the particles thus deranged till the external resistance is removed, when this stored-up mechanical force, in conjunction with cohesive force, returns the body to its original form, as before stated.

Chemism, I take, to be that power or form of cohesion which combines chemical elements in certain definite proportions, and into definite forms. Crystalization I regard as but the result, one of the forms of chemism.

When two or more chemical elements which have an affinity are brought together, cohesion is by these conditions, changed into chemism, either with or without the interposition of heat or some other force. Chemism continues present, to preside over these chemical changes, until it has fulfilled its mission, when it returns to its original form of cohesion, in order that it may hold the new compound together, as it is held in its original elements.

It is cohesion possibly in the form of chemism that arranges the particles of any substance, so as to make it either a good or bad conductor, or constitutes it either transparent or opaque. It is this form of cohesion, as I take it, that arranges the particles of carbon in anthracite coal, so as to form an opaque substance, and the same particle of carbon in diamond, by which it becomes transparent. Cohesion proper only holds the particles in that form in which they were handed over to it by chemism, whether as coal or as diamond. It is chemism which changes soft iron into steel, and thereby renders the substance capable of a larger measure of cohesion, and by a new disposition of its particles, into a better conductor of electricity.

There is, besides the force-element in its various manifestations, of which we have spoken, what we may, for want of a better term, designate the life-element, out of which proceeds the spiritual substance in man and beast, as well as the immaterial organism in the vegetable kingdom.

When God formed the material body of man, it was out of the dust of the earth: and wher in like manner, he formed the spirit in man, he formed it, as I conceive, out of this immaterial life substance, organizing and vitalizing it, so that it might be in man a living soul, endowing it also with powers as the Creator thought proper to bestow; and, among others, with reason, which constituted man a responsible being with an eternal destiny, either of weal or woe, according as he may use or abuse those powers, with which his Maker has endowed him.

Out of this same fountain of immaterial life substance were also formed the spirits of brutes, but on whom the Creator has bestowed no rational or responsible faculties; so that their spiritual powers contain, in themselves, no di-

* It has been a serious question which view of gravity is more probably the correct one.—that is, whether the falling stone is *pushed* toward the earth by the inflowing currents of force from outer space, or *pulled* toward the earth by the rays of gravity shooting out from the earth, interlocking with the inherent gravity of the stone, and then circling back to the earth, bringing the stone with them. We have preferred the latter view, for the reason that a magnet will *push* as well as *pull* a body under certain arrangements of polarity. How could it possibly *push* a body away from it if force currents do not issue from it as a centre? And if they can thus issue from a magnetic pole, may not gravital currents issue from the earth and return in circling currents, acting only on bodies when returning, while magnetic currents can act in either direction according to the relations of polarity? (See our article on "The Nature of Force," *Microcosm*, Vol. I, page 134). Still we are glad that Dr Crawford has applied his powerful mind to the problem.—EDITOR.

rect evidence that they shall sustain the shock of death; but, in that crisis, may be relegated to the fountain whence they came.

Immaterial organisms in the vegetable kingdom afford, if possible, still less evidence that they shall continue after the dissolution of their material covering.

It is not my object at present to prove that man and brute, as well as vegetable forms, besides possessing material organisms, have also organisms of immaterial substance, of which the former are but the external covering. This branch of the Substantial Philosophy, I take at present for granted, simply referring the reader for proof to the "Problem of Human Life," and the other writings of Dr. Hall.

We have no evidence, nor reason to believe, that these two fountains, that of the physical force-element and that which we have called the life-element, ever commingle; in other words that the one is ever transformed into the other, as we have seen to be the care in the various manifestations of physical force.

Nor have we reason to think that any portion of the force-element ever becomes a part of an organized body, although it may pervade that organized body, as heat and electricity, for example, in the animal system.

But, while the physical and vital force-elements can never exchange places, like the various manifestations of the former element, they frequently exercise a reciprocal influence, one on the other. Electricity, light, and heat, for instance, may affect life, as when heat or electricity are employed to resusitate a man rescued from drowning. Life, on the other hand, frequently affects chemism. Of this we have a striking example in the controlling power which life exerts to prevent the gastric juice from attacking the living stomach, while it dissolves dead flesh taken into that same stomach. Should a man, however, in the prime of life, and with an abundant supply of gastric fluid in his stomach, be suddenly killed, this dissolving fluid will immediately begin to eat holes in the stomach, although it could not touch it when he was alive. Life kept chemism in abeyance; but when death came, chemism was ready to do its work.

While life often holds the force element, in the form of heat, electricity, chemism, etc., under restraint, it often, on the other hand, employs it in the work of building up, and sustaining these material organisms; but none of these forces constitute any part of the immaterial organism itself!

If the spiritual organisms in man and brute are constructed from this life-fountain, so are they augmented from the same source. But here opens a wide field of inquiry, which limit of space will not permit us to enter at present, which would lead us to inquire how much of this immaterial organism has descended to us from our parents, and how much has come to us from this life-fountain direct. I may, on some future occasion, take up the important question concerning the *origin of material and immaterial substance*, when the question now referred to could be more appropriately, and would be more fully investigated, than can be done in the present connection.

We have now seen that, besides the material universe, there is a spiritual world—organic forms of immaterial substance, such as angels which are ministering spirits, and the spirits of men and brutes.

But besides these two departments of God's works—the material, and mental or spiritual, there is the vast, all pervading physical force-element, which is also an immaterial substance. It is a many-sided substance, manifesting its presence and power everywhere in this vast universe, under a variety of forms, as light, heat, sound, magnetism, gravity, electricity, cohesion, chemism, etc.

Now behind all this power there is GOD, who uses this many-sided force-element in the government of his material and immaterial universe.

This force-element, as we have seen, adapts itself, in the variety of its manifestations, to the conditions of the world, both material and immaterial. This servant and creature of God appears as light, heat, gravity, or some other of its many forms, to carry out the will of the great ruler of the universe. But we are not to conclude that the manifestations of this force-element, with which we are acquainted, are the only manifestations of which it is capable or possible. In other parts of God's universe this same force-element may have a far greater range and variety of manifestations than those witnessed here by us; and is it not possible, nay, probable that, in a future state, we shall have a vastly greater number of manifestations of this power than have ever yet been displayed to man or angel?

Again, is it not altogether likely that the miracles recorded in Scripture were wrought by God through the instrumentality of this very same force-element, which we have seen as light, heat, electricity, gravity, etc., but performed by a manifestation of power entirely different from any which we have ever witnessed in the ordinary government of this world?

ST. THOMAS, DAK.

GAZING INTO A WELL FOR LESSONS IN ASTRONOMY.

BY THOMAS MUNNELL, A. M.

THE *Ironclad Age* is a paper published in Indianapolis, Indiana—a Mr. Monroe, editor—devoted to materialism and hostile to the Bible after the manner of Mr. Ingersoll, who is his ideal of what a man should be. In a recent number is what purports to be a lecture from Prof. Richard Proctor assailing, from a professedly scientific view-point, the grand doctrine of the immortality of man. If Mr. Proctor had ever paid the least attention to the Substantial Philosophy he never would have exposed himself in such an article as the one aforesaid. Having read the lecture carefully through, the gentleman to whom it belonged asked what I thought of it, to whom I replied: Mr. Proctor and all that class of thinkers are looking in the wrong direction to see any evidence of immortality; gazing into certain scientific facts in their most materialistic aspects. A man can see but few stars looking down into a well. Astronomy cannot be studied by intently gazing into a pit. To "seek the living among the dead" was long ago pronounced a useless undertaking by very high authority. Such scientists may poke around among the metals, the gases and the rocks for ages yet to come and find but little said about that "eternal life which God who cannot lie promised before the world began." They may analyze the waters of the ocean, the various soils of the earth and give the exact percentage of each element so found, but "life and immortality" will not present themselves, nor will they reveal themselves to the microscope, the telescope, the spectroscope, nor any other appliance that deals with merely material things. Whatever hints may be had from nature concerning a spiritual hemisphere will be found among the immaterial forces of nature as brought out by Substantialism during this opening decade of its wonderful career. But none of the Scientific "princes of this world" seem to know this, for "had they known it they would not have" ransacked the material to find the immaterial. Gravitation is an immaterial entity and utterly refuses to respond to the roll call of material things, and so with other forces that might be named that boldly take their stand on the side of the immaterial. But instead of catechising these forces to see what they might say about an incorporeal world lying beyond the frontiers of the visible and ponderable, said scientists spend their time on physiology, anatomy, chemical analysis and all the rubbish of the laboratory to settle the question of the immortality of the soul, and finding no vacated apartment either in the ventricles, the oracles, or any other part of the heart of a corpse, nor any deserted chamber in the brain where the spirit once abode, conclude that a man and a beast die alike and so proclaim the mortality of both.

Eighteen hundred and twenty-nine years ago Paul described these Scientists by the single term *psuchikos*, which is rendered in 1 Cor. 3, "natural" but more accurately "sensuous," saying "the sensuous man receiveth not the things of the Spirit of God, neither *can* he know them, because they are discerned spiritually." That is, whoever limits the channels of communication to his own mind to the five senses is a "sensuous" man and as such refuses to learn anything by revelation spiritually. The passage does not mean, according to former teaching, that an unconverted man cannot understand the gospel without some miraculous power to help him, but means simply that the man who rejects all truth coming through revelation necessarily confines himself to his physical senses as the only means of knowing anything, of course "receiveth not the things," that can only be discerned by revelation. This sensuous philosophy was well known and directly condemned by the Apostle Paul in 1 Cor., second chapter. He positively denies that our knowledge of spiritual things comes through the five senses, saying, "Eye hath *not* seen nor ear heard, neither have the things God hath laid up for them that love him entered into the heart of man, but God hath *revealed them to us by his spirit*," and of necessity the Positivist cannot receive "the things of the Spirit." He then reasons further by a telling illustration thus: "What man knows the affairs of a man except the spirit of man that is in him? even so the things of God no man knows except the Spirit of God. Now we have received the Spirit of God *that we might know* the things that are truly given us of God." That is if A could transfer a portion of his mind to the mind of B, the latter would know the affairs of A for he would have the mind or spirit of A. So when inspired men had "received the spirit of God" they knew God's affairs to the extent intended by the Lord; and the statement is strictly and scientifically true that "the sensuous man receiveth not the things of the spirit of God, neither *can* he know them" because they are known only through revelation—"spiritually discerned." The sensuous man is like one viewing the heavens with the naked eye and numbering about one thousand stars, but the man of faith who uses the telescope of revelation beholds his 100,000,000 of shining wonders in our universe, not to name the 4,000 other universes flung out into illimitable space by the hand of God.

The visual limits of some insects are but a few inches in diameter and the only question raised here is whether men should confine their knowledge to things of animalcular dimensions and reduce themselves to the condition of mere brutes, saying "Let us eat and drink for to-morrow we die," or rise to Paul's conception of manfulness—"Though the earthly house of this our tabernacle be dissolved we have a building of God, a house not made with hands, eternal in the heavens."—2 Cor. 5: 1.

Jesus Christ came as the champion of the doctrine of immortality. Scarcely a paragraph in the New Testament can be found that does not either directly or by plain implication teach it. It is the fundamental doctrine of all religion. If "to-morrow we die" it makes but little difference to us who Christ was or "what will ye do with him." If Jesus "only hath immortality" and has not "brought life and immortality to light" for me, he is not the friend I have always believed him to be. If he was and is merely willing that I should be "raised up at the last day," but unable to raise me, I don't need him as much as I now believe, for I have plenty of well-meaning but feeble friends among men. But Jesus is "mighty to save even to the uttermost." We are not trusting to a broken reed, nor are we "seeking the living among the dead." We are not studying astronomy through a well, nor are we searching for life among the molecules of Protein. Higher conditions of being will be found above us, not below us. If God exists as a Spirit it is possible for us to exist as spirits also. The real "man" may be "in the body," or "out of the body," and if "out of the body" it will be incorruptible, and therefore immortal and altogether suitable for the "New Heavens and New Earth wherein dwelleth righteousness."

MT. STERLING, KY.

CARTESIANISM.

BY REV. J. H. LIGHTBOURN.

FRANCIS BACON had not closed his eventful life when René Descartes entered upon that great work which made him his peer and rival. Bacon was recognized as the founder of modern philosophy. Aristotelianism had laid hold upon the world, and had controlled and shaped its thought during the mediæval ages. The works of Aristotle had been translated into Arabic, and the Islam as well as Christian mind was permeated with the teachings of this great philosopher. This philosophy was so engrafted in the credo of the church, that Luther found Aristotle a mightier foe than Leo X. He said, if Aristotle had not been of flesh, he would have affirmed him to have been truly a devil. But Luther found Aristotle a hard devil to cast out, and the hero of the Reformation had to submit if not surrender to Aristotelianism. What Luther the reformer failed to do, Bacon the philosopher accomplished. He supplanted the Aristotelian Organum by his Novum Organum, and broke the spell by which the intellect had been fettered for ages.

Bacon was the recognized Master, and the undisputed Founder of modern philosophy, when Descartes startled and astonished the world with his new Method, and taught a psychological philosophy the most original and comprehensive, and which immediately raised him as the equal and placed him alongside of the great Bacon. The psychology of Bacon was vague, obscure and unsatisfactory, especially upon the pivotal point on which all controversies turned—the *soul*. He held a strange Dualism, the *spiraculum* or spirit, which he considered scientifically incognizable, and a subject of faith; and the *soul* which he calls physical, and describes as a thin, warm, material substance, possessing *form*. He saw in matter great potency, ascribes to physical bodies perceptions—the magnet *perceives* the neighborhood of the iron; the soul through physical organs holds communion with the outer world and receives ideas. In animals he saw instinct approximating reason, which embarrassed him, as it had all psychologists. Plato had given man three souls, one immortal soul located in the cranium; two mortal souls, one located in the breast, the other in the stomach. Aristotle had taught the theory of *creation*—a soul created for every body begotten. He also gave to man two other souls, which he called *sensitive* and *vegetable*.

The Cartesian psychology forever swept away Bacon's dualism of spirit and soul, which was a modification of the Platonic and Aristotelian theories. It is equally fatal to the theological trinity of spirit, soul, and mind. The Cartesian Dualism consists of two wholly heterogeneous substances—a *thinking* substance and an *extended* substance. Descartes defines substances as that which so exists that it needs nothing else in order to its existence. Every substance has a pre-eminent attribute which possesses its nature. *Thought* constitutes the nature of thinking substance, and *extension* constitutes the nature of corporeal substance, and everything which can be ascribed to either of these substances can be found in its pre-eminent attribute. The aim of the Cartesian argument is to prove that the soul is an entity distinct from the body, that it is indivisible, and therefore a *unit*.

The starting-point and foundation of Cartesianism is the well-known aphorism—*cogito ergo sum*. In his "Meditationes de Premia Philosophia," Descartes gives an account of the conception or origin of his *Method*. He had turned away from books and authors, and after ridding himself of all traditional opinions, he rebuilds from the foundation. Having stripped his intellect; with no opinion, no credo, he has nothing left—but *doubt*. Of this, however, he is *certain*, he doubts. This is his starting-point. Doubt is to him what that fixed point was to Archimedes, by which he declared he could move the world. Descartes has found the fulcrum. Doubting everything else, he cannot doubt that he doubts—of one thing he is certain, *he doubts*. Doubting is a species of thinking, he doubts, therefore he thinks, and from this single fact that he thinks, of which it is impossible to doubt, he is certain that he exists. He says when he thinks that he exists, the very act of thinking proves that he really exists—*cogito ergo sum*. This is the starting-point and foundation of that philosophy which Buckle says enfranchised the European intellect.

Doubts are not to be stifled, but permitted to range unchecked. One by one they refuse to render any reasonable account and elude us like a mirage which some malignant power created for our illusion. Attacked in detail they vanish one after another into as many spectres of uncertainty. We are seeking what they cannot give us, but we reach the ultimate, the great fact that it is *we* who doubt, *we* who think. We may doubt that there is a world of material things around us, but we are certain that we are thinking. Hence the criterion of truth is a clear, and distinct conception, excluding all possibility of doubt. The foundation point established is the *veracity of consciousness*. The Method of Descartes rests upon the assumption that the object of knowledge naturally fall into series or groups; that in every such series there is a dominal element, simple and indecomparable; that investigation must begin with this primitive element and pass from it to the more complex and relative elements, so that the causal or primal term and its remotest dependent are brought together, the whole series connected like the links of a chain. The fundamental element in a series is recognized by its intuitive or self evident character. Thought is the dominal element of the series of thinking; substance and extention that of coporeal substance. Descartes starts with personal existence—the existence of the *ego* which is the inference of the consciousness of thought. From this self-evident, indisputable truth, he proceeds to link other truths—Something cannot come into being if nothing existed before, *ex nihilo nihil fit*, hence the existence of the Creator is the *ergo* of "*sum*," as sum was the ergo of *cogeto*. The celebrated *ens perfectissimum* argument known as the *a priori* proof of the existence of God is in the same line of argumentation. By the same method the material universe is reduced to extension and motion. The Cartesian method which begins with doubting everything ends in universal belief. The Encyclopedia Britannica speaks of the method of Descartes as the grandest, and perhaps unequalled in the annals of philosophy.

SPONTANEOUS GENERATION--No. 3.

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

AS ONE of the leading primary properties of matter is inertia, is it not plainly manifest that to affirm that these untold millions of marvelous life-forms evincing such wonderful skill, wisdom, and power, are the result of nothing above mere lifeless, powerless, blind, inorganic matter, is to affirm one of the greatest absurdities that it is possible for the human mind to conceive? And yet, such are the difficulties that beset evolutionists in their vain attempts to get rid of a Creator, that they are forced to do this very thing. Nay, more, they are compelled to admit that all the marvelous instincts that are seen throughout the animal kingdom, and that even the intellectual faculties of our race that we see so grandly displayed in the arts and sciences, have all resulted from this insignificant and inadequate cause. The very idea of inert, dead matter producing, or originating *life*, which is so far superior to matter, and that independent of any supernatural intervention, and that, too, when there was no such thing as life, or instinct, or intelligence, or power of any kind, in any form, in the whole universe from which these entities, or any one of them could possibly come, is so preposterous, that it is difficult to comprehend how it could ever have been born outside of the walls of an insane asylum. Only think of it, that from the slimy ooze of the sea bottom, or in other words, from a mass of mud, have come all the intelligence, consciousness, and morality, that are seen among men. This certainly involves an amount of credulity that has never been surpassed in any age. The deepest sea-soundings ever yet attained, are not deep enough to effectually cover up and hide the absurdity of this godless theory. The thing itself would be too ridiculous to write about, or talk about, or even to think about, were it not for the fact that evolutionists are urging with apparent candor and sincerity, this nonsensical and astounding hypothesis upon the public as a substitute for the sublime Cosmic theory of Moses, as recorded in Genesis. As absurd as it is upon its very face, they are compelled to adopt it, or else they must give up their atheism and chime in with the Bible theory of a supernatural creation. But such is their hostility to God, that they adopt the former with all its glaring absurdities.

Even Herbert Spencer, while he knows that there is not a particle of proof that there is such a thing on our globe, or that there ever has been, yet has the temerity to pen the following as a special plea for this his cherished pet theory.

"The chasm," he tells us, "between the inorganic and the organic is being filled up. On the one hand, some four or five thousand compounds, once regarded as exclusively organic, have now been produced artificially from inorganic matter, and chemists do not doubt their ability so to produce the highest forms of organic matter. On the other hand, the microscope has traced down organism to simpler and simpler forms, until in the *Protogenes* of Professor Haeckel, there has been reached a type distinguishable from a fragment of albumen only by its finely granular character." ("Principles of Psychology," Vol. I., page 137.)

Is it possible that after all the hue and cry that evolutionists have made about the certainty of Spontaneous Generation, that this is the most and the best that can be said in its favor by one of its most able and distinguished champions? He tells us that "some four or five thousand compounds once *regarded* as exclusively organic, have now been produced artificially." The whole pith of this consists in the fact that these four or five thousand compounds were *once* believed to be *organic*, but that they are now known to be only inorganic compounds as they "have been produced artificially from inorganic matter." Now is it not most astonishing that he should imagine that the discovery that "some four or five thousand compounds that were once believed to be *organic* but which are now known to be *inorganic*," tends to prove or to make more plausible the doctrine of Spontaneous Generation? As well might it be claimed that the discovery of Huxley's blunder in claiming that Bathybius was the connecting link between the organic and inorganic, but which he now acknowledges to have been a great mistake, has well nigh proven Spontaneous Generation to be true. And then the further astounding declaration, that because chemists had demonstrated that these four or five thousand compounds that once were regarded as organic, were *not* organic, that they "do not doubt their ability so to produce the highest forms of organic matter." Think of it! a scientist who finds it impossible to believe that matter in any form was ever created, because as he affirms such a proposition is *unthinkable*, yet is prepared to believe that chemists have the ability "to produce the highest forms of organic matter," such as mammals, etc., and that in this way the "chasm between the inorganic and the organic is being filled up." But after all, although Herbert Spencer utterally and significantly fails to prove his baseless assumption, he has nevertheless succeeded most admirably in proving how absolutely barren is the whole field of science and nature, of any evidences, or evidence of *Spontaneous Generation*.

Speaking of the above paragraph, Dr. Elam very properly asks: "Does not every candid observer know that this said chasm is not in any way being filled up and that the chemist could quite as easily construct a full grown ostrich as this despised bit of finely granulated albumen?"

Respecting the utter failure of Herbert Spencer in the above paragraph to make any approach toward producing any evidence in its favor Dr. Wainwright has justly said: "As for the four or five thousand compounds as well might the goldsmith say he did not doubt

his ability to make gold out of a baser metal, because he had already moulded it and colored it, in four or five thousand different fashions." It is not in any sense true that any substance even distantly resembling organized matter has been formed.

The line of demarcation between the organic and the inorganic is as wide as ever. For what are these organic matters said to have been formed from their element? They are chiefly binary and ternary compounds; certain acids of the compound radical class, some alcohols, ethers, and the like. Not one of them bears the most remote resemblance to anything that can live: Few of them contain nitrogen and these few chiefly *amides* are only combinations of ammonia or ammonium with other binary or ternary compounds, and can only by courtesy of convention be allowed to be of 'organic' nature. Neither chemically nor physically are they in any way allied to matter possessing the capacity of life.

"It is now thirty-five years since the author of the 'Vestiges' in his 'vigorous exposition' enunciated the belief that albumen might be any day realized in the laboratory, and that there was no chemical peculiarity forbidding that realization. In those thirty-five years scientific chemistry has advanced with colossal strides, at a rate of progress previously unknown and unimagined. Its triumphs are attested by the number and character of its investigations, its improved methods, its enlarged nomenclature its ever-increasing wealth of results. Its history during the present century presents a continuous series of remarkable discoveries; the number of non-metallic elements has been increased by the addition of iodine, bromine and selenium; that of the metals has been nearly doubled; the carefully examined compounds have increased a hundred fold, 'a vast array of substances' has been compounded or de-compounded but towards that border-land which separates the organic from the inorganic—if such a border-land there be—this triumphant chemistry has not advanced one single step." (Scientific Sophisms, pp. 70, 71, 72.)

All has been done that can be done by the most skillful and competent. No experiments that have been thought to have the least bearing in that direction, have been neglected and still there yawns the same gulf between the organic and the inorganic, the living and the not-living, as wide and as deep as ever.

TOMPKINS COVE, N. Y.

SO-CALLED CHRISTIAN SCIENCE AND SUBSTANTIALISM.

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

IN a recent number of the ARENA, Rev. W. H. Slingerland reviews Mrs. Eddy's "Christian Science," and gives a few quotations from the work. While I fully agree with him in regard to the falsity of her claims to originality, and the absurdity of her pretension to teaching science, yet I do not share his fear as to the danger that will be produced by the promulgation and acceptance of her theories. If the practical application of this "Christian Science" cure is dangerous, then verily poor humanity will have a sorry time in steering between Scylla and Charybdis. For, if the practice of mind-cure be a dangerous thing, what term can express that for drug medication, founded as it is upon theories that are in direct antagonism to every law of nature? Any teaching that will induce people to discard the practice of the so-called medical science of this generation is a benefit, positive and decided.

So far as I have investigated Mrs. Eddy's "Science," I can see nothing but a jumble of ambiguous phrases, covering up a manifest paucity of thought, with ideas so vague and ill-defined as to evidence her ignorance of the laws of psychology and physiology; still I can conceive how certain minds could, through her asseverations of mind-cure, have their faculty of faith so stimulated and intensified, that through this accelerated motor-force the nerve-centres would be deflected into new channels, and thus a restoration to healthful conditions be effected.

Her assertion (by no means original with her), that everything is *mind*, is true in its ultimate, in as much as that mind is the creative and controlling power, and that all substances, material and immaterial, are correlated to, and are ultimately resolved back to it.

Mind, with its correlated vital force, is the real, as it is the only permanent or immutable substance which maintains and perpetuates our identity; matter is but a temporary condition, a visible expression of mind, according to the principles laid down by Substantialism. In other words, matter is but a varying condition or manifestation of invisible or immaterial force made tangible to the senses of perception for definite and well-defined purposes; and therefore, in one sense, it is as real as mind itself, since it has a real existence. Yet while we bear in mind the well authenticated facts of material disintegration, we must admit the principle that everything in its ultimate or last analysis is mind. But as mind expresses itself in different aggregations and arrangements, with new laws super-imposed, we must have a separate and distinct term to designate these varying forms and manifestations of the forces; and we must also recognize their inherent laws and constitutional relations, else we shall have no sure basis upon which to mount to impregnable facts and principles. To deny the existence of matter, as real, is at once to deny the power of mental consciousness, and if this be denied, then we have no evidence of our own individual existence.

While, therefore, matter in its philosophic ultimate is but mind, yet being its tangible expression, it has laws and relations different from those of immaterial force. These peculiar relations and laws must be observed in order to preserve harmony—in other words, health and life. Therefore, in the treatment of all diseases incident to the human body, we must take account of the laws which control it as organized, visible substance; we must also recognize the fact of our duality,—that while mind has a visible expression which we denominate matter, this physical structure has embodied in it a mental force, correlated with the body in power and action. If we ignore this well-established fact, and treat the body as if it were solely mind, independent of material laws, we shall assuredly fail in effecting any cure of disease. And if we ignore mind as an entity, and treat the human system as simply organized matter, as do materialists, we shall also fail to heal. And for the very reason that the dual nature of man has not been taken into account in the treatment of disease, has medical practice been such a failure. A true medical science and successful healing art can only be established, when the laws of body and mind are understood, and their reciprocal and correlative action rightly directed. When these correlated forces are rightly utilized through extrinsic aid, then we can confidently expect to remove diseased conditions, and turn these dual agencies into the channels of health.

We all recognize the fact that the human organism sustains certain determinate relations to the external world; that air, light, food and drink are essentials for life,—that heat, magnetism, electricity are forces that co-ordinate with vital force,—that health, growth, and existence depend upon fixed proportions of rest and exercise. And when we fully comprehend all these relations—when we know the kind and amount of food and drink which subserve the real requirements of the system, and bring it nearest to physical perfection—when we know what are its demands for air, light, exercise and rest, what the conditions for a free play of the mental forces, in a state of normalcy,—then we will know how to regulate its conditions when diseased: for the only true and successful method of restoring health, is to supply the diseased system with whatever it can appropriate of those elements and forces, which it uses while in health, to preserve health.

As we have stated, we recognize the fact that all things tangible to the senses are real—that matter in one sense is as real as mind—since it is a visible embodiment of mind, and were it not for this perceptible manifestation we, as organized beings could know nothing of mind or its correlated immaterial forces; for it is an impossibility for physical vision to take cognizance of invisibility.

All force, as taught by the Substantial Philosophy, is unseen, and we can only know of its existence by its manifestation through material substance. For a wise and beneficent purpose, Omnipotent power has incorporated the human soul in a corporeal frame, with physical senses of perception constitutionally related to all material substance, both in the organic and inorganic world; these physical senses are the servants of mentality and gather food for the supply of the reflective faculties the action of which incites a spirit of investigation, and thus all truth in every department is developed.

Perceiving effects, man has thus been led by a law of his mentality to reason back to cause. Our primeval ancestor beheld the effects produced by wind, fire, water, lightning, etc., and these as well as all other displays of force, he severally attributed to a tutelary deity, before whom he bowed in abject servility, to whom he paid homage, and sought to propitiate by sacrifices. But as man's mentality developed with the progress of the suns, he discovered that all these effects were produced by the play of physical forces—the unseen, but real. All that we perceive in the universe are but effects,—the cause is always in the invisible world, and we could not even conceive of the real or intrinsic cause, were it not for the effect. Thus, it is inevitable, that in man's mental constitution and his relation to the universe, his first process of reasoning should be *a posteriori*.

All geological evidence tends to establish the fact, that this planet was evolved from gas, or invisibility, and through the aid of chemistry every element of which it is composed, can also be resolved back to invisibility. When matter is thus rendered invisible what is it? Has it returned to nothing as so many theologians claim it was in the beginning? Surely it is just as reasonable to suppose it returns to "nothing," as that it was made from "nothing." What is nothing? Can any one describe nothing? Let the most astute logician or metaphysician attempt a description, and he will find himself adrift in a mystic sea richocheting from its turbulent billows, still grasping at something. It is an impossibility for the mind to form a concept of a condition of nothingness, and no such condition can therefore exist. There is not the minutest portion of space imaginable, but is pervaded by immaterial force, and this force is constantly changing; for there is a ceaseless activity, and action is but change. This is the grand law constitutionally impressed upon the entire universe by creative intelligence; and this is what we call Substantialism.

NEWBURG, N. Y.

IS EVIL AN ENTITY?

BY REV. W. AMOS MOORE.

THE Rev. A. D. Potts in his article on "Substantial Creation" in the June number of the ARENA quotes St. John as follows: "All things were made by him and without him was not anything made that was made," and adds "such is our belief in the days of Substantialism." I beg leave to ask the brother if in the light of the above quotation he believes in evil or "the devil" as an entity? and if so is it an "entity" that "was made?" If so, then, by whom was it "made?" If an "entity," must it not have life, force, power, and governing principle? If so, whence came they? Can force, life, principle be destroyed? If not, then, is there not something eternal that is not God or of God, and how can it be possible to overcome the world, the flesh, and "the *devil*," "the last enemy," "death," etc.

CHICAGO, ILL.

REPLY BY REV. A. D. POTTS.

Imagine my astonishment when the above letter from the pen of Rev. Mr. Moore reached me. Without any explanation of consequence, the brother sails out on the ocean of queries with flying colors and spread canvas. One thing of vital importance pushes

itself into my mind at this time and it is the fact that Brother Moore has failed to read aright the able article of Dr. Hall on the subject of "Material and Immaterial Substance" in the May number of the ARENA. Had he done so, he might have seen how I carried out the same ideas on the subject of "Substantial Creation." And it is on the rock of inability or unwillingness to discover the true dividing line between the *material* and *immaterial* that so many who assail the Substantial Philosophy make wrecks of their once proud intelligence.

Whether Brother Moore is after pure truth or is only eager to entrap, is a matter set aside for the present. With my knowledge of the Substantial Philosophy, (and I mean to keep on getting more) I will endeavor to explain what I mean when I call evil an entity. Brother Moore pointedly asks the question, "Is Evil an Entity?" I say it is. It is either something or it is nothing. What does Webster say about the word in question? Here is his answer—Entity according to his derivation is "a real being, whether in thought or in fact; being; essence; existence." And how about evil? The same authority defines evil as something "not good;" or in other words, "anything that directly or remotely causes suffering of any kind to sentient beings." Thus, then, if evil is something it is an entity; it exists, has particular being, influence. If it is not an entity it is nothing; has no existence; no influence; can do no injury. What then is evil but the devil? Prefix the letter *d* to the word evil and you have the word *devil*. To my mind it is very evident that they go hand in hand in their onslaughts on men. And I verily believe that Brother Moore preaches against both of them. If they are not entities then he fights as "one that beateth the air." The next questions propounded by our inquiring Brother, are these: if evil is an entity "is it an entity that was made?" and "by whom made?" The reading of God's Word casts enough light on the subject. That word never speaks of anything bad being made by the Creator.

When I quoted St. John I knew what kind of things were made by God. Yes, indeed, I repeat it that "all things were made by him." More than this I remember God's words when He spoke of His creation and said that "it was good." Certainly all the things made by God were truly good. Do you not know that while all things are possible with God that they are only the *all possible things?* Do you not know that certain things are impossible with God?

Is it not impossible for God to lie? Could He then make evil and call it good? Would not such a course throw Him open to the charge of lying? Again, is it not impossible for God to deny Himself? Is He not holy, and altogether righteous? Could He associate with evil without denying Himself His just prerogatives? What answer then shall we make to the foregoing questions? We have already answered one question by saying that evil is an entity. That admits of no further discussion. And, indeed, the next question as to the origin of evil has been indirectly answered by showing that God is not its author. He could not be such, and at the same time be supremely holy. Whence came evil? I say it was not made at all. This then forever exonerates the passage of Scripture quoted from St. John as shielding evil or of tracing its origin to our God. No, indeed, evil was not made in the sense that God works.

Evil *"became,"* so to speak. The Devil came to be, in other words. The Devil is only Lucifer changed. Evil is good corrupted. Adam before the fall was a saint; after the fall a sinner. God made or called into being, Adam, the saint; Adam became a sinner by taking to himself the essence of evil. God gave Adam the freedom of will, and Adam sinned against God in the abuse of that freedom. The fruit that Adam ate had not so deadly an effect upon him as the disobedience connected with the eating. Evil, in his case, was the result of disobedience. Through that disobedience many were made sinners. Because of such a state many were made to suffer. God, in the whole transaction, permitted disobedience, and hence permitted evil. In no sense did God make evil. He could not according to His being and nature depart from purity, and maintain His integrity when He said, "Once have I sworn by my holiness that I will not lie unto David."

And while some may say that God made evil because He made every creeping thing on the earth they only do so because the devil came to Eve in the form of a serpent. He might have came to the mother of all living under some other guise. The devil chose the serpent as the best appearance under which to approach our first parents because "the serpent was more subtle than any beast of the field which the Lord God had made." He always resorts to the best tactics. He is too shrewd to choose a form that will poorly subserve his hellish purposes.

But, in order to make clear my ideas as to how evil came to exist and operate, permit me to make use of an illustration. And right here I would say that I am not trying to answer my inquiring friend from a purely scientific standpoint, but rather to lead him to the fountain of truth in the way most plainly marked out. Now for the illustration:

Dear Brother, think of that clear, rippling mountain stream! See it in its mountainous descent! Speak of its sparkling crystals! That water was certainly made by God. See that man casting into the limpid water the clod of ground! Note the difference!

The water has not been destroyed by his act; no, it still exists, but only as muddy water. The man did not make the water, nor the dirt cast into it. No, but he changed the clear water into muddy water. So, evil was not made in the sense that God is the Author of all things as they exist.

I need not enlarge on the subject of evil as being an entity. Such a position needs no fortifying. Whether evil as such, has life, force, power and governing principle is a question admitting of much thought and careful study. Evil, as we are wont to speak of it, undoubtedly has life, force, etc.

We all know that evil has its burden-bearers. When the devil assaulted Eve he crept, so to speak, into the subtle serpent. When he tried to induce the Savior of the World to worship him he spoke as a mighty ruler and dispenser of wealth. When the evil spirit was driven out of the possessed souls in the country of the Gergeseues it chose the companionship of swine. Again, the same satanic agency has exhibited himself by transforming himself into "an angel of light." Indeed, he shifts from one thing to another. We are told that he assumes the wariness of a lion when he goes "about seeking whom he may devour." Under all these various forms, call them external and communicating if you will, we find the devil operative. And right here let it not be forgotten that the devil, while he inhabits tangible, material, and even imaginary forms, is nevertheless a spiritual power. As he goes forth, clad in certain habiliments, he is nevertheless devoid of immortality in the sense that the soul of man is immortal. It was a part of the wisdom of the ages and of the plan of Divine Goodness that all evil should be brought to naught. More than this, the same Omnipotent Ruler of heaven and earth has forever settled the question of Satan's final overthrow. Do not let any one who is at all serious for a moment entertain the thought that all life is the same in nature and quality. We know that there is plant life and bird life; insect life and human life. Call the principle or force the same in every instance, if you will, but bear in mind that all terrestrial life has its potent opposite.

Far above and beyond our natural life is a principle or force well known as spiritual life. Spiritual life in the sense that we speak of God's infinity cannot be put on equality with the spiritual life of even the angels of God who do His bidding. Hence, when we speak of Satan having spiritual power, it is not meant that the type and character of such power in any way go along with and embrace the scope of infinity characteristic of the Supreme Ruler of heaven and earth. Because our spiritual life will lift us far above natural life in no manner conveys the idea that such life shall make us fit to occupy the throne of God. Indeed, it would only be possible for the devil to enter a realm where his existence would be eternal with the pure in heart in case he should be converted unto the saving knowledge of the truth as it is in Christ Jesus. That such a change will ever take place cannot be believed. And while spiritual power may seem to be eternal in the case of the devil and his wicked angels, it must be strictly borne in mind that the abode where that power shall be exercised will be vastly different from the realm we usually call eternity. We know that a time is coming in which Satan shall cease to rule in the hearts of men. That time will be when God, in His glorious conquest, will smite the demon of darkness, and while thus fallen down, bind him forever to the circumstances of the place, "Where the worm dieth not, and the fire is not quenched." If, indeed, there be any eternity aside from the blessed eternity we are so anxious to live in, it certainly must be that one which our Eternal King refers to, when He says, "Depart from me, ye cursed, into *everlasting* fire, prepared for the devil and his angels." To prove, however, that God shall finally triumph over all His enemies (and truly the devil is a great one), I refer you to the words of the apostle as they are recorded in I. Cor. xv., 24–28, inclusive. I fear that there will be more of an entity in that world of woe, than even the devil will care to enjoy. Unless the devil is an entity, he will not need the place prepared for him and his angels.

PLEASANT UNITY, PA.

THAT WHEEL PROBLEM AGAIN.

OROVILLE, CAL., August 7, 1887.

To EDITOR SCIENTIFIC ARENA:—

DEAR SIR:

Referring to your "old chestnut" item on 14 page of June "ARENA," just received, I desire to say that the "meat of the nut" is contained in the undisputed fact, that with relation to the centre of the axle, around which the wheel revolves, all parts of its circumference or outer rim moves with equal velocity.

Herein lies the confusing idea of the question. As stated, it is only a "catch" at best, for it may be construed to apply to its motion around its axis, or to its movement through space, and a complete answer must first require the statement in the question, of what "mode of motion" is meant.

Taking it for granted that its movement through space is meant, your answer is undoubtedly correct.

Respectfully,

JNO. P. LEONARD.

REMARKS BY THE EDITOR.

Manifestly Mr. Leonard knew, or ought to have known, that our explanation, as to which part of the wheel moves the faster, the top or the bottom, related definitely to the ground and not to the axle. If the ground is not taken into account as a stationary object, then the forward motion of the wheel is not included in the problem, and it would be the same as asking the silly question which part of the wheel, the top or bottom, moves the faster when it is made to spin around a fixed axle? It is not likely that the question propounded by the inquirer to whom we responded, involved any such nonsense; and therefore could not have meant the motion of the wheel in relation to the axle, but in relation to the ground; and consequently our answer was not a "catch" but the legitimate solution. If we ask how fast a man is going when walking at a certain rate on the deck of a steamboat, it may be intended by the interlocutor as a "catch"; for it may mean with relation to the deck, with relation to the water, with relation to the earth's centre, around which it is rotating, with relation to the sun around which the earth revolves, or with relation to space through which the solar system is traveling with unknown velocity. Each relation requires a different answer, which will depend entirely upon which way the boat is traveling. Surely this needs no elaboration to make it understood. But the manifest meaning of such an inquiry should alone involve the man's movement with relation to the deck, unless the other relations are specified.

THE MONEY QUESTION SOLVED.

BY REV. D. OGLESLY.

THE Money Question has been on the tapis for thousands of years. Every device that the ingenuity of man could invent, has been tried. Every substance in the realm of nature almost, has been used. Slaves, cattle, wood, iron, brass, gold, silver, copper, nickel, sea-shell, and coon-skins. And yet, to-day, the closing decades of the 19th century, finds the question, apparently, as far from being settled as it was at first. From age to age, and from generation to generation, the so-called statesmen and legislators wrangle over it for the thousandth time. Is it possible that it is a question that cannot be settled? Can it be that a question so vital to society, a question that lies at the base of civilization, that enters into the very heart of Christianity itself, cannot be settled permanently?—so permanently that it will not be necessary for rulers and legislators to be tinkering at it from year to year? Like every other structure that is to stand, the system of finance or money must be based on a foundation of truth and justice. And the reason why the thousand-and-one systems that have been tried and proved failures is, they were erroneous and false. The writer in this article proposes to point out the false basis of every system that has gone before, and indicate a true one—and the *only* true one that can be constructed and stand. This looks very "cheeky" in a very humble and obscure writer, to presume to do such a thing. To call in question the wisdom of the world on this matter, and point out a system in advance of all that have been constructed. Will the reader please grant this request—Defer judgment until we finish the investigation? If he will do us this favor, and himself the justice by so doing, we have no fear about the result.

In order to get down to bed-rock truth on this question we must find out: First—what money is. Second—What is money made for? Third—who makes money.

Now these questions are so simple, so common-place that it seems unnecessary to ask them. Every one is supposed to understand each and all. But, do they? 1st. What is money? Ans. Money is not property. It is not wealth. It is not a material thing. It has no color, weight or measure. No length, breadth, nor thickness. The *materials* used in making money, or for money, have all the foregoing qualities. The material is one thing, but the money represented by it is another thing. Many readers of this article know this as well as the writer, but for those who have not investigated the subject, it will be necessary to prove it by demonstration.

Illustration: Take a silver dollar, or an eagle of gold. These are money. Melt them; the metals remain as heavy and pure as ever, but they are not money. Now where has the money gone? It is not there. This shows that the material is not the money. Now suppose you get hold of the die-plates, and recoin the metals. There they are as bright, as heavy, as pure as before you melted them, but you are liable to a berth in the Penitentiary for counterfeiting. But what have you counterfeited? Not the metals. They are as pure as ever. You have counterfeited the money. The Government or sovereign power only, being authorized to make money. Other illustrations could be used to prove this proposition, but it certainly is unnecessary. The point is demonstrated that money is not a material thing.

They brought a penny to the Master. He asked, "whose image and superscription is this?" They answered, "Cesars." He replied, "Render to Cesar (the Government or sovereign power) the things that are Cesars." Here it is all in a nutshell. The "image and superscription" constitutes the thing we call money. *It is the evidence of sovereign authority or law, in the markets of the world.* And any substance capable of receiving an "image" or "superscription" would answer that end. Of course, wise statesmanship would select the most convenient, the hardest to counterfeit, and in harmony with these two qualities, the cheapest substances or material.

In view of the foregoing facts, what a humiliating spectacle it is to see the so-called great statesmen of our country, and the world, wrangling over the question of how much silver to put in a dollar. Wrangling about making the dollar bigger, so as to be worth more. It is a dubious specimen of christian charity to refrain from becoming religiously mad in reading the childish twaddle about the size and weight of a dollar, when the dollar has neither size nor weight. Is it possible that these great statesmen do not know this? Have they never emerged out of the woods of barbarism? They wrangle about the money of barbarism. They would swap one thing of intrinsic value for another thing of intrinsic value, when they ought to know that money has no intrinsic value—only exchange value. This introduces us to our second proposition. What is money made for?

Money is made to facilitate exchanges. It does this by representing property. As a rail road ticket represents a certain distance of transportation, so money represents property. The railroad ticket shows that the holder has invested with the company an equivalent for a certain distance of transportation. So any given amount of money is evidence that the holder has invested in the wealth of society that amount in labor or material of some kind. A sells a farm to B. B hands A the money, and receives his title deed. Neither of them have received pay. B's deed only represents a certain amount of land described in it. It would be worth no more than that much blank paper, unless he by it takes possession of the property which it represents. So of A's money. It is worth nothing at all to him, until he spends it for property. All exchanges are made on this basis, where money is used. Exchanges made without money are barter. This system of barter would practically mean no exchanges. No exchanges, means no stimulus to produce. No production means idleness, vice, crime, degradation and barbarism. This shows that money is vital to the life and existence of Civilization and Christianity.

Third proposition.—Who makes the money? Everybody is supposed to know, that the Government or sovereign power in any country, makes the money. This is a correct principle, because the money of a country is made for all people in that country to do business with. In our country the people are supposed to rule. And when the word Government is used, it will mean society. Society then makes the money through or by their servants in Congress.

Now we come to the point aimed at from the beginning. We propose to show here and now the defects in every system of money, in every nation, in every age of the world. It is this—(for one error runs through all,) the systems of money of our world, always have recognized and do now recognize the *possibility* and *right* of the individual to own money the same as property. This is the universal and fatal mistake of mankind. It is the *sand* upon which the systems of money always have been built. Hence they crumble and fall, and carry down with them the Governments of nations. The individual *cannot* own money as property, *because* it is *not* property. His right begins and ends with its *use*. Society created money for the individual to *use*. The individual can neither make nor destroy money. We respectfully challenge the most rigid criticism of the thinking world upon this point. We humbly submit, that the *position taken is impregnable*. It is new, but the editor is noted for attacking and overturning hoary Errors, and will therefore scarcely refuse me a hearing.

THE TRUE SYSTEM OF FINANCE.

We will close by outlining the true and the *only* true system of national finance. Let the Government establish banks of deposit and supply them in connection with the Postal service, say in each county seat for the country, and as many in the cities as are necessary. Let the Government furnish *at cost* to the people, all the money necessary to do the business of the community. When any one has money, and does not need it to do business with, let him deposit it with the Government for safe keeping, and for others to use, if they need it. Of course when a deposit is made, a ceritficate is given. When the depositor needs money, he draws it out. The benefits of this system would be:

FIRST—There could never be "panicky" or "hard times." For these are only another name for scarcity of money wherever business needed money, there it could be had. Under the present vicious systems, panics are "made to order." We have money kings who can control the volume of money, and do just as it suits their avaricious greed for gold.

SECOND—It would open the vaults and safes of the money-mongers, and cause the money to flow on its mission for use and for doing business. It would crush out the present system of banks, and liberate the *peoples'* money.

THIRD—It would at once, and forever wipe out, and bring to an end the pernicious systems of debt and usury for money. These curses, that hang over the race like the pall of death, would be no more. Yes usury, the thing as clearly and forcibly condemned in God's word as murder or theft, has hitherto defied all remedies. This evil would find a certain remedy in the system here outlined.

The Father above could confer no greater boon on our suffering race than to remove usury, and make it impossible for it ever to curse our world again. The system we propose would do that. We would never again be humiliated by the spectacle of Government borrowing of the individual its own money, and paying the individual for the privilege of using what it alone has the right to make. Shade of the sages! What wisdom!

Take a few facts, dear reader. As the case stands under our system of individual ownership of money with its debt and usury, one-half, perhaps two-thirds of the money of our country is locked up in bank safes, and held by the money-mongers under lock and key. It might as well be in the bottom of the ocean, yes, better, for all the good it is doing. Those who hold it, never do business with it. They never expect to do business with it. Although society made it to do business with, these Shylocks are permitted to stand between society and the business of the country, and demand toll on the money belonging to society!

Take another fact. The corporate debts of our country amount to about twenty six billions of dollars. Add to this the mortgaged debts, or debts secured by mortgage, and private debts, and the probability is it will not fall below thirty billions. No man can comprehend this overwhelming sum. Yet all this is drawing interest, much of it usurious interest. It draws this by day and by night. It draws on Sunday as well as during all the week. Drought, flood, famine, do not stop it a single day. And this interest amounts to five hundred dollars, to each man, woman and child in the republic; yet this interest, three thousand millions a year, is paid in some way. How is it paid? It is far greater than the increase of the wealth of the country. How then can it be paid? Reader, it gets its pay by absorbing like a sponge, the wealth of the country. "The big fish eat up the little fish." The money and the land of the nation are gradually sliding into the hands of the wealthy few.

In our comparatively new country, we have a million and a quarter of land tenants. A few men control the land as well as the money of the country. This is the legitimate result of the system of things that recognizes individual ownership or property in money. Egypt, Persia, Greece and Rome, succumbed to this system of things. Less than five per cent. of the people owned any land in those governments when they died. We may deplore this state of things. We may wrangle over the foolish question of ratio between gold and silver; we may philosophize about the size of the Bland dollar. We may do all these, and a thousand similar foolish things, but if we continued the same pernicious system, it will continue to breed debt, usury, monopoly, strikes, panics, poverty and crime, because the system is erroneous, founded in injustice, "conceived in iniquity, born in sin."

Yes, by it cities of greater and still greater magnitude will spread out, magnificent palaces will rise, millionaires will spring up as mushrooms in a night, but the great mass of our race will sink deeper and deeper down into poverty, wretchedness and ruin.

RICHVIEW, ILL.

THE NATURE OF FORCE. NO. 1*

BY REUBEN HAWKINS.

Is FORCE a primary causative entity in nature, or only an abstract idea conveying to the mind the effect of the motion of matter?

Is the doctrine of the correlation of the various forces true, in the sense that they are convertible one into another? Can the absolute force which rules the universe be properly correlated to anything, in terms signifying equivalence? In other words, is there an infinite Fountain-head, not the equal of all phenomena, but their originator, their superior? These are important questions, as our belief or disbelief in an intelligent Creator hangs upon the answers we may give.

A body of matter in motion manifests to our senses, when brought in contact with us, or under other proper conditions, what we will call mechanical force; and extreme mechanical force applied to a body which is free to move, will put such mass in motion.

Motion itself can be nothing but change of location in space—but what is the mechanical force carried by the moving body as momentum?

The cause of motion in a cannon ball may be traced back, step by step, to gaseous expansion caused by heat, which was generated or awakened into activity by chemical action; and the conditions and causes which made such chemical action (combustion) possibly may be traced further; and these causes and effects may also be expressed in terms signifying mathematical equivalence within certain limits, ending somewhere—some say in sunshine—where mathematical formulas fail us.

But in admitting these formulated mathematical laws as correct within the limits of their application, does it necessarily follow that one kind of force is changed into another?—or that these various phenomena are only changes in the modes of motion? Is it not more reasonable to conclude that these various forces have a substantial, though immaterial existence, and that they are infinite in extent, and ever ready to act when material conditions are such as the laws governing their action require, each in succession doing its work and coming to rest in the preparation of the material conditions upon which its successor will act, or continuing to act perpetually as in gravitation?

Suppose we fire a cannon ball upward, vertically, in a vacuum, it will rise till gravity cancels its momentum, and it will remain at rest at the point where such cancellation is finished if its fall is prevented:—now into what other force, or mode of motion, has its momentum or motion of mass been converted? Will heat be generated by arrest of motion under these circumstances? I do not think anyone will so affirm. Where, then, is the mathematical equivalent of the cancelled mechanical force? It can only be found in the work performed—though in the performance of this work the conditions have been so changed that gravitation may restore the equivalent of the canceled momentum by acceleration of fall. But has the original projectile-force been converted into gravital-force? Gravital tendency toward the earth will be somewhat decreased by its elevation, and again somewhat increased by approximation of the earth in its fall; but has the original projectile-force anything to do with these changes? Nothing except to change the conditions as to relative location of the ball and earth. The scientist will tell us that the original projectile-force will become *static* at the highest elevation of the ball, and if he is a mode-of-motion philosopher, his words will imply a static mode of motion, which to us—who are less gifted in imagination—is an absurdity.

With regard to simple mechanical force, however generated, (not including gravitation) and its apparent conversion into heat, light electricity, &c., or all of these successively, we can trace such correlation as implies equivalence between cause and effect, and apparent conversion of one into another; but *with this kind* of correlation we can never reach gravitation.

The correlation between gravitation and these other forces is such as to preclude the idea of even apparent conversion. Gravitation brings into activity these other forces, and controls them within the bounds of law, without any apparent reciprocal effect on itself. It works without loss of energy.

The returning ball weighs just as much as it weighed before starting, although gravity has performed the double work of canceling its motion and momentum in one direction, and giving it an equivalent momentum in the opposite direction. It is performing perpetually a work analogous to this, on an infinitely prodigious scale, in swerving the heavenly bodies from straight lines, and holding them in their orbits, without loss to itself or change into any other form or mode of action.

If heat were generated by the simple arrest of motion, the planets would soon melt with fervent heat, as their direction of motion, *and momentum in that direction*, at any given point in their orbits, is all canceled when they reach a point 90° further on, and at 180° it is entirely reversed in direction. This is exactly analogous in principle to the reversal of direction of the cannon ball. The conditions however, at the start differ, in the fact that the ball travels along the line of gravital pull, while the planet's direction of motion is across this line. The point however, which I wish to make, is that gravity performs work continually without loss or compensation to itself. On the contrary heat, light, electricity, &c., generated on the earth are evanescent in *active* duration, and their final equivalents after they cease to act can be found only in the work performed in the change of condition or location of matter.

I know of no means, however, by which gravital-force can be canceled or rendered static or inactive.

Other forces or obstacles may counterbalance or overbalance its pull on a limited mass of matter, but it pulls nevertheless, eternally, so far as we know, regardless of all change in material conditions, or amount of work performed—modified in intensity only by variation in distance according to the laws governing its action, but never changing into any other force, "form of force," or "mode of motion." A pound of matter of any kind reduced to the rarest possible form of gas, still weighs a pound. So in following the chain of forces apparently interconvertible in their correlations, we are confronted by an impassable gulf when we try to reach gravitation; and we are forced to abandon any attempt to include gravital-force in a correlated circle of forces interconvertible, or apparently so:—and this is true whether we consider the evanescent-forces developed on the earth as real entities controled in their action by the higher forces of nature, and the conditions of matter, or mere modes or effects of the motion of matter.

In gravitation we have proof, not only of the persistence of force, but of the persistence of the *same force*—more proof than the mode-of-motion theorist has any use for.

Then, we conclude that whether simple mechanical force should be regarded as the mere phenomenon of motion produced by a higher causative-force, rather than a substantial, though immaterial entity or not—from whatever theoretical stand-point we regard it—we can trace its correlations, so far as regards mathematical equivalence and apparent conversion, through only a few of the forces of nature, or so-called modes of motion.

The mode-of-motion theorists take as a basis for their reasoning the (probably true) theoretical proposition, that a mass of matter in motion will continue to move forever in a straight line and at a uniform rate, unless its motion is obstructed or modified by extraneous causes. They assume that the normal or natural state of matter is a state of motion—that there can be no such thing as rest. They further assume that every arrest or modification of motion of mass, from whatever cause, which results in a deviation from the foregoing law, will result in the development of some other kind of motion (commonly called force) as heat, &c., which will be the equivalent of the lost motion of mass, and that these developed forces (or modes of motion as they call them) will in turn develop into other forces or modes of motion. All these processes include changeability into all the forces (or so called modes of motion) of nature. Their reasoning leads them to the conclusion that there is nothing in the universe but matter, because they assume to be true the false proposition that all the forces of nature are convertible into each other under proper material conditions, through a correlated chain which forms a complete circle, so to speak. The proposition that one *elementary thing* can be changed into another *elementary thing*, being untenable—unthinkable—they naturally drift into the conclusion that force has no entitative existence—that it is merely the phenomenon of motion.

If such a correlation as is claimed by them can be proved true, I can see no way to avoid the conclusion that all the forces are merely the phenomena of motion, and that matter with its observed characteristics and motions is supreme. That gravitation, sunshine and perhaps other causative forces of nature coming from the sun, or other heavenly bodies, develop heat, light, electricity, mechanical and probably other forces on the earth, is so apparent as to be universally admitted; but in the development of these forces, it is just as apparent that gravitation and sunshine lose none of their intensity and suffer no change in mode of action; hence I assume that the correlation of force, if by these terms gravital or mathematical equivalence is implied, and even apparent convertibility must be restricted to the forces developed or brought into action on the earth, by the greater primary or causative forces which operate from beyond the earth, and which in themselves are unchangeable and inexhaustible so far as we know or can know.

If the mode-of-motion theory of force be true it follows of necessity—*mathematical necessity*—that the forces developed on the earth by gravitation, sunshine, &c., must eventually be reconverted into these outside causative forces, or these forces would lose their energy. Is there any evidence of such re-conversion? I think not. Is there any evidence that gravitation is effected in any way whatever, or that the sun is losing any of its energy, in the performance of the vast work being accomplished by these agencies?

Theorists may speculate on these questions, but their speculations should not be accepted as truth.

Let them first show the facts on which their speculations are based—then let them show that the facts they present include all the factors in the problem under consideration, before accepting their conclusions.

[CONCLUDED NEXT MONTH.]

* Those who shall desire to obtain a critical insight into the nature of force, and the myriad difficulties which beset modern science in maintaining the various motion-theories of the books, should not fail to study these elegantly written papers of our very thoughtful contributor, Mr. Hawkins. They are among the best written articles we have ever printed—EDITOR.

OUR PRIZE ESSAYS, NO. 1. *

SUBSTANTIALISM.

ITS RISE. PURPOSE. GROWTH.

BY O. F. HIGBEE.

ANCIENT Philosophy had two extremes—idealism and realism. Realism under the icy hand of modern speculation has degenerated into materialism, the worst form of unbelief. It would destroy all hope of a future life and consign man and the brute to the same destiny. Until within the last quarter of a century those who reject Revelation could give no account for the life and order that exist in the world about them, and the Christian philosopher had simply to point to the fact of existence to silence his skeptical opponents. Scoffs at the supposed inconsistencies of the Bible had but little effect upon the students trained

(*Continued on Page* 61.)

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

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

PASTOR HENRY B. HUDSON, - - Associate Editor.

Whole Series, Vol. 7. New York, September, 1887. No. 4.

$1.00 a Year. Single Copies, 10 Cents.

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(For "PUBLISHER'S NOTES" see page 63, and first and second pages of cover.)

THE SCIENTIFIC ARENA will continue to be the official organ of the Substantial Philosophy. Dr. A. Wilford Hall, Ph.D., LL.D., will remain editor-in-chief. Rev. H. B. Hudson continues associate editor. They, with the publisher, will exercise every proper means to add to the already large list of distinguished writers who contribue to the columns of THE ARENA.

While thus assuring to our readers the original contributions of the best thinkers in the ranks of both clergy and laity, an effort will be made to provide subject matter for the home circle, and we hope to make THE ARENA a welcome vistitant to many more thousands of families, as "our family paper."

ANNOUNCEMENT.

☞ O. F. HIGBEE, of Iowa City, Iowa, is entitled to the prize offered in the July issue of THE ARENA, for the best paper on the Substantial Philosophy. His contribution will be found printed elsewhere in this issue of THE ARENA.

W. H. PEPPER, of Milford, Ky., contributed a good treatise upon the subject. He will receive a copy of "The Problem of Human Life," by Dr. Hall.

☞ We now renew the offer, for the best original MSS. article upon same topic, received before November, 1887. Address,

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38 Park Row, N. Y. City.

WEIGHT AND PRESSURE OF THE AIR:

ILLUSTRATED BY THE DIVING-BELL.

BY THE EDITOR.

WE have, during the past year, received several argumentative letters from Mr. Joseph Smith, of Hickory Hill, Pa., denying the theory of atmospheric pressure as taught in the textbooks and in the schools. In a recent letter he repeats his skeptical arguments with almost defiant assurance, and challenges us to prove, if we are able to do so, that our atmosphere presses as universally taught, about *fifteen pounds* to the square inch in all directions and on the surfaces of all bodies at the sea-level.

We really did not suppose that a scientific matter so well established by practical tests, made in hundreds of different ways and upon thousands of different occasions, needed any new scientific proof at this enlightened day and age of the world, nor, in fact, that any man could be found with even a smattering of an English education, capable of denying such a well-established principle in physics. Indeed, we have believed that Mr. Smith, give him time enough would work out the problem for himself, and that he would by his own native ingenuity, demonstrate that the received doctrine of atmospheric weight and pressure must of necessity be true. But he does not seem to be any nearer finding his way out of the scientific wilderness in which he has become lost any more than a year ago. We have therefore concluded to extend a helping hand and point out to him, by the simplest possible illustrations and proofs, what he might have found out himself had he made half the effort to show the doctrine to be true that he has expended in raising trivial objections against it.

As Mr. Smith has spent days and possibly weeks in writing letters and framing supposed difficulties in the way of the accepted doctrine of atmospheric pressure, let him now spend one day in working out a simple experiment which we will here suggest, and it will save him money in the future in both time and fools-cap.

Let him procure a short piece of smooth tubing of an area of one square inch cross section. Let him fit a movable air-tight piston, as nearly frictionless as possible, into one end of this tube and then connect the other end with the exhaust valve of a common air-pump, thereby to remove the air from the tube beneath the piston. Now let him attach this movable piston to the hook of a common spring-balance fixed to a support above, and commence pumping the air out of the tube; and we assure him most positively that he will see to his surprise and edification that just in proportion as the air is exhausted will the piston settle lower and lower into the tube, pulling down the spring of the balance, thus indicating the presure of the outside air in relation to the counteracting pressure of the air still remaining unexhausted in the tube.

Whenever he shall have exhausted one-half of the air contained in the tube, the register of the spring-balance will indicate *seven and a half pounds*, minus the friction of the piston; and whenever all the air shall be pumped out, or as nearly all as can be effected by the best form of air-pump, the spring-balance will register nearly fifteen pounds, minus, in like manner, the frictional resistance of the piston.

The same proportional result precisely will be obtained when a larger tube is employed. If it be equal to two square inches, cross-section, four square inches, eight square inches, etc., the register of the instrument will approximately indicate respectively, 30 pounds, 60 pounds, 120 pounds, etc., and so on for any larger or smaller tube.

Now, after Mr. Smith shall have tried this experiment to his satisfaction, he has only to ask himself the simple question:—Is it the *pressure* of the air outside of the tube which acts on this spring-balance, or is it the *emptiness* of the tube inside or below the piston which produces this weight and pressure in mechanical pounds? The answer is simple and plain: As emptiness or vacuum is absolutely *nothing*, it can of course produce no mechanical effect. The conclusion is therefore irresistible, *that the pounds indicated by the spring-balance are caused alone by the weight of the outside air.*

One of the supposed difficulties in the way of the received theory of atmospheric pressure, and the chief one which seems to puzzle Mr. Smith, is the fact that an ordinary sized man must have a constant pressure upon the surface of his body, of about 14 tons, if the theory be true, or enough to crush him to death. Mr. Smith asks, with a sneer at the accepted theory, how this can be? We answer, that each and every fibre, or minute particle of a man's body is not only permeated with air, but individually surrounded by it at the ordinary atmospheric pressure of 15 pounds to the square inch. Hence, it follows, as this pressure is outward from every part of our interior structure and in all directions, as well as inward; and as this general pressure is thus sub-divided up by acting on millions of minute fractions of every organic being, and counter-balanced by acting on all sides of each of such minute fractions, it is exactly equivalent to sub-dividing the 14 tons of aggregate pressure by *millions*, thus making its compressing effect inappreciable on any one part of the body's surface.

On the other hand, if a man had no air inside of his structure to counter-balance the pressure of the outer atmosphere he would without doubt feel a very uncomfortable pressure if he would not be fatally crushed. It would be the same in effect as to be placed in an air-tank or caisson and suddenly subjected to the pressure of another atmosphere before having plenty of time to breathe.

This is beautifully illustrated in the use of the *Diving-Bell*. Submarine explorers, especially when searching in deep water, are obliged to make their Diving-Bell trips with great caution and deliberation in order to avoid this very crushing weight and pressure of the air, the existence of which Mr. Smith so strangely denies. Should the Diving-Bell be let suddenly down fifty or sixty feet, the explorer confined within it would never come up alive, as the weight of the water above the bell would instantly produce on the air within it a pressure of one atmosphere, or 15 pounds to the square inch, all over the surface of his body, for each 33 feet the Diving-Bell would descend, a result which would no doubt be fatal at the depth supposed. To avoid this result a very slow descent is necessary in order to allow the explorer time to adapt his lungs and circulation to these abnormal conditions of pressure.

The increasing pressure of the air as the bell descends, is caused by the water's rising in the mouth of the bell, thus compressing the air in its upper portion into a smaller volume. This upward tendency of the water in the bell is entirely owing, as just intimated, to the weight of the water outside and above the bell, corresponding to the depth it has descended; that is, about 15 pounds to the square inch for each 33 feet of descent.

If Mr. Smith will study the pressure of the water on the surface of bodies at different depths, he will have no difficulty in solving all his objections to the weight and pressure of

the air, as the principle involved is precisely the same. At a certain depth the cork of an empty flask will be driven into it, and at a still greater depth, if hermetically sealed, the flask will be crushed by this pressure. Yet the most delicate fishes actually live and breed at a depth of several miles below the surface of the ocean, subjected to a water pressure of more than 6,000 pounds to the square inch.

The reason for such a possibility is explained on precisely the same principle as that just given in the case of a man's body subjected to an atmospheric pressure of 14 tons. These submarine animals, so often brought to the surface in our deep-sea dredging operations, are constituted largely of water at the normal pressure at that depth, their most minute parts being surrounded with it, thus virtually subdividing this aggregate pressure on their bodies almost infinitely. We trust these hints will throw a flood of light on the mind of our excellent friend Mr. Smith.

Now there is a moral to be drawn from this fallacious position of Mr. Smith so vehemently urged upon our consideration. Because we have boldly taken issue with scientists on various theories and false doctrines in physical philosophy, such as those making the natural forces but modes of motion instead of substantial entities, young investigators must not suppose therefore that we are ready to oppose indiscriminately all theoretic doctrines of science, nor must they expect us to join them in a general crusade against well-established laws and principles of physics. They will find themselves entirely mistaken if they suppose that we have any sympathy with that blind iconoclasm which acts in science as does the bull we read about in a china-shop.

We have been urged scores of times to take and defend the most ridiculous positions in physics, such, for example, as that cold, darkness, and even vacuum, were real substantial entities instead of mere negations or absence of objective existences, and because we have not done so, at the urgent suggestion of some enthusiastic but short-sighted investigator, we have been denounced as inconsistent with our own iconoclastic principles of Substantialism. We wish to warn all such backward progressivists that to reform science is not by any means to deny or repudiate well-established principles of physical law. Because we have fearlessly criticized certain phases of theoretical astronomy is no reason why we should fight the law of gravitation, or fall into the monstrous fallacy of the flat-earth theory, as advocated by "Parallax" and his followers.

The most scrupulous discrimination in science is our constant watch-word, having long ago resolved to accept and defend whatever is defensively in the books, and only to oppose that which will not upon close scrutiny bear the light of rigid and unbiased investigation. A man is no more fit to be called a scientific investigator, who for novelty's sake will reject a theory because it is old, and try to find something new that will answer the purpose, than are the modern fossils of science who, out of admiration for recognized authority, will repudiate everything that is new in scientific or philosophical discovery, however reasonable on its face, simply because it has not first been accepted and taught in some respectable college.

THE STUDY OF SUBSTANTIALISM.

BY THE EDITOR.

Some readers suppose judging from heir communications, that the Substantial Philosophy can be grasped and comprehended in a single hour's study, while others suppose that they could overturn it in half that time, and that too, without knowing what Substantialism signifies.

Now both of these suppositions are wrong. The unfoldment, analysis, and vindication of the principles of Substantialism have cost us more than ten years of the hardest mental labor we have ever given to any subject, and we believe we speak truthfully when we aver that he will be a bright student of physical and metaphysical science, who in one month of laborious study shall be able to comprehend the details of those principles and illustrate them to others, clear, simple, and conclusive as they are on their face to every intelligent thinker after they have once become familiarized.

The Rev. Henry B. Hudson, the eloquent lecturer, though he grasped and took in the basic principles of this philosophy by simply reading and studying the "Substantialist's Creed," during a single sitting, confesses that he found the grand and comprehensive sweep of those principles, with their detailed elucidation and bearing, no child's play even during weeks of laborious study to make them his own. And we assure those who shall ever enjoy the pleasure of listening to that orator through a course of three or four of his lectures on the Substantial Philosophy, its vindication and its value—that they will be very apt to arrive at his conclusion.

As to those readers who think themselves competent to overturn Substantialism in half an hour, we venture to guess that they have never so much as read the *Substantialist's Creed*, much less have they studied even one of the hundred or more critical essays and arguments by which the principles of that creed have been defended and maintained in our publications in the face of all opposition during the last six or eight years.

We do not hesitate to declare, even in the face of such bigotry as will condemn a doctrine without investigating it, that it is only the careful study of the Substantial Philosophy in its bearings upon the anologies existing between science and religion which will enable any theologian however able or highly educated he may be, to keep his feet one minute in the presence of a bright follower of that bold and defiant materialist Ernst Haeckel, or that great English scientist, Thomas H. Huxley. Those men will pick up the text-books now approved of and used in every religious college in this land, and from which are daily taught the young men of the rising generation, and they there find that heat, light, sound, and the other physical forces and phenomena-producing causes are but modes of motion of material particles, and in no sense substantial entities. Now what can any scholastic theologian say in reply when such materialists make application of this mode-of-motion philosophy to the forces we call mind, life, soul, spirit, etc., and insist by every principle of logic and natural analogy that these forces likewise are but the phenomenal motions of brain and nerve molecules?

What can modern religious philosophers, reared in the scientific scholasticism of our great colleges and universities, say in reply to Haeckel when he defiantly throws into their teeth the logical truth that since heat-force or sound-force is only a mode of motion of matter which motion necessarily ceases to exist as soon as the moving matter comes to rest, therefore, life-force, soul-force, and mind-force, as the analogous motions of brain and nerve matter, must also cease to exist at death or whenever the brain and nerve molecules shall cease to move? These learned theologians could make no reply. They would be dumb in the presence of such logic.

There is not a beginner in philosophy and logic anywhere in any school in Christendom who would not be compelled to admit the consistency and cogency of Prof. Haeckel's reasoning, and the utter discomfiture of any theological exponent who should attempt to prove the soul a substantial entity after avowing his acceptance of the text-books which resolve all the analogous forces of nature into modes of motion of material particles. Indeed, the ablest theologian of the land could be tied hand and foot by a child who knew how to wield this single argument of the materialist.

If soul, mind, life, and spirit are natural forces—and none but quibbling sophists will dispute it,—then those forces must be modes of motion of nerve and brain matter, just as sure as heat, sound, light, magnetism, etc., are but modes of motion of other material molecules. The religious philosopher who concedes the latter has hopelessly given away the entire doctrine of the possible immortality of the soul to the materialist. Weep and mourn and lament as he may, the soul, mind, or spirit, as the rational force of man's intellectual being, cannot be consciously immortal except it be personally a substantial entity; and as force throughout physical nature is confessedly but motion which comes to an end when the body moving comes to rest, hence the soul-force, as motion ceases to be when the physical organism ceases to move. If any form of force whatever in the natural universe be accepted as mere motion, then logically and inevitably *death ends all!*

There is no help for modern religionists, no salvation for their doctrine of the immortality of the soul, but by the study of Substantialism, and the acceptance of its scientific demonstrations that force *per se*, instead of being a mode of motion, is in every conceivable case a substantial entity—an objective thing.* With force thus demonstrated to be an immaterial substance (even including such forms of force as sound, light, and heat), then away goes materialism to the limbo of exploded hypotheses, where it long ago would have been consigned but for the persistent prejudice of scientific theologians who have refused to accept Substantialism in support of the scriptural doctrine of human immortality.

It is not too late for them even yet. They have by no means sinned away their day of substantial grace. Let them at this warning toll of the bell of a new era in science and a new impetus to religion, resolve to commence at once the study of Substantialism, and if they go earnestly about it, they may depend upon it that in less than a single month the mists of materialism will begin to lift, and the soul now bowed down in darkness will be enabled to

"Read its title clear
To mansions in the skies."

*When we first wrote the "Problem of Human Life," we were fresh from the scientific controversies which made *matter* and *substance* synonymous terms, and it is not to be wondered at that we were occasionally betrayed into the same error of using the term *matter* when we should have employed the more general term *substance*. The revolution from this erroneous use of words and this jumbling of the old school phraseology with the newly developing philosophy was too great to be instantly accomplished. Our writings for seven years past, however, have made sufficient corrections of such slips to leave no excuse for any candid person's now misunderstanding Substantialism.

REV. DR. CRAWFORD'S PAPER.

We would not be doing the reader justice should we not call special attention to the first contribution in the present number of the Arena from the pen of our new and able contributor in Dakota. Such nice discriminations in the more intricate phases of physical and metaphysical science, as they bear upon the Substantial Philosophy, especially in an elaborate critical argument, are very rare indeed. This paper is a timely example for other Substantialists, showing them plainly what they may accomplish even in a few months by a persistent study of the principles of that far-reaching philosophy. We are proud to welcome to our columns all such bright intellects, who are able to prove by their pens that they think above, below, and beyond the ordinary surface of things. We have other articles constantly appearing in the Arena which are equally discriminating, though not so elaborately argued and carried out.

CARPENTER AND ZETETICISM.

BY THE EDITOR.

In the July number of the ARENA in answer to a query from a correspondent, we presented a criticism based on unquestioned facts against the flat-earth theory, which no human power can overturn or even jostle. That argument was founded on the main fact, that if the earth is flat, and if the sun, moon, and stars are always the same distance above its surface, merely circling diurnally around the northern centre of this plane, as the flat theory teaches, then the setting of all these heavenly bodies is only an appearance resulting from the law of perspective on account of increased distance—an absolute and self-evident impossibility. That the setting of the sun and moon is an appearance thus caused alone by perspective, or by a narrowing of the angle of vision between the sun and the earth's surface, both Carpenter and Parallax distinctly insist. Indeed, they can assume no other view since they deny the rotundity and revolution of the earth, the only other class of fact which could possibly cause such appearance. We repeat here, as we stated in our July article, that a more self-contradictory, preposterous, and puerile assumption never found a lodgment in the brain of the craziest lunatic confined in an asylum for the insane, as we will now for the third or fourth time proceed to show.

Soon after our July article appeared, Carpenter became so utterly "rattled" on account of its annihilating effect, that he simply raved in a column article in the *Baltimore Weekly*, a paper which for some incomprehensible reason admits his erratic pen into its columns. He used the term "liar" repeatedly, and applied the ugly epithet to us as nearly as he dared in view of the legal consequences, for he is a wily defamer with legal methods in his madness.

After a few weeks of mental perspiration he thinks better of the poor policy of calling people "liars" without proving it, and really comes down, in another column article in the *Weekly*, with the semblance of an attempted argument. He does not, however, pretend to deny our explanation of perspective effects as they act on measurable bodies near the earth's surface. No, not at all. He does not in the slightest degree demur to our position that a white globe, say, three feet in diameter and maintained three feet above a perfectly flat prairie while receding in the distance, would be reduced to a mere point by the law of perspective the moment the three feet between it and the prairie was obliterated by the same law. He knows only too well and dares not deny, that the apparent height of any body over a plane, while such body is receding in the distance, *only diminishes in precisely the same ratio as the apparent diameter of the body itself decreases.* This is the universal law in the case of all bodies of measurable diameter and of a known distance above the ground, or separated a given distance from any other object. There is no exception to this effect of the law of perspective, as "Parallax," in his great book, admits and proves by various illustrations. Why, then, should not visible heavenly bodies, of a definite measurable apparent diameter, and of a definite measurable apparent distance above this "flat earth" conform to the same law of perspective both as to their own decrease in apparent size and their decrease in apparent height as they recede? Why, in the name of all that is rational, should the sun, which Parallax and Carpenter tell us is "700 miles" above the ground when overhead, and two feet in apparent diameter, and which continues to be "700 miles" above this flat earth while receding from us—why, we insist, does this sun appear to come clear down to the flat earth and disappear, thus wiping out "700 miles" of actual space by perspective effect, owing to its increased distance, *while not diminishing its diameter a hair's breadth by the action of this same universal law of perspective?*

Come, Mr. Carpenter, the readers of the *Baltimore Weekly* are not such idiots as their imbecile editor takes them to be. His calling the ARENA a "Rag-Bag" repeatedly in one brief editorial, like a naughty boy making faces, shows the true calibre which is capable of supplying readers with such impoverished puerility as this flat earth drivel. He dares not to allow you to print this article in his paper and attempt a reply. If he will do so, and if you will answer it, we will, according to your own magnanimous game of ! :ff, give you "one hundred dollars!"

But to return to this latest article of Carpenter, which for once condescends to what he calls argument, let us look at the only thing he presents which has that appearance, even in a remote degree. Here it is in his own words:

"The doctor forgets that luminous objects, or lights, do NOT diminish in apparent size as their distance increases in anything at all like the ratio maintained by non-luminous bodies. Besides, the Zetetic philosophy deals with what IS—not with that which is thought SHOULD be, even though a Dr. Hall should think it."

We now assert, with all the emphasis our language can concentrate, that this only argument of Carpenter in his column article as in any way affecting the force of our criticisms, is based on what he must have known to be absolutely false in fact. We assert, what any one knows to be true, that a luminous body, having a distinctly marked outline of subtended vision like that of our sun or moon, will decrease in apparent size by the law of perspective as it recedes in the distance, exactly as in the case of any other visible object. It is only self-luminous bodies *without an outlined visible diameter*, such as electric arc-lights, which by their scintillations do not decrease in apparent brightness in the ratio of their increased distance. To prove this let it be tried on a *transparency*, say three feet in diameter, as bright as the full moon, and let it be gradually removed over a flat prairie in a dark night, keeping its lower edge three feet from the ground, and Mr. Carpenter can rest assured that whenever this subtended angle of vision between it and the ground shall be wiped out by perspective (which will occur when it has receded 9,000 feet), *its diameter will also be wiped out and reduced to a mere point, the same exactly as if it were a white board, viewed in daylight.* There is no mistake about this law of perspective applying to all bodies, luminous or non-luminous, having visible and measurable diameters, thus annihilating the entire system of zeteticism.

But there is one other absurdity of this perspective setting of the sun we have not yet alluded to, and which is so amusingly monstrous that it should not be neglected. As the sun's apparent diameter by perspective is two feet when overhead, or just "700 miles" away as Carpenter and "Parallax" teach, we find by calculating backward just what the real diameter of the sun would be if placed right by the side of us. This is determined by the well-known rule that any round body, whatever its size, will be reduced to a perspective point in receding 3,000 times its own diameter from us. That is to say, let a white board one foot in diameter be removed 3,000 feet away and it will be seen as only a mere point.

Now by a reversed calculation the sun, which is two feet in apparent diameter at "700 miles" away, must be when near to us only about 1,250 feet in actual diameter, the apex of the subtended angle, where the sun would come to a perspective point, being but about two miles farther away than is the sun now—or 702 miles! Hence, if this zetetic sun should by any accident chance to get two miles farther away from human gaze than when overhead, it would inevitably become only a point of light like a fixed star! Yet it is a fact well known to every tyro in astronomy, that in winter in the arctic regions an observer sees the sun in the south still two feet in apparent diameter, *when it is thousands of miles farther away than in March when viewed from the equator!* Thus is the whole zetetic philosophy strangled into a ghastly absurdity.

Astronomical information is to the effect that the planet Mars is nearly a duplicate earth. The conditions of land, air and water are precisely similar, but the climate is thought to be much milder on account of the small amount of snow at the poles. One of the moons of Mars, it has been ascertained, completes a revolution round that planet in seven hours.

DANIEL CURRY, D.D.

THE N. Y. *Christian Advocate* of August 25 contains notice of the death of this noted divine. From a very interesting sketch in connection we take the following:

Daniel Curry was born in New York, near Peekskill, Nov. 26, 1809. Working his own way, he entered Wesleyan University, whence he was graduated in 1837, in the fifth class sent out from that then infant institution, the first fruits, on so high a plane, of the new life of American Methodism. Immediately he took charge of the Troy Conference Academy at Poultney, Vermont; but in 1839 became Professor in the Georgia Female College at Macon. In the Minutes of the Georgia Conference for Jan. 20, 1841, the last name in a list of twenty-five admitted on trial is Daniel Curry. He was stationed at Athens, being returned in 1842, and in 1843 admitted into full connection and transferred to Savannah. In 1844 he was sent to Columbus, but in the course of that year, in view of the increasing troubles and probable division on the question of slavery, he was transferred to the New York Conference, and appointed to Twenty-seventh Street, in this city. In 1846-47 he was pastor of the First Church of New Haven, Conn. In 1848 the New York East Conference was organized, and Daniel Curry was one of its original members. During the next seven years he was successively pastor of Washington Street and of Fleet Street, Brooklyn, and of the First Church of Hartford, Conn. In 1854 he was returned to Twenty-seventh Street, New York; but in the course of that year was transferred to the Indiana Conference, and made President of the Indiana Asbury University. In two years he came back to the East and was pastor in the South Third Street Church in Brooklyn for one year, at the close of which he was stationed at Middletown, Conn., the seat of his *alma mater*, returning a second year. In 1860 he removed to New Rochelle, remaining two years, and then to Thirty-seventh Street, New York, being as usual sent back for the second year. In 1864 he was made presiding elder, but at the General Conference, a few weeks later, was elected Editor of *The Christian Advocate*, performing the duties of that office for twelve years. He was elected in 1876 Editor of the *Repository*, and in 1884 Editor of the *Methodist Review*, dying in office like his predecessor in *The Christian Advocate*, the famous Dr. Thomas E. Bond. The General Conferences, of which he was a member, were 1848, when he represented the New York Conference less than four years after he joined it; 1860, 1864, 1868, 1872, 1876, 1880, and 1884, the New York East Conference; in all, eight General Conferences.

Dr. Curry, though classically educated, was pre-eminently a reading, thinking, observing man, rather than technically a scholar. His mental energy, sustained without apparent diminution to the last, betokened the soundness of his ancestral inheritance, the regularity of his physical habits, and the continued and easy play of his thinking faculties. While not narrow, he was intense and impulsive, and his more conspicuous infirmities (for what man that liveth is free from infirmity?), arose from those qualities. Yet was his passion rather intellectually combative than malignant, and his prejudices often melted of themselves where strokes had but hardened them.

THE AMERICAN ASSOCIATION.

WE had the pleasure of attending the meetings of a portion of the sessions of the American Association for the Advancement of Science, at its annual assembly, in this city, at Columbia College, during the month of August. Well on toward a thousand members of the Association were present from all sections of the United States, and we enjoyed a feast of observation while inspecting the cranial make-up of these scientific specialists, each of whom, so as far as we could learn, has his hobby or particular scientific field, which is uppermost in his thoughts. A large number of these are radical thinkers, with original conceptions,

which reach far beyond the boundary of accepted scientific theories, and no doubt some of them would not have been received as members of so cautious and conservative a body, had their idiosyncrasies previously become dangerously public.

One of the members present, in whom we took more than ordinary interest, was our very dear friend Chancellor John Kost, M.D., LL.D., at the head of the Fla. State University, at Tallahassee. The Doctor urged us to allow him to submit our name for membership in the Association, but we declined the honor, not because we would not appreciate the distinction it would confer, but because we felt sure that we could not pass the black-balling ordeal. We have unfortunately been too outspoken in our criticisms of modern scientific theories, to be tolerated as a member of any regular scientific association which indorses the text-books on physicial science as now universally taught. But things, we believe, will change in the near future.

It is impossible to give even a list of the papers read and discussed at this meeting, as there were many separate sections all in session at the same time in as many different rooms, so that the only satisfactory way of grasping the general outlines of this important meeting will be to get the Report of all the papers when printed, and deliberately looking over the various subjects discussed. They will make when published a massive, and no doubt important volume to the scientific investigator.

One of the very interesting features of the Association's present meeting, was the lecture of Prof. Drummond, of Scotland, author of "Natural Law in the Spiritual World;" at the close of the sessions, on the "Heart of Africa." It was one of the raciest and spiciest platform efforts we have ever listened to. The next meeting of the Association will be a year hence at Cleveland, O.

PROBLEM IN SOUND.

EDITOR OF ARENA:

DURING the past two years or more, my attention has been called to the following phenomenon in relation to sound and its transmission through the atmosphere, namely: When present where a body of singers were making vocal melody, I could observe no discord or lack of synchronism in the rendering of the music, all the notes appearing to blend in harmony, so that the ear was not offended by any discord either in melody or time. But on removing to a distance of one, two, three hundred yards or more, a very perceptible difference was noticed in the time of certain notes as uttered by the singers, so that the apparently perfect blending of voices when present became distinctly separated, as it were, when at some distance away, so that the apparent perfection of the synchronism was destroyed. As far as my observation has extended, the further the removal from the singers the more marked becomes the divergence of unity in time. I think I have noticed this peculiarity more than a dozen times, always with the same result. In most cases the singers were in a house or building of some kind; but on several occasions they were singing in the open air in a park or grove. So far I have not noticed any case of such perfect unity, but that at a distance there could be detected a variation from the synchronous rendering of all the notes. Yet, I presume, such absolute perfection of unity may be and often is attained.

As the person who is the best qualified as an authority upon the subject of sound, now living, this problem is referred to the Editor of the ARENA for elucidation in the interest of the musical public.

OSKALOOSA, KANSAS. J. W. ROBERTS.

REMARKS BY THE EDITOR.

We have noticed the same unsynchronous effects in the case of a body of singers as described by the Rev. Dr. Roberts, but we had no difficulty in reaching what we regarded as a true and satisfactory solution. It seems to be this: The want of synchronism in the occurrence of the various notes observed at the distance was actually present the same when the listener was directly among the singers; but owing to the persistence of loud sounds, that is, their resonant reverberations, this want of synchronism was not detected. At a distance this reverberation is not so much in the way of correct observation. No considerable number of singers, unless specially trained, can utter all their notes, at any given part of a musical measure, simultaneously. It is all the best trained brass bands can do to play in exact synchronism, and in such cases the harmonious and synchronous occurrence of all the notes is just as observable a quarter of a mile away as directly where the band is playing. This we have taken special pains to ascertain in order to demonstrate what is generally believed to be true—that all sounds, soft and loud, high and low, travel with precisely the same velocity, though some investigators have thought there was a slight difference. If any such difference exists it is so slight that we would sooner attribute its supposed detection to a defect of observation than to facts *per se*.

"SO-CALLED CHRISTIAN SCIENCE."

THOSE who wish to read a physico-metaphysical discussion of high merit should not fail to examine the article named above, from the pen of Mrs. Organ. Our eye seldom strikes literature more refined and classical in its composition than this same model production by our lady contributor.

BREAKING OF WINDOWS BY AN EXPLOSION.

WE have received a score, more or less, of attempted answers to our Physical Problem presented in the July ARENA, not one of which meets the case, simple as the problem is. The matter will be settled in the October number, and the true solution given.

WILLIAM LOGAN HARRIS.

William L. Harris, D.D., L.L.D., one of the Bishops of the Methodist Episcopal Church, is dead—so the message reads. But is not the term misapplied? Such as he never *die*! It is to them a translation to another and more extensive sphere of labor and exalted service for the MASTER they served here.

We wish we could in this issue give all the printed tributes to the nobility of life illustrated in the career of Bishop Harris. We cannot.

But we wish to say this—We knew the friend who has "departed this life." Perhaps all unconsciously to himself, we *loved* him. Our lines of service in the Master's cause were divergent, not in *motive* or *principle* of application, only in this—*his* was the leadership and authority to command, for God assigned him to his broad field of labor. *We* were only an employee, subordinate. How tenderly and sincerely we bear tribute to his cheerful greeting with hand and voice, his courteous bearing toward those in other conditions and occupations in the great "Book Concern," only our old-time fellow-employees who feel as we feel, can appreciate. We give our humble tribute. E.

MAGAZINES.

The Century Magazine, "first in war" sketches and in its masterly articles treating of more peaceful topics, is in hand. The list is so full that it is invidious almost to select for special mention except as individual tastes suggest. We may merely allude to the Sonnet, "H. H.'s Grave," (with Illustration,) because the author Miss M. Virginia Donaghe, of Colorado Springs, Col., is our personal friend, and we have profound pleasure in the fact that we were instrumental in introducing this writer to the pages of the Century. Her "Questioner at the Mouth of the Sphynx," suggested by the painting of Elihu Vedder, in the November Century, will be remembered by many readers.

"Scribner's Magazine" for September is a very valuable number. We commend "Scribners" as improving. It deserves and we are glad to be assured is receiving increasing patronage. The leading articles, "Looking Across the Plain of Thebes from the Tomb of the Pharaohs;" "The Modern Nile;" "The Thackeray Letters—No. 6.;" "The Development of the American University;" "The Motif of Bird Song," are each worth the price of the Magazine.

"The Magazine of American History" is as usual, full of valuable reading.

"The English Illustrated Magazine," "Lippincott's," "American," "Cosmopolitan," "Cassell's Family Magazine," "The Quiver" are all worthy of favorable mention.

"The Popular Science Monthly" has not lost one jot or tittle of value. It is all good. Our readers may very profitably read "The Economic Disturbances since 1873," by Hon. D. A. Wells. "Sleep and its Counterfeits." "Ethnological Sketches in Annin and Tonquin," and the "Sketch of J. J. Audubon" with portrait.

"The Bizarre Notes and Queries" published by S. C. & L. M. Gould, Manchester, New Hampshire, at $1.00 a year, is worth all and more than its price. It has a good motto, "Go on, and the light will come to you."

PUBLISHERS AND PUBLICATIONS.

WE purpose to make THE SCIENTIFIC ARENA valuable to the fraternity of Publishers as an intermediate between themselves and our extensive constituency of intelligent subscribers. Few mediums have a larger list of professional men—Presidents of colleges, professors, teachers, clergymen, physicians, engineers, lawyers, students, etc. We may point with pardonable pride to this fact; and a reference to the subjects treated in our columns, and the list of distinguished writers, will confirm our claim for the broad field occupied by the ARENA—"Scientific, Philosophical, Religious."

We have books in hand to which we shall devote space in forthcoming issue. Our acknowledgments are tendered to the publishers.

We are obliged to defer to the October issue a review of Prof. Drummond's "Natural Law in the Spiritual World." This review is written by a gentleman fully competent for the work; and who is well known as a member of the editorial staff of a leading denominational weekly in New York City.

"My confession, and the Spirit of Christ's Teaching," by Count Lyof N. Tolstoï, (T. Y. Crowell & Co., New York) is remarkable both because of the character of the work itself, and the prominence of its author. We may find place for extracts from this volume hereafter.

"Progression; or the Genesis of the Natural and Spiritual World"—written by William M. Goggin (one of our circle of subscribers) Shelbyville, Tenn., published by Albert B. Tavel, Nashville, Tenn., 1887, price $1.50—is evidently the result of closest study and profound thought. The volume is in the hands of our reviewer. The author claims that "in this work the truth of the Mosaic Cosmogony is witnessed and confirmed by the evidences of Geological Science."

We have recently enjoyed attendance upon the ministrations of Rev. Horatio N. Powers, Rector of the Episcopal Church at Sparkill, N.Y. Dr. Powers originally was Rector of St. John's Church, Chicago, and his presence in this little country village is occasioned by illness in his family necessitating residence in this climate. It is gratifying to know that his labors are appreciated and that the society to which he ministers is prosperous. A friend recently passed into our hands a little volume written by Dr. Powers, and published by Roberts Brothers, Boston: "Through the Year; Thoughts relating to the seasons of Nature and the Church." We have read this with interest and profit. Our pencil marked many passages—for which we may hereafter find room in our columns. We quote briefly: "He who decries actual scientific knowledge virtually decries the wisdom of God in giving man his vast powers, and in building the Universe as he has." (Page 5.) "True religion enjoys all that reveals the harmony and beauty that are perfect in Him who is in all and over all." "The great cause of joyfulness in religion is in our right relations with God. . . . . Joy dwells where his love abides." (Pages 6–10.)

The *N. Y. Times* in speaking of "The Works of Orestes A. Brownson," first published by his son, H. J. Brownson, says: "Dr. Brownson's work was too purely personal to be repeated; indeed, he could have no successor; but the usefulness of his writings was not exhausted with the occasion which called them forth; they have exerted great influence in giving a broadly American character to the policy of the Roman hierarch; they have shown the possibility of being truly American and truly Roman without unfaithfulness to either Church or State. Great as were Dr. Brownson's services to philosophy and religion, the broader field which he covered as a Catholic publicist—by that term truly describing himself—best indicates the character of his thinking. He was a philosophical student of political thought as expressed in principles of government."

The last volume of the British *Directory of National Biography* records a curious fact regarding the youth of William Chambers, the Edinburgh publisher. It is stated that when a boy he had to support himself on four shillings a week. He eked out his income by reading in the morning entertaining books to a baker and his men, who, in return gave him his breakfast, which consisted of a penny roll hot from the oven.

It is announced that the "Bankside" parallel text edition of Shakespeare (the first volume of which will be issued by the New York Shakspeare Society in October) will employ the entirely unique system of line notation finally adopted by the Society, and which it believes will be found satisfactorily adapted to all critical purposes in the study of any edition of the works.

The Autumn announcements of G. P. Putnam's Sons in the Story of the Nations Series are these: "The Goths," by Henry Bradley; "Ireland," by the Hon. Emily Lawless; "Mediæval France," by Prof. Gustav Masson, of Harrow; "Turkey," by Stanley Lane-Poole; "Holland," by Prof. J. E. Thorold Rogers, and "Mexico," by Susan Hale.

The *Athenæum* says a bitter feud has broken out in the camp of the Gœthe worshippers about Scherer's well-known theory on the history of the composition of "Faust." The principal assistant, it says, is Prof. Creizenach, and the chief apologist of Scherer's theory Dr. Erich Schmidt, who has not proved a match for his opponent."

Some "Personal Reminiscences of Charles Dickens" will be contributed to an early number of the *English Illustrated Magazine* by Mr. H. D. Traill, the author of two or three volumes in the English Men of Letter Series. This paper will be followed by some of Dickens' letters that have not heretofore been published.

Thomas Whittaker announces a new work by the Rev. Dr. J. A. Spencer, entitled "Five Last Things," by which are meant Death, the Intermediate State and Place of Waiting of Souls, the Resurrection, Judgment, and Eternity, and in which are presented the teachings of the Bible with fullness and clearness.

Mr. Theodore E. Perkins, well-known as the composer of "Jesus of Nazareth Passeth by" and other popular sacred melodies, conducts the music of the Central Business Men's Noonday Prayer-meeting of New York city. The meeting is held daily in the chapel of Dr. Deems's church.

Messrs. Little, Brown & Co., of Boston, have just issued: "Colors in Nature," for Naturalists, Ornithologists, &c. By Robert Ridgway, Curator of Birds, United States National Museum. This is a valuable work.

Entomologists have determined that the severity of winters is not destructive to insect life. Larvæ may be frozen stiff and yet they will revive with the return of warmth. It is reported that bumble-bees and butterflies have been found in the Polar regions.

OUR PRIZE ESSAYS, No. 1.

(*Continued from Page* 56.)

to harmonize seeming discrepancies, and thus the skeptic, disheartened at his unsatisfactory solution of the mental and physical world, was about ready to give up the contest.

At this time appeared one of the most notable books of the present century—Darwin's Origin of Species—a book which, with one exception, has caused more joy and more fear than any book in the English tongue. Scientists and students read the terrible array of facts presented, and believed that man's origin and destiny were at last solved. There seemed to be no middle ground for the Christian scientists to take between absolute rejection or the full acceptance of the theory of Evolution. Some of the most learned theologians of the day were induced to do homage to this god of Evolution, while at the same time they tried to save enough of the Bible to die by, in this universal wreck of old beliefs.

Haeckel and Huxley went a step farther than Darwin, and eliminated God entirely from the universe. Life with them became the spontaneous product of matter; mind, nothing but the molecular motion of the brain; a belief in God and his providence a superstitious fancy born of a "poetic imagination." So far had these teachings triumphed that a wide-spread alarm was felt throughout the Christian world for the stability of religion.

At this crisis the doctrine of Substantialism takes its rise. Born of the stern necessities of the times, it came to dispel the clouds of materialistic darkness that were fast shrouding the world, to strengthen the hands of the faltering advocates of Christianity by placing their faith upon a more rational and scientific foundation, and to offer to all who cling to nothing because it is old and reject nothing because it is new, a truer and purer philosophy than any which had preceded it.

But the immediate object of Wilford Hall was not to found a new philosophy, but to awaken the religious world to a realization of the monstrous inconsistency of trying to harmonize the teachings of materialistic science and the Bible. In the Problem of Human Life the author passes, in scathing review, the works of the great evolution writers. The very facts and phenomena of Natural History upon which their entire theory rests are turned against the doctrine of transmutation and in favor of special acts of creation. Every argument brought forward by evolutionists is shown to be utterly worthless as teaching the theory of Descent. There is no evasion, no misrepresentation. The vagaries of Darwin and his followers are subjected to the most merciless criticism, and shown to be the result not of a sincere desire to find the truth, but of a blind determination to establish a theory. Thus, at one mighty blow the strongest arguments of infidelity were swept away, and though but a single decade has passed since the advent of the New Philosophy the tendency of scientific and religious thought has entirely changed. True Science and Revelation do not conflict. The book of Nature when read aright is itself a Revelation of the great Author of the universe.

Substantialism rejects the mode-of-motion theory of the forces of nature as not only materialistic but unscientific. Sound, light, heat, magnetism, electricity, mind and soul are all substantial though immaterial entities. The forces of nature and forms of energy, whether manifest in the realm of the physical, vital, or mental, are substantial realities and not mere modes of molecular motion. Everything in nature underlying phenomena, whether visible or invisible, tangible or intangible, of which the mind can form a positive concept, is a real, substantial existence, though it may lie entirely beyond the range of the physical senses. Substance is not synonymous with matter but includes it, matter being one department of universal substance. Beyond the realm of the material, yet closely connected with it, exist those immaterial, substantial forces, the real causes of all phenomena.

To the materialist the current teachings of science prove conclusively that there is no such entity as a substantial God, and naturally and almost irresistably it follows, that, if the forces which underlie physical phenomena are mere modes of molecular motion, so also are those that underlie mental and vital phenomena, and like the former, being mere modes of motion, they must cease to exist when the molecules of the brain and nerves sink to rest at death. Thus the idea of spirit as an objective entity, capable of existence apart from the material body, becomes a phantom of the imagination.

The failure to recognize this fundamental classification of all substances into the material and the immaterial has been the fatal error of the past philosophies. The immaterial is the real, and without it there can be no rational explanation of the simplest event, since ultimate cause lies entirely within the realm of the immaterial. Nature comprises two worlds; one visible, tangible, material; the other invisible, intangible, immaterial. The world of sense is constantly changing and passing away, but the world of immaterial substance is unchanging and eternal.

Upon such broad and universal principles the New Philosophy began its work of revolution. Nurtured in the storm of conflict it has developed a vigorous and substantial life. The swift messengers of the sea bear its glad tidings to almost every part of the habitable globe, and in the land of its birth the portals of fourteen hundred institutions of learning are open to the light of its truth. Never before has such progress been made by any radical departure in the field of scientific, religious, or philosophic thought, and under the panoply of unchanging truth the New Philosophy looks out upon a future as limitless as time, as far-reaching as the destinies of the human race.

IOWA CITY, IOWA.

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* In the July issue of the ARENA a complete set of Dr. Hall's scientific books, value $11, was offered as a prize for the best original essay on Substantialism. The paper here given from the pen of Mr. Higbee, of Iowa, a Substantialist previously unknown to us, has been justly awarded this prize, and may be regarded as a model of literary and scientific composition worth studying. It is manifest that no man could have written such a paper without a long and careful study of the principles of the Substantial Philosophy

Now, to encourage others in the same commendable work, we repeat this offer for each of the best two essays on Substantialism or collateral questions, which shall reach us by November 1, both of which will appear in a later number of the ARENA. We thus give sufficient time that those who may wish to try their skill in defending this revolutionary cause, may have ample time to prepare their minds by study. It is not so much the value of the prizes offered as the honor of winning them. These Prize-Essays must not exceed in length the one here given from Mr Higbee, and may relate to any phase of the New Philosophy which will throw light on the general discussion. We have sent Mr Higbee's library of books to him by express, charges prepaid.—[SEE PUBLISHERS' NOTES.]

CHAUTAUQUA.

Of the year's college Commencements, the most remarkable must be conceded to be the one at Chautauqua. It is true that only about two thousand of the graduating class have been present at the institution itself this Summer, but the class is very much larger. The number of "university men" that Chautauqua annually adds to the community is enormous, and quite leaves old-time seminaries of learning like Harvard and Yale in the background. Instead of confining its attention to striplings of 20, some of its graduating lads and lasses are 50 or 60 years old. Under these circumstances, Chautauqua graduates who are proud of their Alma Mater must, have heard with poignant sorrow the recent news of a row between the Assembly managers and the cottage owners, which threatened the closing of the gates for next year. The cottagers think their real estate is not increasing in value as fast as it ought to, and recriminations and arrests have lately troubled this temple of all the muses. It is to be hoped, in the interests of American university education, that unseemly strife over considerations of lucre will cease. It would look strange to Chautauquans of future ages to find a class of two thousand graduating in 1887 and the gates wholly shut during 1888.—*N. Y. Times.*

KIND WORDS.

THE FEELING AMONG COLLEGE PROFESSORS.

We could give many suggestive letters from professors of physics conveying their impressions concerning the arguments now appearing in the ARENA against the mode-of-motion theories of modern science. The following specimen note from Prof. Titus, of the Normal College, at Harper, Kansas—one of the most critical minds of the West, as we have found out by a correspondence of years—will give the necessary trend of minds of other candid professors who chance to see this journal:

"DR. WILFORD HALL:

"I have just received the August number of the ARENA. That article of yours on 'Condensed and Rarefied Air, and Its Relations to Heat and Cold,' seems to make the mode-of-motion position of Tyndall so ridiculous that I cannot see how intelligent teachers can retain the old doctrine of heat in their schools and colleges. Give us more of the same kind. Enclosed find 50 cents for the Text-book on Sound.

"Yours forever.

"C. B. TITUS."

A writer in the *Critic* has obtained from a wholesale bookstore having a very large trade, a statement of the actual number of volumes sold by it during the last five years of the works of nearly 100 popular authors. He explains that the sales of the various cheap "libraries" are not included, so that the list he prints is to that extent unjust to the British authors. From his list the following are selected:

AMERICAN.

E. P. Roe	1,000	Longfellow	335
Mrs. Mary J. H. Holmes	342	Will Carleton	215
		Whittier	139
Louisa M. Alcott	331	Bryant	28
Lew Wallace	100	Bret Harte	22
Marion Harland	79	Emerson	15
Mrs. Southworth	61	Lowell	13
Fenimore Cooper	52	Holmes	10
Nathaniel Hawthorne	50	Poe	5
Marion Crawford	41	Prescott	35
W. D. Howells	14	Bancroft	29
Henry James	1	Motley	7

ENGLISH.

Dickens	800	Owen Meredith	223
Scott	346	Byron	117
George Eliot	84	Burns	103
Thackeray	74	Milton	66
Bulwer	66	Wordsworth	27
R. L. Stevenson	40	Macaulay	155
Fielding	2	Gibbon	96
Richardson	0	Hume	42
Tennyson	272	Buckle	1
Shakespeare	242		

THE necropolis of the ancient city of Carmona has just been discovered about half a mile beyond the Arab gate of Seville. The inhabitants of Carmona were the most civilized of the Iberian peninsula several centuries before the Christian era, and it said that their laws were written in verse. The excavations which have recently been made have resulted in the discovery of a large number of coins, and between the two fields known as the Quarries and the Olive Groves the excavations have brought to light a great many sepulchral chambers, hewn out on the rock, with funeral urns in the sides. The roofs of these sepulchral chambers are some of them vaulted, while others are flat. There are several furnaces either inside or just outside the chambers, and it was in these that the incineration took place, the ashes being placed in black earthenware urns. Among the other objects found was a mirror with a handle, a lamp, a lachrymary, a bronze statue, several pieces of iron, libation cups, nuts, the remains of a repast, and some pipes communicating with the inside and the outside of the sepulchral chambers.—*London Times.*

On the 10th John M. Clay, aged 65, dropped dead from heart disease at his beautiful home near Lexington, Ky. He had been in the city in the morning seeming remarkably well, and was superintending some plumbing work when death came. He was the only living son of the great commoner, Henry Clay.

To the eastward of Socorro, N. M., two prospectors accidentally stumbled upon indications of ancient ruins projecting above the shifting sands of the plain. Turning to with their shovels to explore their find, a few hours' work brought them to the floor of a small room in the form of a parallelogram. The Socorro *Bullion* thus describes the relics unearthed: "They found the remains of several human beings, several handsome vases carved with geometrical figures of different colors, stone axes, hammers, pieces of cloth apparently manufactured from the fibre of yucca, several strings of beads, sea-shells, arrow-heads, an abundance of fragments of obsidian quartz, and an incredible quantity of pieces of broken pottery, including several with a blue glazing. Only in one other instance have we ever heard of this color and quantity of ware having been discovered in this Territory, and that was at the ancient pueblo near the Santa Rita, in this country, and it indicates that the Spaniards had lived in New Mexico before the extinction of the race who inhabited this ruined and buried village."

"A College of Colleges" is the title of a book, to appear early in September, under the auspices of the Y. M. C. A. International Committee, its publisher being Mr. F. H. Revel, Chicago and New York. It will be a reflex of its Summer School for College Students at Northfield, Mass., June 30—July 12, conducted by Mr. D. L. Moody. The first two chapters will contain an account of its rise and development of its wonderful missionary movement among the colleges of this continent which has resulted in no fewer than 2,100 students—1,600 young men and 500 young women—offering themselves for the Foreign field. The remaining chapters contain verbatim records of addresses by Mr. Moody, Prof. Drummond, D.D., (Author of "Natural Law in the Spiritual World") Dr. Bradus, Prof. Townsend, and Dr. Pierson; as well as discussions participated in by Mr. Moody, Joseph Cook, Dr. Chamberlain of India, and others. The whole will form a book of remarkable interest and value.

What an escape for Mr. Gladstone! He was to have presided over the Eisteddfod. Mr. Puleston took his place, and has been made a Knight. It is terrible to think of the danger which Mr. Gladstone ran of being knighted. Mr. Puleston is a popular gentleman, and, if he likes the prefix of "Sir" being affixed to his name, Heaven forbid that I should object! He is, I believe, himself a bard, and he is a sure Ministerial vote in the House of Commons. Possibly the latter fact had more influence with Lord Salisbury than the former. I see that the successful bard received £40 and an arm-chair, and I confess that personally I should have preferred either of these recognitions to being made a Knight. But of course tastes differ, and as both Mr. Puleston and the successful bard are satisfied, all is for the best in the best of worlds.—*London Truth.*

Every man has need to be watchful. The cable is not stronger than the weakest link, nor the character than the hidden meanness. The secret sin does not grow in a day though it may germinate in a moment. A Scotch preacher beautifully illustrated this by referring to the tiny seed dropped by the passing bird into a crevice of a rock, and which, sprouting, grew, and in process of years by its mighty roots, moved the massive rock until it toppled over into the loch. So we must beware of the trifling thought of sin. We must search by the power of God's spirit. Let us be sincere in the searching, and firm in the evictions of the hidden evil. It is evil temper, cheating, backbiting, murdering character, sly tippling, or open drunkenness, harshness and cruelty. Away with it in God's strength.

The *Evening Post* in referring to the heavy votes on Prohibition in Michigan and Texas, shows that the statements of those who oppose the reform of the Civil Service by declaring that there would be but little in election if it were not for the offices, are false. For here there were no offices to be effected, yet the interest was intense and the vote unusually heavy.

We are often asked about the so-called "Andre Monument at" at Tappan, N. Y. Mr. Cyrus W. Field has been cruelly misrepresented in this connection. He deserves better from his countrymen. His distinguished services, by which the whole world is his debtor, entitle him to protection from the aspersions which prejudice and ignorance of facts engender. The publisher of THE ARENA is in position to speak authoritatively upon this subject. A statement in detail will be given in THE ARENA.

Our subscribers write us about the Keely Motor. Let us say: THE ARENA is not the mouth-piece of Mr. Keely, or his supporters. As elsewhere announced, we seek, and shall give *facts*. Personally, the publisher believes much of the claim made, that a new and powerful agent has been discovered, or "liberated," whether "etheric force" or otherwise. The *development* and *utility* in *practical* employment remains to be proven.

It is said the needle of a missionary's wife was the simple instrument God used to give access to Oriental zenanas. A piece of embroidery wrought by her deft fingers found its way to the secluded inmates of a zenana. If a woman could do such work as that, other women could learn under her instruction; and so, with the cordial consent of the husband, this Christian woman was welcomed to the inside of his home, and as she taught his wife the art of embroidery, she was working the "scarlet thread," dyed in the blood of the Lamb, into the more delicate fabric of their hearts and lives. The church of England Society alone had in 1883 under visitation 1,500 zenanas with 4,000 pupils.

It is not wise to put leaves for protection thickly over plants. They hold moisture, and rot instead of protect, and often breed mildew, which is as bad as cold. It is bright light, together with frost, that injures plants, and enough leaves to shade is all that is required. This is why evergreens, such as rhododendrons and kalmias, suffer so much in winter. Something to keep off the sun is as beneficial as something to keep off the frost. For this reason the ground is itself a good protector. Many tender fruits can be taken care of by bending the branches and covering with earth.

The greatest telescopes in the world are made in America; the man who made them, Alvan Clark, died on the morning of Aug. 19. "From New York to St. Petersburg, and in every civilized country of the world, the name of Alvan Clark is a familiar one among scientists." Yet he was 42 years old before his attention was directed to the subject. January 31, 1862, he and his son discovered while trying a new telescope the companion of Sirius. The French Academy bestowed the Lallande medal for this. Mr. Clark was 83 years old, and like many other eminent men was born on a farm.

Orson S. Fowler, the phrenologist, died on Thursday. He was about six weeks older than Dr. Curry, a classmate of Henry Ward Beecher, and made phrenological books, lectures, and cranium examinations remunerative. He was too shrewd to depend entirely on feeling the outside of the skull, and used his eyes, ears, and every other sense and faculty to acquire knowledge of his "subjects," and was very alert to see when he had made a blunder, and remarkably plausible in explaining himself out of a serious error. At first he studied for the Congregational ministry.

It is natural for youth to be restless for excitement. As a restraint against their seeking undesirable companionship make the home furnish them this excitement. Throw open your best room to the children in the evenings. Have books and a magazine or two, even if you put away less money. Stimulate their ambition, and invent occupations and amusement for your children. Give them games and endear yourself to them by sharing their joys and plays. Encourage them to be affectionate. Do not with formal coldness starve them for want of caresses.

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.

D. K. ELMENDORF & CO., Publishers,
Potter Building, 38 Park Row, N. Y.

Entered as second-class matter at the New York Post Office.

WHOLE SERIES, VOL. VII., No. 5.
NEW SERIES, VOL. II., No. 5.

NEW YORK, OCTOBER, 1887.

ONE DOLLAR A YEAR.
SINGLE COPY, 10 CTS.

CHAUTAUQUA, AS A PLACE AND AN IDEA.

BY REV. J. L. HURLBUT, D. D.

The word "Chautauqua" has become famous during the last fifteen years. An army, over a hundred thousand strong, has accepted it as a slogan, and has rallied behind it as a banner. Its loyal followers are found in every county, almost every town, of Anglo-Saxon America, and in almost every land of the earth. Its authorized literature during the past year circulated to the number of three hundred and eighty thousand volumes, and will circulate more than four hundred thousand during the next ten months. The student of our age who omits Chautauqua from his catalogue of the forces, social, intellectual, and moral, which contribute to shape our destiny, will grievously err. Let us, therefore, study this institution, view its various aspects, and ascertain its underlying principles.

Let us begin with the Mecca of this Chautauqua world, the Chautauqua Assembly. It takes its name from a lake in western New York, nine miles from Lake Erie, yet seven hundred feet above its level; a sheet of spring water, twenty-five miles long, and varying in width from a few hundred feet to three miles. Though situated so near the St. Lawrence system, its waters enter the Mississippi, through the Alleghany and the Ohio Rivers. Near the head of this lake, upon its western shore, a tongue of land reaches far out into the water. Formerly it was known as Fair Point, and was a favorite tenting-ground for summer outings, afterward the seat of a Methodist camp-meeting. But soon after the Assembly, a new thing under the sun, was instituted; it took the simple name *Chautauqua*, and by that name is known throughout the world.

From the edge of the lake the ground rises in a succession of natural terraces, crowned with great trees, and broken here and there with ravines. Parks have been laid out, streets and paths have been made, but the natural beauties of the place have been preserved, and a city of many cottages has risen within the grove. The place has become a summer resort, yet free from the evil influences which gather around nearly all the seashore and mountain boarding places. The gate-fees shut out the lower elements of society, and pay for the literary and musical entertainments of the Assembly. There are no bars in the hotels, and no saloons on the ground; no card-playing, nor dancing, nor any of the endless frivolities of the average summer resort. The educational features draw to the grounds thousands of intelligent, aspiring, and earnest people, and these give the place its predominant and peculiar type. Yet it is by no means a strait-laced concern, with all work and no play. There are boat-rides on the lake, fireworks, and illuminated fleets; high-class concerts in the amphitheatre, organ and piano recitals, entertaining lectures, stereopticon pictures. A New York merchant said to a business friend, "Yes, I go to Chautauqua every summer, and after experimenting in many places, we like it the best of all. We can get all the literature and music that we want, and in quantity to suit ourselves; we meet hosts of the best people; and we are not compelled to come into contact with either people or pleasures that are objectionable." So much for Chautauqua as a place.

But if the only attraction of Chautauqua were its woods and waters, its walks and its recreations, it would never have been celebrated throughout the world. On this lovely ground is seated the Chautauqua Assembly, and this institution we must next consider. It was established in 1874 by Dr. John H. Vincent and the Hon. Lewis Miller, one a clergyman, the other a "lord manufacturer," as Tennyson would call him. These two men have been so closely identified in the development of "the Chautauqua idea," that it is not possible to say just where the thought of one ends and that of the other begins. The original conception was of a gathering for Sunday school people, with courses of study suited to their work, literary lectures and musical entertainments. Around this have clustered many other departments, and the meetings have extended their time from two weeks to two months. From the beginning of July to the end of August many schools and classes are in session. There is still the original Normal Department for Sunday School teachers, under charge of Rev. Dr. Dunning, of Boston, giving instruction to nearly a thousand men and women in Bible knowledge and Sunday School work, with an annex for boys and girls, taught by Rev. B. T. Vincent, of Philadelphia. There is a School of Languages, ancient and modern, directed by Prof. W. R. Harper, of Yale University; a Teachers' Retreat, for secular teachers, giving knowledge of methods and principles, under charge of Hon. J. W. Dickinson, of Massachusetts. There are classes in history, in art, in photography, in phonography, in clay modeling, in kindergarten, in business, and in many other departments of knowledge. There is a college of music, with a chorus three hundred strong, giving frequent concerts through the Assembly season. The stranger who visits Chautauqua and rambles through its walks, and listens to its popular lectures, and sails upon the lake, is not always aware of the work which is going on around him. The entertaining features upon the programme attract the multitudes, but all the time there are two or three thousand students in the various classes, who make Chautauqua, not an aviary of singing birds, but a hive of bees, gathering honey of a rare and priceless sort. The best which one sees at Chautauqua, is not its illuminated fleet, which reminds one of Venice during the carnival, or of Bagdad "in the golden prime;" nor its amphitheatre thronged to listen while orators speak and songsters trill forth their notes, and the great organ gives its voice—it is its people—the ardent souls hungry for knowledge, men and women who have cheerfully pinched themselves for a year that they may afford six weeks at Chautauqua, and have felt well repaid for their self-denial in the gains which they have obtained. The best people are those who meet in the Normal Hall, and in the class-rooms at the college building, and in the grove of the Academia; the students who come to Chautauqua for work, and who there obtain knowledge to use in home, and forge, and field, and public school.

This brings us to another and wider Chautauqua, whose center is in the forest by the lake, but whose circumference is the round world. In the year 1878, a department was added to the Chautauqua system, which has become its most widely known and most im-

OUR NEW FISH COMMISSIONER.

Professor G. Brown Goode,

Successor to Prof. Spencer F. Baird, as Chief Director of the Smithsonian Institute, Washington, D. C., and also Commissioner of Fish and Fisheries, has been for a number of years assistant secretary of the Smithsonian. Professor Goode is about 36 years old. He received his early academic and scientific training at the Wesleyan University, at Middletown, Conn. After taking his degree he became attached to the Smithsonian, directing his attention more particularly to ichthyology. Professor Baird at once availed himself of his services for the work of the Fish Commission. When the Berlin exhibition of fish and fisheries was held, Prof. Goode had the American Department under his charge. He acquitted himself so well as to receive the highest praise from Germany. At the London exhibition of fisheries in 1883, he represented the States as commissioner there, and his ability was so conspicuous as to receive commendation from so distinguished a source as Prof. Huxley. The present commissioner will carry out successfully the work originated by his distinguished predecessor.

portant institution,—the Chautauqua Literary and Scientific Circle. This provides a course of reading and study, not for the summer weeks at the Assembly, but for the months of the year at home. It is based upon the plan of a college curriculum, though it is all in English, and the mathematical studies are not included. By the C. L. S. C., a mother at home may keep in a measure abreast of her boy in college, for while he is reading Greek, she is pursuing a course of Greek literature in English; while he is digging out the construction of Livy and Plantus, she is reading them in a translation. The course extends through four years, and embraces the history and literature of Greece, Rome, England, France, Germany, and America; the leading sciences, each in a compact summary; morals, Christianity, art, and in general the most important subjects of study. This great Circle is peculiar in having two centers, one at Chautauqua, where its reunions are held, and one at Plainfield, N. J., where its records are kept. Through it many a toiling woman keeps her heart warm by contact with thought; many a young man is lifted above his lathe and his plow, by the inspiration of culture. It is not a college, nor a substitute for the college, but it brings the atmosphere and the outlook of the college into the home.

The enrolled members of the C. L. S. C. are upwards of sixty thousand, and as many more outside of its membership read its course and belong to its constituency. Half of them are reading alone, each in his or her own home, with no fellowship except the invisible companionship of the Circle. About half are organized in local circles, which meet weekly or bi-weekly to compare the results of their reading, read papers, or answer questions upon the course. The members of the circle are everywhere. For example, there are 180 circles, with over 2,000 members, in the State of Michigan, and about as many in Kansas. Philadelphia has nearly 1,000 members, and Boston about 800. Scarcely a township can be found in the United States or the Dominion of Canada without either a local circle, or some individual readers. Nor are they limited to the New World. The Circle has a strong foothold in Scotland, has an affiliated membership in England, and on the European Continent. There are circles at the Cape of Good Hope, in India, in the Sandwich Islands, and 2,000 members, natives, in Japan, where the books have been translated, and they have their own magazine.

The greatest day in the Chautauqua season is the Recognition Day of the C. L. S. C., when the diplomas are distributed to those present who have completed the course. The class of '87 has included, in the aggregate, nearly twenty-five thousands readers. Of those, about seven thousand have persevered to the end and completed the course; and about seven hundred of these graduates were present at Chautauqua to receive their diplomas. There were processions, songs, floral decorations, banners, emblematic arches, under which the graduates passed, while little girls strewed flowers in their path, addresses and congratulations, and the conferring of the diplomas, amid an enthusiasm greater than was ever witnessed at a college commencement. The superficial observer might criticise some of the exercises as sentimental; but the philosopher will note that it is on waves of sentiment and enthusiasm, that the greatest results are brought to pass, and the world is lifted higher.

We must note, in this rapid glance, that Chautauqua does not stand alone in this work. It has been the parent of many daughters, and now there are forty-five assemblies closely following the original pattern, and many of them bearing its name, as the Kentucky Chautauqua, the Florida Chautauqua, the New England Chautauqua, the Puget Sound Chautauqua, in Washington Territory. All of these furnish normal courses for Sunday school teachers, special classes in various subjects, and meetings of the C. L. S. C.; and all of them have their Recognition Day, when the graduates of the region around may receive their diplomas. The assembly idea has entrenched itself strongly in the land, and during last summer more than half a million people took part in these gatherings.

There is a higher department of the Chautauqua work which is attracting attention, and destined to greater prominence and power. A few years ago the originators of the movement launched forth the Chautauqua College of Liberal Arts, a correspondence university. The experiment had been tried of conducting classes in many departments by correspondence; but it was now proposed to give a complete college course by this plan. It was not intended to offer this as an equivalent for the college where the student sits down for four years with the professors under the magnetism of personal contact. Chautauqua is no rival of the colleges, but rather their helper and their herald. It was designed to aid those who are compelled to remain at home, but at home can give an hour or more each day to study, not merely to reading. It gives lessons under a specialist in each department, a written examination in presence of an inspector, and a standard as high as that of the best colleges. The student who studies one course at a time will need sixteen years to complete the curriculum; and if he takes it, they will be sixteen years of study with all its benefits. But if two or more studies are carried on simultaneously the time can be proportionately shortened, though the requirements will not be lowered. A thousand students in the different departments of this University are now pursuing its work under the constant instruction of teachers whom most of them have never seen.

The fundamental propositions upon which Chautauqua is based are these: First, that every one needs culture, whether he handles the plow, the plane, or the pen. Secondly, that every one can have culture who is willing to pay its price in study and in work, even though not all can spend four years in college halls. Thirdly, that culture should be under Christian auspices, studying God in all his works, and keeping "our heavenly Father in the midst." Upon these three foundation stones Chautauqua builds its edifice, and invites all the world to enter its portals.

THE NATURE OF FORCE.—No. 2.

BY REUBEN HAWKINS.

(*Concluded from last month.*)

THE tendency or fashion of late years among students of physical science seems to be to follow the reasoning of a few bright intellects who have spent their lives in the vain effort to prove that there is no God; and the mode-of-motion theory of force has been seized as the most effective weapon they could find for the accomplishment of this end.

Herculean efforts have been made, with questionable success as I think, to prove that heat, light, sound, and electricity are only different modes of the motion of matter. In the case of heat, light, electricity, etc., developed by the sun, it has been necessary to invent a kind of *immaterial matter* called ether, to act as a medium of transmission by vibration, in order to uphold the theory. This immaterial matter (pardon the name I give it, I can't think of any other that fits it), in its supposed characteristics, is as absolutely beyond our comprehension as the spiritual essence of Almighty God. I use His name reverently. To the common mind, when willing to think for itself, there are two characteristics which it is necessary any substance or thing shall possess in order to be comprehended as matter. These are *inertia* and *weight*. By weight I mean adaptation to the action of gravital force. This supposed ether cannot have inertia or it would obstruct and retard the motion of the planets; and it cannot be subject to the force of gravitation, or it would gravitate to, and remain surrounding the sun, planets, and stars as an atmosphere, and the lines of vibratory transmission would be broken. Yet it has assigned to it a vibratory duty which it would be impossible for it to perform without inertia. More than this—it has assigned to it the necessity of performing a complexity of vibratory gymnastics infinitely beyond comprehension—absurdly impossible.

Beginning at the lowest vibrations, which are said to be heat, we are asked to ascend a progressive scale, each step of which is a more rapid vibration, till we reach a point where there are some 396 trillions of vibrations per second of time, where the lowest color, red, makes its appearance; we proceed with the measurement of the periodicity of vibration and find a continued increase in rapidity as we pass through the different shades of red. We pass in like manner through all the primary colors of the solar spectrum, with their blendings into each other, finding an ever increasing periodicity till we reach the last, violet, where we are told that the etherial vibration has a periodicity of about 800 trillions per second. Beyond this limit, we are told that the rapidity of vibration continues to increase, but that the force manufactured is chemical or some other kind of force. I believe the number of etheric vibrations per second which is required to evolve vital and mental force have not been determined.

Now to fully understand the profundity of the foregoing problem, it is necessary to bear in mind, that all these numerous and different kinds of vibrations—that is, different as to both amplitude and periodicity—must take place in the same material, and at the same time and place.

These conditions require that each particle of matter shall move in different and opposite directions at the same time, as a little reflection will convince any one.

If the student feels inclined to pursue the subject further, let him in imagination follow the converging rays of heat, light, electricity, chemical force, etc., passing from the sun in countless trillions of supposed vibrations of different lights and periodicities, through a 30-inch refractory lens, to the focal point where they all at the same time occupy, in crossing each other, the same point in space; then let him conceive this if he can, of the wonderful and impossible vibratory movements required of this infinitesimally small quantity of matter (supposed ether) located in this focal point, in conducting all these trillions of vibrations of different lengths and periodicities through this point and extending each way in a straight line beyond, without any interference with each other. The one who believes that vibratory motion of matter can accomplish this feat is a good materialist, no matter what his professions may be.

It is quite as easy to believe that $2+2=5$, for this is just as reasonable. In both cases an unreasonable degree of faith is required. In this illustration with the lens it is evident that the result cannot depend wholly on material conditions or motions. The concentration of so much *immaterial force* in so small a space as the focal point of the lens, and the continuation beyond this point, of each of the millions of rays of sunshine without variation from straight lines, or change in characteristics, or mode of action, ought to give us a high appreciation of the inexhaustible immaterial fountain head of all force—the Almighty Creator.

Then, are these evanescent forces which are developed on the earth, such as heat, light, sound, etc., merely the phenomena of the motion of matter? I think I have shown that sunshine can not be such vibratory motion, whether or not the forces developed by it, in connection with matter, may be so regarded. Who has analyzed sunshine and proved that in its essence (or in its mode of motion, if you prefer,) it is composed of either heat, light, electricity, chemical or any other known earthly force, or all of them combined?

Very much has been learned regarding the laws of development of these forces by sunshine in connection with material conditions, but all that has been learned of sunshine itself is that the laws governing its transmission are absolutely and mathematically inconsistent (according to the laws of motion of matter,) with the theory of transmission by mechanical vibration, or any kind of vibration of matter. Sunshine itself must be immaterial.

Who has even attempted an explanation, on the vibration hypothesis, of the wonderful and

perpetual action of gravital force? Perpetual and uniform in its action according to the laws governing it—ever pulling without any material cables to unite the infinite number of bodies reciprocally pulling at each other—forever exerting a force beyond finite comprehension in magnitude, and in kind perfectly analogous to the simplest kind of mechanical force, except that it is exhaustless and not even apparently convertible into other forms or modes, and is regulated in its intensity of action by the law of distance, and quantity of matter involved. *Developed* mechanical force comes to act when its work is performed. This is true also of other developed forces. Gravitation never ceases—never changes. This is probably true of all the primary forces of nature. The cords by which gravitation pulls *must be immaterial.* A supposed material connection by means of ether, or some other material substance devoid of material characteristics, is simply unthinkable and absurd. The mode-of-motion theory of science is based on but few proved facts, perhaps only one. The principal fact if not the only one, is that musical tones are manifested to our senses in rapid pulsations of measurable periodicity. Other forces may be manifested in like manner by pulsations of measurable or immeasurable periodicity. But admit this, and does it necessarily follow that the manifestations of these forces are the mere phenomena of the vibratory motion of matter?

As to gravitation and sunshine, I think I have shown that such explanation is unthinkable, however difficult it may be to comprehend the existance of Spiritual entities and immaterial forces.

It is not denied that these forces cause vibration or other kind of motion in matter, according to the kind of force employed, and the relative conditions of the matter.

The venerable theory advanced by Pythagoras some 2,500 years ago—plausible as it appears, when superficially considered—that sound is only the phenomenon of the vibratory motion of matter, has never yet been proved true by any satisfactory practical test. So it is yet only theory. That the pulsations occur, in different periodicities for different pitches of tone, is easily proved. But that these pulsations are vibratory motions of the conducting medium lacks satisfactory proof. In fact, it is found to be self-evidently false when we undertake to reconcile the theory with the simplest axiomatic proposition with respect to the laws of motion. *Matter cannot move in two opposite directions at the same time.*

When a multiplicity of tones of different pitch are transmitted through the same conducting medium at the same time, the conditions are such as to require (according to the vibration theory) that each particle of the conducting medium shall not only move in opposite directions at the same time, but also at various different velocities at the same time, in order to accommodate all the tones transmitted. It requires no mental effort to see the absurdity of this, yet it is taught as truth by men who have great reputations for learning.

It is simply assumed to be true without proof, and on the basis of this assumption, and the apparent inter-convertibility of some of the forces, has been built the mode-of-motion theory of heat, light, and electricity.

Materialists have carried it further and made it include all the forces of nature. If they can prove the theory true as to all the forces, Mr. Herbert Spencer is fully warranted logically in the conclusion that he sees, in matter, the promise and potency of all things, and the atheist has, in science, a writ of ejectment by which to dethrone the Creator, and leave matter the only true God. The grand fundamental difference which distinguishes the materialistic from the theistic theory of science. is found in the implied denial by the materialist, that infinity can be predicated of anything except time, (or duration as applied to matter), and space, while the theist holds to the belief in an infinite intelligence, which is also the infinite fountain head of power. The materialist believes that the normal motion of matter in the aggregate, is the mathematical equivalent of the aggregate of all phenomena, that there is no reserve force by the use of which an intelligent controlling mind could change the order of natural phenomena or suspend any of the laws of nature. That blind nature (that is matter) through inherent motion which it had in the infinity of past time, working according to the requirements of perfect laws (which have no entitative existence, but are simply abstract ideas, or intelligent expositions of the manner in which matter works) has, through the processes of evolution, brought things into their present relative conditions. I would like to ask Mr. Spencer or any other naturalist who can or can not answer the question: Why did not the relative condition of all things on the earth—in the universe—reach their present state long ages ago? Matter has had, according to the theory, an infinity of time in which to operate, no change in fundamental principles has taken place. Answer who can. But suppose this theory to be true, and what an incongruity we have in the wonderful panoramic show provided by nature, with not a single mind in the universe capable of comprehending it!

The theist sees, or thinks he sees, in Creative power the "process and the potency" to lift the mind of man above material conditions, and reveal to him the wonders of the works of God, which are perfectly adapted to mental comprehension but too vast to be explored by mortal man, chained to the earth and limited in mental capacity by the conditions of his present existence.

In conclusion I would say that the generally accepted theories of science are useful as figures of speech, in illustrating that which is true quite often, especially in the mathematical problems of science.

It is admitted that mathematical consistency must prevail throughout the operations of nature. The means employed in every case must be no more and no less than adequate to produce the effect, but it does not logically follow of mathematical or any other kind of necessity, that there is no infinity of mind in control of an infinity of force to be used at life's will.

These theories of science (I mean the current theories taught in the schools) furnish an illustration of the results of the life-labors of many great minds, and are entitled to a candid consideration, but a proper distinction should always be made between demonstrated truth and mere theory.

CHILLICOTHE, Mo.

WHAT IS SCIENCE? (A LECTURE).

BY REV. THOS. H. MCMULLIN.

SCIENCE, as a phrase or term, conveys to the average mind the idea of undisputed, unquestioned certainty. By its votaries it is sometimes defined "the sum of human knowledge classified." Thus the known facts, truths, phenomena, and laws relating to the solar system and the heavenly bodies, intelligently arranged and classified, constitute the science of astronomy. The true student of science knows, and is always free to admit, that in all departments of scientific research, from astronomy dealing with immensity, to entomology dealing with the microscopic organisms of insects, he meets at every turn of his path, with facts and truths but imperfectly understood. with laws but partly apprehended, and with phenomena surpassing his comprehension.

So, also, in arranging and classifying observed phenomena, known facts and recognized laws, and from such, as a basis, reaching out after the unknown, it is legitimate to indulge in suppositions, and construct hypotheses by which to reach an explanation of known phenomena, and to discover new laws and their observed operations.

If the casual reader, or the student, would keep clearly in mind the distinction between the certain and the suppositious, the actual and the hypothetical, the known and the unknown, many of the mistakes and errors of the present day would be avoided.

How common to find men of little erudition, and of still less scientific preparation, loudly preaching in the name of science. "Science teaches us," etc.; "science tells us," etc., when they are uttering what was originated only as suppositions, as hypothetical, and which among students of science take no higher rank.

Nature is robbed of her treasures of truth and fact but slowly. Man in the exercise of his dominion over earth, the rightful dominion of mind over matter, has always found her loth to part with her gifts, and man's store of knowledge has been gathered slowly, by arduous, painstaking, patient, persistent effort and struggle; here a little, there a little, and as each generation has left records of discoveries made, facts observed and conclusions reached, their successors have discovered much of error in recorded data, and more of fallacy in accepted conclusions.

The study of the atmosphere affords a striking illustration of this thought. The first thing we have use for when we come into the world is air; we breathe it every day that we live, and it is the last thing we use before leaving the world. We ought to understand it if we understand anything in the universe, and yet the human family breathed it for centuries before they knew what it was, or had any just conception of it.

Thales, a great philosopher who flourished in the year 640, B. C., promulgated the theory that air and every thing else was made of water, and that all life resided in it. About a century afterward Anaximenes said Thales was wrong, that everything was composed of air and that it was the essence of life.

Diogenes, a few years later, thought the air to be an intelligent spirit, who was generally in a kind and pleasant humor, but would occasionally become angry and produce storms and hurricanes. 348, B. C., Aristotle divided all substances into four elements—earth, air, fire, and water. But little more was known about the subject till A. D., 1100, when Olshausen, a Saracen, discovered that air possessed weight, and that it merely encircled our globe, instead of extending through all space, as had formerly been supposed. In 1630 Galileo investigated the water pump and found that water would not rise in a tube more than thirty-three feet when the air was drawn off.

Torricello applied the same principle to mercury, which led to the construction of barometers, and laid the foundation for further discoveries. It was found that air weighed about 15 pounds to the square inch and that its weight varied with the weather.

In 1650, A. D., Otto Von Guericke invented the air pump. Boyle, the next investigator, endeavored to ascertain the chemical constituents of the atmosphere. He concluded that there were different kinds of air. Hales pursued the investigations still further; but Black was the first to use the plural for the word air, and to use a balance for weighing *airs.* A. D., 1772, Rutherford discovered nitrogen. In 1774 Priestly discovered oxygen. Lavoisier, a Frenchman, generalized the observations of others, and invented the caliometer. He classified the elements of air as oxygen, nitrogen, and carbon. Liebig has since discovered that the atmosphere possesses a small portion of ammonia.

Dr. Playfair, who has recently examined the subject with ability and precision, says: "Fresh observations are still being made, which tend to show how little is yet known about the air;" and I might by way of suggestion add, that electricians fill it with ozone, musicians fill it with sound, and when treating of those departments of physics, scientific speculations fill it with light, heat, odor, gravity, and ether, and still we breathe it, and it sustains life now just as when introduced into the first pair of lungs.

Closely resembling the path here indicated as traveled in pursuit of the knowledge of the chemical constituents of air, are the lines of investigation and research as to all the substances, forces, and agencies in nature; and the present state of human knowledge as to the nature, source, and laws of many of the simplest, every-day things is such, that he who asserts with dogmatism to-day, may to-morrow be compelled to retract.

The limit of the certain is extremely narrow, while the realm of the suppositions, hypothetical, and unknown, includes by far the greater part of what is said and written concerning

sound, light, heat, gravity, and electricity, and many other matters that are met with in the study of natural philosophy and chemistry, such as atoms, molecules, ether, etc.

Just now a scientific conflict is in progress, relative to the nature, production, and transmission of sound, light, heat, electricity, magnetism, and kindred (what shall I say? forces, modes of motion, or substances?) which for importance, and for zeal and ability on the part of the contestants, is not second to the struggle between the astronomical system of Copernicus, and the Ptolemaic system which it eventually superseded, the success of which was due so much to the bold, indefatigable labors of Galileo.

To an elucidation of the principles involved in this modern, present undetermined scientific conflict, this occasion will be devoted, with a view of enabling those who hear me to take a stand on the right side of the controversy, and then to lend such intelligent aid and influence to the support of true principles, as a future study of the subject may suggest.

By way of preface to this particular branch of the theme, let us consider the present state of scientific opinion, or rather the state in which popular scientific opinion was in, when these new, progressive ideas were first advanced a few years ago.

Sound and light have been so much studied together, that the laws governing the transmission of both have run somewhat in lines. Newton at first supposed light to be a substance, and sound a sensation caused by motion. His contemporaries agreed with him as to sound, and upon this belief was constructed what is known as the wave-theory of sound, viz., that sound originates in the motion or vibration of a sonorous body, which motion is imparted to the air or other transmitting substance in waves, which continuously projected through the air, strike the ear and produce the sensation called sound. Before committing himself to this theory, Newton made a calculation based upon the known density of the atmosphere, at a temperature of 32, and the known time of vibratory motion of sonorous bodies, and ascertained that if the theory be true, sound would under such circumstances travel 916 feet per second, whereas the well-known observed velocity was 1,090 feet, or 174 feet per second too much. For some years this absolute contradiction of theory by fact caused investigators to hesitate about the truth of the theory, when an idea occurred to La Place, the great French mathematician, to meet the emergency. He suggested that the wave motion of the air, while conducting sound, alternately compressed and rarefied the air, and thereby mechanically increased and elevated the temperature of the air one-sixth, which increase of temperature would account for an increased velocity of 174 feet per second. Newton and his contemporaries accepted La Place's suggestion, and from that time on this has been taught as part of the wave-theory of sound.

As to light, from the known analogy of its transmission to that of sound, Newton was forced to abandon the corpuscular theory, and to account for its transmission from the sun to earth, there was supposed to exist an imponderable substance called ether, filling all space, which was set in vibratory or wave motion by the sun's light, which vibration or undulation striking the retina of the eye produced the sensation of light. Not one scintilla of proof of the existence of this imaginary ether ever has been offered, yet the undulatory theory of the transmission of light based upon its supposed existence has from Newton's day to the present been taught as science.

In much the same state, has been the scientific vagaries as to heat, odor, magnetism, electricity, gravity, atoms, etc.

As to the atomical theory, one set of scientists profess to tell us the relative weight, shape, size and mechanism of atoms of the different substances, and upon such suppositious facts, is based the study of organic chemistry.

On the other hand scientists of the highest authority say "No human being has ever seen an atom of any substance whatever, and there exists absolutely no direct evidence of the existence of any such atoms;—they are pure figments of the imagination. The existence of ultimate atoms as a merely hypothetical probability, is rejected by many of the most eminent scientific men, among them the great Faraday. "Many of these things offered at what they are worth—that is as hypotheses more or less probable, or as *simple artifices of intellect*, may serve and really have served to collate facts and to incite to further investigations which, one day may lead to the truth; but, when perverted by being stated as truths they falsify the intellectual education of the student of inductive science, and bring reproach on its modern progress."

These quotations are from two of the most eminent living authorities, one of England the other of Italy. The Substantial Philosophy to which I now will direct your attention, finding scientific truth at the mercy of the wave-theory of sound, the undulatory theory of light, and the theory of heat as a mode of motion, began the most rigid, scrutinizing investigation of the facts supposed for so long to support these theories, and upon the conclusion of such investigation has been able to demonstrate the complete unreliability and defenselessness of the whole of these theories, and the utter fallacy of the opinions and statements taught as science, in their support.

It will sound on this occasion, perhaps, as an idle boast, or the exaggerated, overheated statement of a partisan, but nevertheless, I boldly assert, that almost everything heretofore taught in the name of, and science, relative to the nature, production, and tranmission of sound, is destitute of truth, and is the sheerest of fallacy.

(*Concluded next month.*)

THE GLACIAL THEORY.

BY REV. JOHN CRAWFORD, D. D.

When a very young man, the writer was led seriously to question the validity of the current geological teaching; and, in this doubt, he has been confirmed by all his subsequent study and observation.

God has given two revelations to man, one in the volume of inspiration, and the other in the volume of nature; and, as these two are from one and the same source, the God of truth, they cannot be discordant; nor can they require any forced or unnatural interpretation of either to bring them into harmony. That science which demands a thumbscrew exegesis of God's inspired volume must be false! And that theology which undervalues a legitimate study of God's work, under the feeling that it must be hostile to revelation, must be spurious!

But is it not true that forced and unnatural methods of interpretation are in constant use by scientific divines, in the vain attempt to bring the inspired volume into harmony with the geology of the schools?—methods which, if universally applied, would unsettle every doctrine, and sustain every form of heresy!

The forced methods of interpretation thus employed, and which sets at defiance every law of language, only opens the mouths of infidels to blaspheme the Scriptures, and confirms them in their unbelief.

Young men also, in their ardent pursuit of knowledge, are sadly tempted to doubt whether that book can be from God, which cannot be harmonized with scientific truth but by a mode of interpretation which looks like shuffling, and which no man of sound mind would employ in the interpretation of any other document.

Moreover, this limping exegesis is everlastingly *on the change*, to adapt itself to the ever varying phases of geological science; and it is remarkable, if not amusing, to witness the kaleidoscope exegetical variations, in which many of our scientific divines exercise themselves, in order to keep Scripture interpretation in harmony with the fitful scientific teaching of the day. They are anxious to keep their theology abreast of advanced scientific thought. They think science must *dictate* to Bible exegesis, but will not allow the Bible to make a single *suggestion* to science! Is this rational? Is it scientific? Are we to swallow with devout humility all the teaching of infidel and semi-infidel scientists, and allow them to dictate to us in our methods of Scripture study?—to be overawed in our investigation of God's word by such men as Darwin and Tyndall, and Huxley, and Hæckel, and Helmholtz, and Spencer, sceptics as they are! Shall we acknowledge their sole prerogative to speak with authority about the work of him whom they refuse to worship, while we decline to pay the slightest attention to the plainest declarations of the Almighty Creator himself? or, if we do, employ all our learned ingenuity to explain them away, in humble deference to these scientists who are hardly agreed among themselves about any one geological question of importance!

I am, however, happy to acknowledge that geological research, especially by those men who have made laborious and pains-taking surveys, has brought to light a great multitude and variety of facts, which will be of immense value in building up a sound geological science in the near future; but the reader must pardon me when I say that the foundations of this science *have yet to be laid!*

At present, what is commonly regarded as geological science has its foundations laid in mere hypotheses and the wildest assumption. The facts are *true* and *valuable*, and some important principles have been established; but their wider inferences are, for the most part, false and deceiving.

In the history of the earth's crust there are a few stupendous, miraculous facts, which are recorded in the inspired Volume alone, and which can, therefore, be learned from no other source, but which are *amply confirmed* by the state of the crust itself, and which throw immense light upon its study.

Now, without taking these facts into account, no reliable geological science can be established. To teach geology is to teach the history of the earth's crust; but no complete or harmonious history of that crust can be made out, so long as a few grand, miraculous events, implying great geological changes, and which are recorded in the volume of inspiration, are either ignored or overlooked. Yet it is an undeniable fact, that the current geology of the schools belittles, or entirely explains away, these great events of Scripture! For example, is it not the case that whole treatises and textbooks of geology have been written, and are taught in our colleges, in which there is not the most remote reference made to the flood of Noah! I have, at this moment, four such treatises lying before me, which do not make the slightest allusion to the Holy Scriptures! I am not surprised to find such sceptical scientists as those whom I have named above, ignoring the word of God; but it is lamentable to find so many *professed believers in revelation* following their example.

I do not wish to make any undue use of these miraculous interpositions; but neither would I *overlook* them.

If we would construct a science, it must be by an ample introduction of *facts;* and not on conjecture and unproved hypotheses. In order to do this, we must have all *the facts which are within reach, both natural and miraculous!*

No man can construct geological science from miraculous Scripture facts alone. Neither can he out of the facts discoverable in the earth's crust, while he refuses to take into account the stupendous changes effected in that crust, by the direct interposition of God, as recorded distinctly in the volume of inspiration.

God evidently intends his rational creature, man, *to study the two volumes together*,—that of Nature, and that of Revelation; and these are designed by him to throw light one upon the other. If, then, the scientist refuses to receive light from any one of these sources, he must expect to continue in partial darkness with rerard to the other.

Let it not be forgotten, that the works of Creation and Providence, and the works of redemption, are but integral portions of *one grand scheme* of the Creator. Should not the Christian philosopher, therefore, expect the two books—that of Creation and that of redemption—to have strong connecting links? I

may be regarded as uncharitable: nevertheless I avow my firm belief, that *no sceptic can be a safe leader in science!* The man who diligently and devoutly studies God's inspired volume has a great advantage, even in the study of nature, over the man who disregards it! I think history will bear me out, when I affirm that such men as Newton and Bacon and Locke, who respected the word of God, have made safer advances in science than our Darwins, Heckels and Spencers, who ignore the very existence of that great Jehovah, whose works are the objects of their research. Great collectors of *facts* they may be, but their *science* will soon follow them to the grave!

But I must not lengthen these preliminary remarks.

My object, in this article, is to point out, very briefly, the light which the flood of Noah throws upon what is called the Glacial period.

As on other geological topics, so here, the flood has been entirely ignored. I am not, therefore, surprised to find no satisfactory explanation of the Glacial period in those authors, who have largely written on the subject; although their facts are, for the most part, reliable. Nor am I surprised to find very conflicting explanations given.

In a brief article for a periodical, it would be impossible for the writer to enter extensively into details, or to expose the various false theories—which have been promulgated on this subject. All that he can aim at is to set forth, and in the briefest manner, what he believes to be the only scientific and scriptural explanation of the facts presented.

It cannot be denied, by any one who has examined this subject, that there is abundance of evidence that in some past time, immense fields of ice, and of enormous thickness, have moved down from the polar regions towards the equator, carrying with them, and depositing in their course, large quantities of boulders and other drift, turning the course of rivers, traversing lakes, and sweeping over hills and mountains; leaving deep groovings and scratches in the rocks over which they passed, made by the portions of detached rocks which they carried with them, frozen into their mass; until they gradually melted away, as they approached the equator. And, when the rapidity of the thaw kept equal, or nearly equal pace with their onward movement, moraines of debris were deposited, often forming ranges of hills, usually running east and west.

Sometimes these hills are found to be two or three hundred feet high, as in the neighborhood of Boston, and in Central New York.

The effects of modern glaciers in the region of the Alps, and other mountain slopes, help to explain the much more stupendous glacial movements, to which I now refer; but which have not been repeated in historic time.

Notwithstanding the attempt of Drs. Crole, Geikie, and others, to account, *on astronomical grounds*, for this glacial period, I am fully persuaded that no satisfactory explanation has, or can be, given on scientific grounds alone. The word of God must furnish the key. Let us attend to the Divine solution of the problem. Nor is any forced exegesis required to bring out any recondite meaning.

Gen. VII., 11.—"The same day were all the fountains [or the *places* of the fountains. The Hebrew mem in composition has this force,] of the great deep were broken up."

It is evident, from this passage, that the waters, which then flooded the earth, were procured by an elevation of the ocean bed, with a corresponding depression of the land; or, as stated by Dr. Adam Clark, on this passage, "the circumambient strata must sink, in order to fill up the vacuum, occasioned by the elevated waters."

Passing on to the 19th and 20th verses, we read, "And the waters prevailed exceedingly "upon the earth: and all the high hills, that "were *under the whole heaven*, were covered. "Fifteen cubits upwards did the waters pre-"vail: and the mountains were covered."

Now, is this true? or is it not true? If it be true, why is this stupendous geological fact overlooked? and, if it be false, why do we regard the book in which it is found a revelation from God? Again, if it be false, how can we put confidence in the words of Jesus Christ, (with reverence I say it,) who declares, of this very book of the law of Moses, that "not a jot, (the smallest letter in the Hebrew, in which it was written,) or a keria (or portion of a letter) shall pass from this law, till all be fulfilled."

Let our new-light theologians pardon this dash of "*bibliolatry*" on the part of our Lord! Matt. V., 18.

But here some scientific divine would, no doubt, suggest that "The Bible was not given to teach science." How does he know what it was intended to teach, but from itself? It was given to teach just *what it does teach!* And it most distinctly teaches, in this passage, that, in the days of Noah, the whole earth was flooded, by upheaving the bottoms of the ancient oceans, until all the high mountains under the whole heaven were covered fifteen cubits! I believe this implicitly, on the testimony of the Creator, who also declares by his apostle, that "*All* scripture (words written,) is divinely inspired!"

Now, suppose the bottoms of the Atlantic and Pacific oceans were uplifted to-day, and their waters poured over the surface of the earth, would not the result be precisely as in the days of Noah? All the high mountains under the whole heaven would be covered.

The polar regions would, as a matter of course, come in for their share of these waters; and what would be the result? Would they not be immediately *frozen*, just as the polar waters are frozen now? This additional water would be congealed, and *added* to the ice which was there previously.

Mr. G. Frederick Wright says, "A few degrees nearer the pole, Sir J. C. Ross describes the ice as rising from the water, in a precipitous wall, one hundred and eighty feet high. In front of such a wall, and nearly seventy degrees from the South Pole, this navigator sailed four hundred and fifty miles."

Now, if this polar ice is one hundred and eighty feet thick above the surface of the water at seventy degrees from the pole, it must be about twice that thickness below the water, and proportionately thicker in higher latitudes.

Then take into account the large addition of water, caused by the flood, thrown on the top, and added to the frozen mass!

Again, by degrees, much of the original or lower ice, would, by the rising of the water, be buoyed up, having broken from its moorings, and bearing with it in its elevation vast portions of earth and rock on which it had rested, and to which it had been firmly attached by freezing. This under ice would ultimately adhere to the ice above it recently formed.

Now, after this enormous quantity of ice was formed and loosened from its former earthy support, with its large cargo of *debris*, the present ocean beds were miraculously formed, that the superfluous water might be drained and dry land thus provided, as the future residence of both man and beast.

Moreover, after this subsiding of the waters, there would necessarily be an enormous excess of ice in the polar regions, formed in the manner above described, which could not, like the uncongealed waters of temperate and tropical climates, speedily descend into the new-formed ocean beds; but which ice must, by a slow descent towards the equator, press onwards until ultimately dissolved, as it approached a tropical climate, scoring the rocks and mountains over which it flowed with the stony material detached from the granite and other rocks where it was formed, and the stones which it had picked up in higher latitudes; and depositing this debris, and forming terminal moraines at the end of its course, where, from the increased heat, its slide was not more rapid than its dissolution.

Now I ask my readers, is not the explanation, which I have thus briefly outlined, both scientific and simple? Are not the ascertained glacial facts and the Bible statements, taken in their obvious meaning, in perfect harmony? Do not these statements also throw a clear light upon the science, and the science strongly confirm the statements? This is evidently what was intended by the brief scientific declarations which we find in Scripture: and they who, in their scientific pride, disdain the assistance of Scripture, when tendered by the Author of both Nature and the Bible, have no one but themselves to blame for the darkness and uncertainty which hang over their science.

I may, with the editor's permission, draw attention to other harmonies between geological facts and scripture statements, which render mutual confirmation; and this where the common teaching of the schools is irreconcilable and contradictory; or where apparent harmony is obtained, either by silencing the inspired statements, or by forcing them into compliance with the science.

Before closing, I would briefly notice a fact, much relied upon, to prove the great antiquity of the Glacial period.

It has been said that an enormous amount of time must have elapsed, while the Niagara river has been cutting its channel from the lake to the falls, after the old one had been filled by glacial debris; and the Mississippi also, in cutting out the gorge below St. Antony Falls, at Minneapolis.

It is argued that, at the present rate of cutting, very many thousands of years would be required.

To this I would reply, that, owing to the soft and plastic condition of the rocks, at their upheaval, the waters must have cut them much more rapidly than in their present siccated condition.

Again, by the rapid melting of ice, and by the immense quantities of sand and gravel liberated by its thaw, and carried down with the force of a flood, the cutting process would be carried on at a rate which cannot be estimated at all, by the present state of the river.

One circumstance clearly indicates how little reliance can be placed here on the calculations of the geologists. Their reckonings vary by many thousands of years! While Sir Charles Lyle and Prof. Hale require, at the lowest calculation, 30,000 years for the cutting at Niagara, other geologists say "it must have taken "considerably less than 10,000 years!" Does not this look very much like guessing?

We know, by the minute observations, taken in 1680, by the Jesuit Hennepin, and by Carver, in 1766, that nearly 1,000 feet, or 5 feet a year have been cut on the Mississippi in 200 years; and, at this rate, only 9,000 years would be required to cut the entire gorge, from Fort Snelling to the present falls.

Then take into account the two very important circumstances, to which I have directed attention, but which are entirely overlooked by these geologists in their calculations, the comparative softness of the newly upheaved rocks, and the increased volume and rapidity of the stream caused by the dissolving of the ice, with its load of *sand* and *gravel to do the cutting*, and there is no difficulty whatever in admitting that, from the flood of Noah to the present date, there has been ample time for the excavation of the new channel.

ST. THOMAS, DAKOTA.

FIRST PRINCIPLES OF SUBSTANTIALISM.

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

IN our article for the September number of the ARENA we closed with the statement that the human mind could not possibly conceive of *nothing*—that all effort in this direction must, as an inevitable consequence, result in a concept of *something;* and no matter how sublimated or etherealized a resultant the imagination may divine, it will still be something.

Substantialism has fully demonstrated that a condition of nihility does not exist. In fact, the very postulate of the existence of *nothing* is so palpably inconsistent, so antagonistic to all mental cognition of logical facts and deductions, that it refutes and demolishes itself; for how can *nothing*, which is *non-existence*, have an *existence?*

This idea of nothing is but a survival of the old belief which originated with our primeval ancestors, that invisibility was a state of nothingness, and it is but one of the many instances of how a deeply ingrained idea will linger on

through civilization, when the light of science has long shown it to be utterly untenable.

That illimitable portion of the universe which we denominate space, is the great storehouse of the immaterial forces—the primal workshop of Nature, where these mighty forces, through co-ordination, have built up this planet and all the vast solar systems; and it is from the same source that they continue to draw their sustaining power, and effect all the changes in their internal and external economy. And it is from this same inexhaustible reservatory that vegetation extracts its nourishment, and consequently it is from the same origin that animal vitality is indirectly indebted for the elements which it fashions into its many diverse forms.

Chemical and physiological science teaches that the soil is the fountain source of nourishment for the vegetable kingdom—that from its substance is drawn all the subsistence for the organic world. It is true that roots of vegetable formation penetrate the soil, and through the capillaries the immaterial forces are attracted, and by the controlling power of vitality are forced into new aggregations and arrangements, which ultimate in visible or material forms.

While the soil is the localized visibility which furnishes the vegetable domain with those immaterial substances which its growth demands, yet the soil is but a medium—but the recipient of moisture, heat, magnetism, electricity, and all those invisible forces which are drawn direct from the fountain source—universal space. To state it more concisely, these immaterial substances are drawn *through* the soil, but *from* the atmosphere.

By a fixed and determinate law of nature, vegetative life is constitutionally adapted to the soil, through which medium it attracts the invisible forces which constitute its nutrient or formative substance. As soon as these forces are taken from the soil and utilized by the vegetable germ force, they are replenished from the immeasurable force-element in space; and when vegetable vitality relinquishes its supremacy, these invisible physical forces become liberated and return to the great primordial fountain, there to remain until demanded by Nature to subserve other purposes in her grand economy. This is one of the fundamental principles of Substantialism.

Thus we behold the grand concatenation, co-ordination and conservation of force;—the constant round of Nature's energies—the ceaseless law of change.

If the earth were the prime fountain from which vegetative force drew the elements wherewith to construct material forms, then assuredly there would be a marked diminution of the soil. Yet we see immense forests of gigantic trees, which collectively would make thousands of cubic miles of matter, grown upon soil without any appreciable decrease of its quantity.

How could this be possible, if the earth did not continually draw and renew from the original fountain? Such ponderous volumes of vegetable matter cannot be produced from nothing. And this must evidently be the case if the soil is not constantly replenished from the force-element in the invisible world of space.

The soil, instead of being lessened in quantity by the formation of vegetable organisms, is continually increased in volume by their production and decay, year after year, till thousands of cubic miles of vegetable mould are annually added to the normal earth. Thus the earth is continually increasing in bulk by vegetable accretion, causing it to keep pace with its normal shrinkage by the process of cooling. All this natural growth of the earth comes from the mighty and exhaustless force-element of nature, out of which, as Substantialism teaches, "the worlds were framed by the word of God."

Vitality transcends the physical forces, harnesses them down to do its bidding, and then in its laboratory transforms them into structural arrangement of material organic forms.

That the soil is but a mediate state, is a fact, made still more patent when we plant a seed in a small pot of earth. The moisture, heat, and other immaterial substances or forces, resident in the soil, act as stimuli to the vital energy stored up in the seed; they are constitutionally related to it; the seed sprouts and grows into a plant several times the bulk of the soil in which it is grown, yet there is no appreciable reduction in the quantity of the soil.

Vegetable physiology teaches that heat and moisture cause the seed to sprout, but this is not philosophically true. The simple fact is, the heat and moisture overcome cohesive force to such an extent that the requisite conditions are supplied for the latent vital energy to seize upon the immaterial forces, and utilize them for formative purposes.

Certain kinds of seeds may be planted in leaden shot; and supplied with nothing but pure distilled water, the atmosphere and the sun's light and heat, and they will grow and attain maturity, elaborating and constructing their substance out of these elements without any aid from the soil whatever. And when they are subjected to the laboratory processes of the chemist, yield the various earths, alkalies, acids, metals, carbon, sulphur, phosphorus, oxygen, nitrogen, etc., in the same proportions as when they are grown in their native soil. All this plainly demonstrates that vegetable vitality draws from the invisible empire—the force-element of nature—those substances which it transforms into visible material substance, and that the earth is but a reservatory for moisture, heat, electricity, magnetism, cohesion, gravitation, and all those forms of the force element which are correlated to, and subordinated by, the vital force.

In view of these scientific facts, how can we better define matter than in the beautiful language of the poet :—

> All matter is God's tongue:
> Out from its motions God s thoughts are sung,
> And the realms of space are the octave bars,
> And the music notes are the sun and stars.

NEWBURGH, N. Y.

CARTESIANISM.—No. 2.

BY REV. J. H. LIGHTBOURN.

THE starting-point and foundation of Cartesianism is *certainty*, excluding all possibility of doubt—this is the fulcrum on which the Cartesian lever rests.

What is this certainty?

1st. It is not the existence of the ego. In the Cartesian argument the ego posits its own existence. The *ergo sum*, has no force until the *ego* involved in the *cogito* is explained and known. That there is *something* in man that thinks is a truism, but Descartes' *cogito ergo sum*, which has wrung throughout the world, does not tell us what the ego *is*, but what it *does*. What is *it* that thinks? Democritus said, "it is *atoms* that think." Locke says that "matter may be endowed by the Creator with the capacity to think." German materialists assert that "thought is molecular motion;" and that "thought is the secretion of the brain." Descartes was only certain of doubt—the existence of the *ego* was only an inference—an *ergo*. Professor Tyndall has properly said, "no inference from the postulate can be stronger than the postulate itself; the very thing to be proven was postulated in the first two words 'I think.'" Descartes attempts to explain the thinking substance by its characteristic element *thought*; but if the substance be unknown and the properties only partially known, how can our knowledge be certain. Hence the existence of the *ego* is simply an *ergo*, and the ego that thinks is as Bacon declares, "scientifically incognizable."

By *sum* Descartes could not have meant simple abstract existence, if so his reasoning would have been equally conclusive had he said "I breathe," "I feel," "I walk," *ergo sum*. Not existence as can be applied to the irrational brute, or the inanimate rock, but applicable only to the conscious, intelligent soul, to himself the thinking ego. It is in this we see the force and beauty of the Cartesian argument! It differentiates man from the whole animal kingdom; brutes are only automatic machines; man is a kingdom in himself—the only being in the world that thinks—in the whole universe of being man alone can say *cogito!*

2d. The only certainty on which Cartesianism rests and builds is *doubt*. Analysis had annihilated all belief, and nothing was left the mind but doubt. Of this *alone* Descartes professes to be certain—he doubts. He cannot trust his senses, he is not certain of the existence of the material world. Hence arose that idealism with which the name of Bishop Berkeley will always be associated. He denied the real existence of a material world, taught that no abstract ideas exist, extension cannot exist without an extended body; all objects we see and feel consist of phenomena, that which we see and feel is nothing but sensation, only ideas and volitions exist. Hume used Berkeley's argument against the existence of the material world and the other the existence of the spiritual world, to demolish the existence of his spiritual world, and extremes met—the one denying the existence of the material world, and the other the existence of the spiritual world, and between the clashing theories of the bishop and the infidel there was no world left!

That doubt is the only thing of absolute certainty, or that there are not other things the existence of which we are as certain as we are of that of doubt is gratuitous. The conviction of certainty produced in the mind by the senses, is as strong as that produced in our consciousness by doubt. If the senses are sometimes unreliable, so also is our consciousness. There are hallucinations and impairment of the mind as well as illusion and impairment of the senses. From his own account, we have a description of the excited condition of Descartes's mind. He says, laying himself down "brimful of enthusiasm" and wholly possessed with the thought of having found that day the foundations of the wonderful science, "he had three dreams, which he believed were sent him from above." In these dreams he saw "a Path which God had chalked out for him." But Descartes was not only subject to hallucinations of mind, but he was the victim of superstition. The doctrine of transubstantiation which involves a contradiction he accepted as an undoubted truth in his creeds; showing a strange mixture of credulity with doubt. Then his whole process was simply emptying and filling. After emptying himself and wallowing in "the slough of despond" then he begins to fill himself up. What did he gain by this emptying and filling? After wandering through tangled woods, and stumbling over a rough and stony road he gets back from where he started. One would have thought that so bold a doubter would have adopted an eclecticism, and have rejected some things that doubt had thrown out.

Descartes was a great thinker, but he was not a brave man; he was bold in thought, but timid in action. His work which he called "The great book of the world," in which he taught the Copernican system, he suppressed, as soon as he heard that the "Inquisition of the Holy Office" had compelled Galileo to abjure his opinion of the earth's motion as a rank heresy.

How much Descartes doubted, and how much he believed, is very uncertain. At least we arrest him at his very starting-point and to his assertion "I doubt" we respond "We doubt your doubt."

The foundation of Cartesianism is false. Christianity teaches that it is through *faith* that the mind attains a knowledge of God. Cartesianism in direct contradiction teaches that it is through *doubt* that this knowledge is acquired. The gospel of Jesus, "believe and be saved," is substituted by this psuedo-philosophy, *doubt* and be saved. Not by faith, but by doubt, man comes to God:—thus the line is sharply drawn, Descartes versus Jesus.

Faith, and not doubt, is the first flower that blooms in the human soul. The consciousness of faith is as real and as certain as that of doubt. Thinking is as much a species of believing as of doubting; in believing I think, therefore I exist,—the proof of existence is the same, be the starting-point faith or doubt.

Doubt is a destroyer. Cartesianism made a

deep impression upon the world, and especially upon the French mind. It was a bold and startling doctrine, that doubt is the starting-point and foundation of knowledge. It was a new gospel, and no wonder the French people became a nation of doubters. Carlyle in his French Revolution says: "A new philosophy dawns; by victorious Analysis men hope to get rid of Death, as they have already got rid of the Devil, so that in spite of Death and the Devil they shall be happy. So preaches magniloquent philosophy! Twenty-five millions of people! for them there is no Era of Hope except in the gloomy rest of Death! One huge motionless cloud girdles the whole horizon covering a sky of the color of lead. At last with one loud howl the whole Four Winds are dashed together and all the world exclaim there is a tornado! Behold the World-Phœnix in fire-consummation, and fire-creation! Wide are her fanning wings; loud is her death-melody of battle thunders; skyward lashes the funeral flame, enveloping all things—it is the death-birth of the world!"

France is the only country in which infidelity has been associated with democracy and revolution. This infidelity was the natural outgrowth of a corrupt religion and a false philosophy. After superstition and licentiousness had corrupted the true faith, and destroyed the public veneration and respect for religion, it became easy for Cartesian doubt to dislodge the idea of God from the mind of France, and to write over the tomb the inscription of annihilation—"Death is an eternal sleep!"

THE SCIENCE OF JACK FROST.

BY SAMUEL LLOYD, ED. *Sanitary Plumber.*

Among the popular fallacies none is more prevalent than that relating to the expansion and bursting effects of ice in our water pipes. Even among intelligent plumbers the belief seems to be very general, that the mischief takes place when the ice commences to melt; and, in fact, it is only a week ago that we read in one of our scientific exchanges that it was well known that water expands when it first congeals, and also goes through a second course of expansion as it first commences to melt, a scientific paradox which the writer makes no attempt to explain, and which as a matter of fact, exists but in his imagination. It is somewhat laughable to hear some people descant upon the best means of thawing pipes so as to avoid bursting. Some advocate a gradual melting of the ice, while others are in favor of a hot douche, so as to heat the exterior first. The effects, however, are just the same, for in either case whatever damage is to result from that particular freeze, was done long ago, and the burst actually took place just *before* the freezing rather than during the process. The pipe was cracked by the expansion, and a piece of ice protrudes through the aperture and serves as a plug to check the flow; but days, weeks or even months may elapse before a warm thaw sets in and exposes the damage that has been done.

Pipes do not always burst after a freeze. Lead is very ductile, and will often yield or stretch sufficiently to allow for the expansion of the ice without making an open fracture; but the pipe is gradually weakened by each successive freeze, and will sometimes be as thin as paper before giving way. Pipes are most likely to freeze at the top of a curve or bend, when some slight obstruction tends to collect the ice, which, being lighter than the water, rises in flakes and soon become united in a compact mass.

The reason why ice floats is readily understood. Water assumes its most condensed form at 40° F., and as it becomes congealed by the frost expands a little over a tenth of its size. A piece of floating ice has a tenth of its bulk above the water line, therefore when we see an iceberg three hundred feet high we can get an idea of its size by calculating that its depth is nearly 3,000 feet.

Why liquids congeal at a certain low temperature is also well understood, but the cause of their expansion is not so readily explained, nevertheless, the following theory seems to be based upon accepted hydrostatic laws and may throw some new light on the subject:

It is unnecessary to give the why and the wherefore of the laws of capillary attraction; it is sufficient to say that it has been demonstrated that liquids possess a peculiar affinity for minute fissures, and will ascend or *climb* through a lump of sugar or sponge or woody fibre and exert a marvelous expansive power. This same principle which is utilized to rend a rock by inserting in a crevice a wooden wedge which is afterwards saturated with water, seems to come into play in the bursting of our water pipes. When liquid freezes a fine net work or filagree of frost appears throughout the water, and rapidly increases in denseness until it reaches that necessary stage of compactness to form minute pores and fissures, when the phenomena of capillary attraction is exerted with the consequent fibrous expansion as in wood, which develops that marvelous power which almost defies resistance.

SPONTANEOUS GENERATION.—No. 4.

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

As the theory of modern evolution absolutely requires that *life*, together with all the various organized forms with which it is associated, shall have come originally from inert dead matter by Spontaneous Generation, its votaries have applied themselves most assiduously to the task of proving by experiments, that life under certain favorable conditions can be, and is, generated from lifeless matter. But after all their pains-taking experiments, the proof of even its possibility under any circumstances is still wanting.

Nor will it ever be known how many of their experiments of this kind have in their own hands falsified this most essential part of the evolution theory, or presented only negative results, as they have no interest in, nor any heart to publish to the world their own defeats. This much, however, is certain, that they have furnished us with no reliable evidence of the correctness of this part of their system. The alleged proof that they have furnished, and which they patronizingly beg us to accept, is logically insufficient to prove anything of the kind. This is clearly evident from the fact that all of their experiments are based on mere assumptions; and hence their deductions and conclusions rest on no better foundation. In every instance in which they have resorted to experiments, they have *assumed* that life cannot exist under certain unfavorable conditions, namely, under a certain amount of heat, and then, when a solution (or whatever form of matter may be used for the occasion), has been raised to the designated, or chosen temperature, and living *Bacteria* has been obtained from the prepared solution, it is generally at once *assumed* that *Bacteria* has been obtained or generated by spontaneous generation. This, however, is not proof, it is only assumption.

These experiments are about all of one kind, and the conclusions reached are obtained in the following way:

All living forms are killed by being heated to *n* degrees.

The solution or contents of the closed vessel have been heated to *n* degrees.

Therefore, all living forms that existed in this vessel have been absolutely killed.

But living Bacteria, etc., appeared in the contents of this vessel subsequently to its being heated.

Therefore, they have been spontaneously generated.

Now the logical form of this reasoning is all right, but it is obvious that the correctness of the conclusion depends entirely upon the validity of the first and second propositions. It is therefore necessary in the first place to prove that the *n* degress of heat will positively destroy all life germs of every kind; and secondly, that the experiment or experiments, were so carefully conducted as to have excluded beyond a doubt the admission of *Bacteria* from the surrounding air.

Now, if it could be proved that in cases which are not open to doubt, living matter is always and invariably killed at precisely the same temperature, there might be some reason for the assumption that in those cases which are obscure, death must take place under the same circumstances. But what are the facts? It has been demonstrated that between the lowest temperature at which some life forms are certainly killed, and the highest at which others certainly live, is rather more than 100° Fahr., namely between 104° and 208° Fahr.

There is, therefore, no ground for the assumption that all life is destroyed at the latter temperature, or at 212° Fahr. even.

In the Encyclopædia Britannica it is stated, that Dr. Roberts of Manchester, in experimenting upon this subject, found for example, as every other careful experimenter doubtless may do, that by taking an infusion of hay which was rendered alkaline with ammonia, or liquor potassæ, that "it was not sterilized except after an exposure to the heat of boiling water for more than an hour. Sometimes it became productive after two hours, and once after *three hours of such exposure.*" (Proceedings of the Royal Society, No. 152 p. 290.)

"Under these circumstances," says the editor of the Encyclopædia, "it will be evident that no experimental evidence that a liquid may be heated to *n* degrees, and yet, subsequently give rise to living organisms, is of the smallest value as proof that abiogenses has taken place, and for two reasons: Firstly, there is no proof that organisms of the kind in question are dead, except their permanent incapacity to grow and reproduce their kind; and secondly, since we know that conditions may largely modify the power of resistance of such organisms to heat, it is far more probable that such conditions existed in the experiment in question than that the organisms were generated afresh out of dead matter." (Vol. iii, page 689.)

In the above experiments of Dr. Roberts we have positive evidence, that when infusions containing *Bacteria* have been subjected to a heat of 212° Fahr. (the boiling point of water, and the temperature at which such experiments are usually made), and *Bacteria* afterwards make their appearance in such infusions, that it furnishes no proof whatever that spontaneous generation has taken place, but rather that the original *Bacteria* were not destroyed although they may have been subjected to such a heat for more than three hours. In view of these facts it is no wonder that leading evolutionists have so little to say about such experiments. And yet unless they can furnish some proof that abiogenses is something more than a visionary speculation; something more than a mere assumption, their whole system of Atheistic evolution is absolutely and hopelessly ruined.

THE LAND, AND TAXATION.

BY EDWARD H. ROGERS.

In coming before the readers of the Arena with an economic article, it is incumbent upon the writer to state that the ideas which will be developed, are those of a workingman of American parentage; they are also the result of a quarter of a century of active effort in the ranks of social reform. These efforts have been devoted mainly toward the reduction of the hours of labor, but they have involved a diligent study of the whole field of reform.

The two important topics above named will at once call to mind the able and devoted leaders, Henry George and Rev. Dr. Edward McGlynn, and both questions will be considered in their relation to the remarkable movement now in progress under their auspices.

It should, however, be further stated, that the above experience was preceded in the earlier years of my life by an intensely sympathetic observation of the origin and growth of the movement for the abolition of slavery. No patriotic Christian now doubts that this movement had the Divine sanction; and there seems to be sufficient reasons for thinking that the present efforts of the people to abolish poverty will ultimately be crowned with similar success. Children are already born who will

live to see the full deliverance of our own dear land from what the wisest of men calls "the destruction of the poor—their Poverty."

I am not carried away by enthusiasm! Our recent experience in throwing off the weight of slavery might have made me so, but it has been so appalling in its circumstances that I am effectually sobered. Weighing carefully the forces which I see in operation I behold a dark and troubled vista expanding before me, in point of time, several decades at least. I write thus gravely because many of the leaders in pending reforms seem to have no adequate conception of the delicacy and complexity of the social organism. Reasoning altogether upon individual lines of thought, they appear to have learned nothing from the fearful experience of war through which we have passed. They do not realize that its magnitude and cost in blood and treasure exceeded the dreams of the most timid, so much so, that we have it from the lips of such a man as Garrison, that if the veil which hides the future could have been lifted, it would have moderated his fiery zeal.

Seen in the light of such observations, intensified by my personal experiences in active military service, it seems to me that all reforms should be pressed inside of constitutional obligations and under the control of Christian principles.

There can be no exception to the last named condition, but inasmuch as political constitutions are of human origin, and therefore fallible, there exists a revolutionary right of resistance after all efforts of a peaceable nature in the direction of reform have failed. Under these circumstances, the Divine Being, in great providential crises, may not only liberate the conscience of large numbers of humble individuals, but he may, by special call to a gifted leader like the hero of Harper's Ferry, inaugurate new conditions in public affairs,—conditions which place arms in the hands of the people, in order to remove by force an overshadowing wrong.

These statements will answer as a guide to the remarks which follow, which I commence by making grateful acknowledgments as a representative workingman to Mr. Henry George for the magnificent service which he has rendered to the humble poor of the world, by the publication of his book, "Progress and Poverty." It was said of Mrs. Stowe's "Uncle Tom's Cabin," that its influence in Europe was the main factor in preventing the Confederates from obtaining money loans, and a high authority writing during the war, gave it the potential force of an "Army Corps in the field." The immediate value of the book lay in its power to make willing captives of the imagination and the heart, thus affording an entrance for the moral and intellectual forces, and compelling a verdict against the system whose enormities it exposed.

Henry George has done this, and more, in his wonderful work. Ruskin says that the "plus" quantities of the rich are mainly composed of the "minus" quantities of the poor, This Mr. George demonstrates. Unpopular, and even offensive, as the statement is to the conservative world, it is so ably presented in "Progress and Poverty" as to force its way irresistibly into the palaces, as well as the cottages of Christendom.

Remarkable as it may seem, and the fact illustrates the weakness as well as the strength of the book, it has accomplished all this by a presentation of only one of the four terrific aspects of usury, that of the Rent of Land. The price of money, of merchandise, and of personal service, or labor, is not taken into account. He would do nothing directly to limit—(as a typical example)—Jay Gould's income, nor would he take any other step than the Taxation of Land to relieve the poverty of the lowest paid classes of labor. His conscience is under the full control of Bible ethics in the matter of Land, but it ceases abruptly to act at that point.

He shows in this his incapacity to sweep the whole horizon of reform. Admitting, as we may, that the application of his ideas would very sensibly reduce the price of land, and thus widen the scope of ownership, it yet remains true that the standing offer of land to the veterans of the war free of price on condition of occupation has not been to any marked extent accepted. The fact is, that if a laboring man has money enough to stock a farm, and support his family until the first crop is gathered, he is raised sufficiently above the most pressing exposures of his class to repress his aspirations for a farm; more particularly when, as is usually the case, his family shrinks instinctively from the isolation and hard labor of the country.

Nothing that has been heretofore said, however, should be so construed as to hinder, for the present at least, the efficiency of his movement in drawing attention to the fundamental character of the Land Question. Sympathetically I find myself powerfully attracted toward the ardent young men of his following who are reaching down to the foundations of human society in their zealous efforts to relieve humanity from its burdens. In the discourses of Father McGlynn I behold the Decalogue honored in a manner to which as a Protestant I have been a stranger, and I feel it to be of the greatest importance that this tendency should be approved and acted upon by Christian men and women of all persuasions. Under the present circumstances Father McGlynn has pronounced against political socialism, but it is to be hoped that he is not so much controlled by the extreme individualism of his associate as to refuse his final approval of such organized efforts to abolish poverty, as are plainly indicated in Scripture. To do this would be to close his eyes to the momentous fact that the communal institutions of the Catholic Church bridged the chasm between Paganism and our so-called Christian civilization. It remains to be seen whether the world will not yet be indebted to the Church, in both of its branches, for a full solution of the Social Question, by the means of similar institutions.

I have said enough to prove that in those aspects of the question in which I differ from Mr. George I am not in the slightest degree under the influence of personal, class, or partisan prejudice. Even if no more should be accomplished by the movement than to throw the incidence of taxation on to the future increased values of Land in our large cities, a great good would be gained. Is it practicable, or even possible, to go beyond this? I am compelled to doubt it, unless, as is indeed possible, the whole social discussion *assumes a revolutionary form.* It ought to be our aim to avoid this. The proposal to place all taxation on Land does not seem to be absolutely unconstitutional, but it involves such radical changes as to excite an opposition as formidable as the effort to abolish slavery. To some of the obstacles we will now turn our attention.

The close alliance between a large class of the *unscrupulous rich,* and a larger class of *illiterate and vicious poor,* in sustaining the liquor traffic, forms one of the most obvious and disastrous of our political conditions. The proposition to place all taxation on the land will draw the Landlords of the great cities into a new agreement with the Grangers in a most determined opposition. In the present conditions of opinion this coalition will not be burdened with the odium attaching to the sale of liquor. On the contrary, it will be sustained by the support of the cultured classes, who will see *danger to the endowments* of our great Institutions of Religion and Learning.

Mr. George relies upon the intelligence and large practical wisdom of the farmers, which will, he thinks, make them willing to submit to this form of taxation after they see its benefits. But is there any foundation for this hopeful view? Are the American farmers going to vote to relieve the Bankers of the great money centres—who hold mortgages on their property—from taxation and generously pay it themselves? Are the agriculturists of the South in such easy relations with the brokers who make advances on their crops that they can go and do likewise? All the facts are to the contrary. All purely agricultural countries tend to slavery, so Buckle says. A blight rests upon the farming of poor men even here in favored New England. All our efforts should be directed to relieve farmers as much as possible from taxation. The support of common schools in the towns of Massachusetts is so onerous, that the State has withdrawn the school fund from the cities, and gives it to the populations of the farming and fishing towns.

Such, in my opinion, are some of the adverse conditions of the Henry George Party.

CHELSEA, MASS.

WHAT IS A MIRACLE?

BY REV. J. W. ROBERTS.

NOTWITHSTANDING all that has been written upon the subject, there is yet remaining in the minds of many intelligent persons either vague or erroneous ideas as to what really constitutes a miracle. Definitions are partly responsible for this state of things, for most of them are not clear cut, and some of them are incorrect. Webster defines the term: "Specifically, an event or effect contrary to the established constitution and course of things, or a deviation from the known laws of nature," which is to some extent misleading, and may be regarded as at least unsatisfactory if not absolutely inaccurate. While it may be difficult to give an entirely satisfactory definition of the term in few words which will be sufficiently comprehensive, explicit, and definite, yet this approximates that end:

A miracle is the interposition or application of a force among the forces of nature, which for a time may dominate one or more of them without arresting or impairing them.

An illustration may aid to a better understanding of the subject. I see an apple falling from a tree, impelled towards the centre of the earth by gravity. I reach out my hand and catch the apple, thus dominating with the life-force which I possess, guided by the mind-force, the law of gravitation. For the time and for the apple the new force is greater than that of gravity, and hence, if the expression is allowable, overcomes it. But is the law of gravitation annulled or suspended or in any manner crippled? Not at all. It never lets go the app'e for a second of time, but holds on to it with just as tenacious a grip as it did while it was falling and when I caught it, which fact is proved conclusively if I cease to operate the life-force and let go my hold upon the fruit. As quick as thought it begins to descend to the earth. Suppose a mountain should be falling instead of an apple, and I had the power to arrest it, and should do so, it would be no more of a miracle than the arrest of an apple. I have not that degree of power, but God has, and if need be could exert it; and if He were to do it, it would be called a miracle, and justly so, because it would be an exercise of strength beyond that of any created being of whom we have knowledge.

Take the instance of the dividing of the waters of the Red Sea and the Jordan at the exodus of Israel from Egypt and entrance into Canaan. Men dam up a stream of water, and it is no miracle, but simply the interposition of the life-force directed by the intelligent mind-force, as in the case of the falling apple. But on the water of the stream thus obstructed gravity still holds its unrelaxed grasp. All that God did at the Red Sea and at the Jordan was to interpose a force greater than that of gravity for the time and dam up the water, at the same time separating it. But he never annulled or suspended the law of gravity for a moment; and as soon as the Hebrews were over in each case, He simply removed the dominating force which had been employed to suit His august purpose, and with all the rapidity with which the pull of gravity could draw them, the waters returned to their normal or usual condition. This ought to be plain.

Take the case of raising Lazarus, or any other person, from the dead. The law of mortality was simply dominated for the time by a superior law and life restored. But the law of mortality still held unbroken possession of the bodies of those thus acted upon by the other

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[Successor to THE MICROCOSM, Founded 1881.]

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

PASTOR HENRY B. HUDSON, - - Associate Editor.

Whole Series, Vol. 7. New York, October, 1887. No. 5.

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THE GAUGE OF TRUE SCIENCE.

BY THE EDITOR.

ONE of the most important criterions of scientific truth in any department of physical investigation, is the simple and natural conformity of the facts and phenomena involved with the obvious and common-sense ratiocination of the observer, as compared with other natural facts and phenomena in adjacent departments of physical research well settled and understood, and about which there can be no rational controversy.

Take any assumed theory of science or any particular part of a theory, and if its explanation of superficially observed facts and phenomena be of such a character as to conflict with well understood and demonstrated natural laws and principles, or if such explanation is obliged to leave out of account certain parts of the phenomena observed, or to ignore certain well-known analogous facts in adjacent branches of scientific research, then we may set down that theory or that particular part of a theory as intrinsically untrue, and of necessity founded on false conceptions of nature's harmonious order of things. And we may add, as a corrollary of this general conclusion, that merely superficial appearances in our observation of natural and mechanical phenomena are the fruitful source of nearly all the errors recorded in modern science.

This rule is infallible, and, as will readily be seen, applies to claimed inventions and discoveries as well as to theories of science. Should there be a claimed discovery for example, in the mechanical generation and application of force, whether said force should be assumed to be new or old, by which results are supposed to be obtained out of all proportion to the means employed, or by which a perpetual supply and even constant increase of such force may indefinitely be kept up by one initial impulse, thus involving not only one but an indefinite number of perpetual motions of ever increasing capacity, we may safely set down such claim as fraudulent on its very face, and its author as a charlatan. For should there be any truth in the claim lying at the foundation of such assumption, that a single initial impulse could thus go on multiplying its perpetual application of similar impulses to the ever increasing supply of such mechanical force, it is plain that the amount of mechanical work which could thus be accomplished through the agency of that first impulse would only be limited by the room for the proper machinery necessary to the application of such perpetually augmenting force till the whole earth could finally be filled with engines of a million horse-power each, and all supplied with their force derived from that initial application of a man's finger exerting a single pound of mechanical energy!

In making application of our gauge of true science to the theories of the day, as taught in our schools, we find no better illustrations than in the current teachings concerning the physical forces, especially those of sound, light, and heat. The original source of error in theoretic science, as also in claimed mechanical discoveries, is the acceptance of superficial appearances for the real facts involved, which facts are often covered up by these very appearances which so easily mislead unphilosophical minds, and thus prove the prolific cause of all the false notions taught as science.

The Ptolemaic theory of the motions of the heavenly bodies, and the present flat theory of the earth, are apt elucidations of this habit of accepting merely superficial appearances in place of the real facts of nature, as the basis of theoretic explanations.

The very magnitude of the earth, contrasted with the limitation of our own very circumscribed senses and perceptions, makes the diurnal and annual movements of the earth insensible to us, unless our rational faculties take the place of mere sensuous observation. The same is true of the enormous distances demonstrated to separate us from the heavenly bodies, and those bodies from each other, though they appear to the superficial observer, who judges only by appearances, to be barely a few miles away, and to be clustered close to each other.

The principle of superficiality which causes the infant to reach out anxiously for the moon, and even angrily to strike its nurse because she will not pluck the bright toy and bring it down as a plaything for baby, is the same as that which inspired the feeble conception of a "Parallax" and a Carpenter, who innocently suppose, even in this enlightened day and generation, that the sun, moon and stars are all less than a thousand miles from the flat earth, thus proving themselves to be but superficial infants of a larger growth.

The ancient astronomers of the Ptolemaic school went by the same criterion as their guide, and not being able to perceive directly by their senses that the earth moved either on its axis or in its orbit around the sun, they seized upon the apparent motions of the sun, moon, and stars as the real movements in the premises, and thus established a theory which satisfied their weak apprehensions, and which prevailed for more than a thousand years. It was not until men, like Copernicus and Galileo, had the intellectual capacity to ignore the manifest daily appearances of the moving sun, moon and stars, and to look at the facts of the earth's two-fold revolution as the simple solution of all heavenly phenomena, that the true theory of astronomy was framed and established.

In like manner the advocates of the present flat-earth theory, chained down as they are to the most superficial and pitiable limitations of observed appearances, really suppose the earth, minus hills, as well as the ocean, minus waves, to be absolutely flat surfaces, since their own contracted view of this surface, in the absence of all exercise of their rational faculties, presents to their puerile intellects the appearance of a perfect plane.

A microscopic louse, placed on the surface of a large round pumpkin, would also declare in like manner that the surface of its globe must be perfectly flat, so limited would be the range of its circumscribed view, extending, say, one-eighth of an inch—a circle larger in proportion to the view of this insect than a radius of 100 miles would be on the earth's surface as viewed by man.

Now suppose a long, straight rod to be passed through this pumpkin from blossom to stem, with a tiny light at the north end of the rod and a larger light, representing the sun, a few feet from the equator at right angles to this axial rod; and suppose this pumpkin to be slowly revolved on the rod with our little flat philosopher placed forty-five degrees from the equator toward the north pole, we assert that the appearances of this polar light, remaining stationary, and of the sun circling southward at noon while rising and setting considerably north of east and west, would be precisely the same to the louse, without the aid of reason, that the sun and north star would present to man

should he ignore the simple fact of the earth's rotary motion as demonstrated in the Copernican system of astronomy.

Now the fact that we have at this very day hundreds of otherwise intelligent men, who firmly insist upon the truth of the flat theory of the earth, based on the very appearances supposed in the case of the insect and the pumpkin, and in total defiance of the great bottom facts of astronomy which show such appearances to be necessarily fallacious, is it any wonder that the wave-theory of sound for example, should have been originally founded upon the superficial appearances of the vibrating instrument and the incidental vibratory tremor of the air and other adjacent bodies?

Although it would have been as easy for acousticans to have exposed the erroneous character of the wave-theory and the fallacious interpretation of the vibratory appearances upon which it was originally based, as it was for Copernicus to expose the erroneous appearances on which the Ptolemaic system of astronomy was founded, it has remained practically the accepted theory of sound from the time of Pythagoras down to the present.

We have never been so thoroughly surprised at the superficiality of critical scientific minds, as since we have been engaged in exposing the errors of the current doctrine of acoustics. More than a dozen different illustrations of the truth of this general charge have been pointed out and demonstrated in our various discussions of this question in the "Problem of Human Life," the five volumes of *The Microcosm*, the Text-Book on sound, and the two volumes of the SCIENTIFIC ARENA, in which an entire neglect of the real guage of true scientific knowledge has led to the acceptance of the most monstrous errors drawn purely from superficial appearances, and which the slightest examination of facts lying just below the surface, but in plain sight of the eye of reason, would not only have dissipated but made ridiculous.

Look at the present teachings of physicists, that the vibrating prong of the tuning-fork must move "swiftly,"—much more swiftly than the clock-pendulum (see Tyndall and Helmholtz, as quoted in the "Problem of Human Life,") owing to its "entire function" of carving the air into "condensations and rarefactions," and sending them forth as sound-waves through the air at a velocity of 1,120 feet a second,—when it is an absolute fact, as we had the honor of first announcing, that a tuning-fork will sound audibly when its prongs, so far from "swiftly advancing," do not travel at a velocity of more than *one inch in two years*; and instead of traveling "very much faster" than a clock-pendulum, as Helmholtz declares, it will sound distinctly when moving 25,000 times slower than the hour hand of an ordinary calendar clock! This fact, carried out at our request and demonstrated by Capt. Carter, Prof. of Higher Mathematics in the Pennsylvania Military Institute at Chester, shows what a prodigious error even the greatest living physicists can fall into by the *apparently* swift motion of a tuning-fork when first bowed or struck. (See "Text-Book on Sound," question and answer 25, with the foot-reading attached.)

From the vibration of the sounding instrument, as the mechanical method in the economy of nature, for the generation, or more correctly speaking, *liberation* of tone, it was easy for early scientists to infer the air-waves thus incidentally produced as constituting sound; and from these air-waves it was another easy step to imagine a stretched tympanic membrane in the ear, like the tensioned head of a drum, responding to these incidental atmospheric undulations, and thus conveying sound to the brain in the form of wave motion! Yet it is a demonstrated fact that there is no such membrane in the ear as the imaginations of physicists have fabricated, and which their theory of misapprehension has always required.

So far from a "stretched membrane" closing the passage to the inner ear, capable of vibratory motion, it turns out to be only a flacid mass of tendinous tissue, incapable of any vibratory action whatever, but very sensitive to this form of natural force, just as the nasal membrane is only sensitive to odor, the optic membrane only sensitive to light, or the gustatory membrane only sensitive to flavor, not one of which is even claimed to produce its respective sensation by vibratory motion!

Thus we see how the vibrating fork or string, with the incidental tremor of the air and of adjacent bodies accompanying it, led to a chain of appearances and assumptions all perfectly groundless till they reached the supposed vibrating "drum-skin" of the ear, an organ which was never intended to vibrate by any sound, however intense.

Then another assumption, growing directly out of this chain of mistaken appearances, and in harmony with it, was the destruction of distant windows by the supposed "sound" or "noise" of a magazine explosion, as taught by all physicists up to the time of its exposure in the "Problem of Human Life" about a decade of years ago. Not one investigator of sonorous phenomena had caught the fundamental idea that it was the enormous mass of powder-gas instantly added to the air which forced the air outward in all directions into a condensed wave, and thus did the damage of breaking the distant windows, and in closer proximity of leveling entire buildings with the ground. Not one single physicist had caught the idea that the sound or noise *per se*, had nothing whatever to do with it.

The superficial fact that the great sound or noise of the explosion was heard to occur almost simultaneously with the disastrous effects observed, was a sufficient basis for all past physicists to draw the inference that it was the "noise" that did the destructive business! They were too superficial to inquire why the thunder peal does not break the glass in a building even where the bolt strikes, especially with its "noise" many times louder than that of a powder explosion a mile away from the magazine, where every pane of glass is often known to be shattered!

One would think that the eminent authors who had recorded such stupendous oversights in their physical text-books, taking no account of the addition of powder gas in the one case, which does all the damage, and the entire harmlessness of the much louder sound of thunder in the other case where no gas is added to the air and not a pane of glass cracked, would almost take it as an insult for any man seriously to call them scientists. Yet these very oversights in our standard text-books which treat of the nature and phenomena of the physical forces, go to make up much of the so-called science as taught in our colleges.

We have repeatedly called upon professors to point out a single instance of reference previous to the year 1877 by any writer to this true cause of the breaking of windows at a distance from a magazine explosion. The great physicists are seeking to ignore this exposure of that fundamental error as if it never had been made; but we have the proud satisfaction of knowing that since the "Problem of Human Life" appeared, they have sullenly kept their mouths shut and their pens stifled in their lectures and published essays about these destructive effects of "sound" on distant windows, and about the prong of a tuning-fork "swiftly advancing," "cutting and carving" the air into sound-waves! We challenge any one of them to point to a single allusion to these old, threadbare, acoustical chestnuts in the lectures or papers of the leading physicists during the past eight or ten years. If they have dared to ignore the "Problem," one thing is sure, it has left its mark upon them. They dare not utter one word publicly in favor of the wave-theory of sound.

Take one other illustration on "heat as a mode of motion," and note the fact that the entire present theory, as now taught in our schools, is based on one superficial appearance which has up to within a short time misled every investigator and experimenter upon this form of force. The appearance alluded to is the fact that confined air when suddenly compressed, rises in temperature in the exact ratio of such compression. No one disputes this fact, because it is an appearance that anyone can observe.

But the physicist who first framed the theory of heat as a mode of motion, acting upon the superficial impression that the energy he exerted in compressing the air must necessarily have been converted directly into the heat observed, absolutely missed the true and common-sense cause of this rise of temperature which Substantialism now so beautifully explains. He never thought that it takes just as much mechanical energy to expand the air up to a given point as to compress it, yet this expansion produces cold instead of heat, and to a corresponding ratio!

The truth is, had he been a Substantialist, and had he believed in the objective existence of heat as an immaterial entity rather than as a mode of motion, he would have learned with surprise what was first announced to the world in *The Microcosm*, vol. v., page 160, that the substantial heat which was already in the air before compression, being also reduced with the air to one-half its volume, was necessarily increased in its intensity in like proportion: while the act of expanding the air by the stored-up mechanical force in it also expands its contained heat in like proportion, thus lessening its intensity, and thereby lowering the temperature of the air.

This new law, expressing the true cause of the observed increase of heat in air under compression, or cold under expansion, is not only in perfect harmony with every phase of Substantialism, but it totally breaks down the theory of heat as a mode of motion, as was elaborately set forth in our leading editorials in the August number of the ARENA.

We could refer to numerous other illustra-

tions of the superficial misapprehensions of physicists which have led to the present theories of sound, light, heat, magnetism, electricity, etc., and upon which, as if they were established facts instead of superficial and misleading appearances, these respective theories have been formulated. But we desist for the present, having presented sufficient proof, we trust, to convince the careful student of this journal that it takes more than a mere surface glimpse at the phenomenal appearances in nature to determine the rock-bottom principles on which true science should have its foundation. The principles of the Substantial Philosophy have their sub-foundation laid deep in this enduring cement that no theory of physical science can be true which ignores the forces of nature as substantial entities, or in their stead accepts the mere superficial appearance of things which substitutes non-entitative motion for substance.

STILL THEY COME.

BY THE EDITOR.

We are more gratified than surprised to receive from different sections of the country substantial evidences that Substantialism is on the continual march to victory, and that new and able converts to this philosophy are avowing themselves in such manner as to make their conversions felt by the public. It is no uncommon thing of late to receive papers printed in distant parts of the world containing able and critical scientific articles from the pens of persons we had never heard of before, but of whose penetrating and even profound knowledge of the Substantial Philosophy there can be no question after reading their articles. This emboldens us to believe that Substantialism is as simple in its philosophical revelations as it is far-reaching in its sweep and bearing.

We were surprised to learn recently that one of the leading clergymen of this city, after studying the subject carefully, expressed his utter inability to grasp the new philosophy of Substantialism, or to know what distinction there was intended to be made between it and the modern scientific theories of the schools. He had the fairness, however, to admit that the fault was most probably in his own intellectual make-up, and not in the philosophy itself.

We are sorry for intellects so highly cultivated that they are incapable of distinguishing between the energetic *forces* or phenomena-producing *causes* in nature which we have proved to be substantial entities, and the *motions* of material bodies which these energetic forces produce.

Modern science learnedly sets forth these forces of nature as the *motions* of matter themselves, instead of the *causes* of the motions. Substantialism sets forth these forces of nature as real substantial agents or actors which move bodies whether large or small, whether molecules or mountains, and that these motions of the displaced bodies are *effects*, and in no sense are they the causes of themselves. If this elementary distinction is too difficult for these highly cultivated scientific brains to grasp, we will cheerfully excuse their owners from ever becoming Substantialists, and will try somehow to worry along without them.

To assist all such superficial investigators to distinguish between force and the motions which force, as an active substantial agent, produces, especially as relates to sound-force, we copy below a brief article from the *West Side*, a paper printed at Independence, Oregon, and written by one Mr. Davidson, who thus unexpectedly comes to the surface as a young master in the lucidity with which he states and defends the Substantial theory of sound. This is only one of a series of articles which he is furnishing for that paper; while he himself is only one, we are glad to say, out of large numbers springing up everywhere, and showing themselves capable of doing efficient service in this noble cause. Let scientific clergymen who cannot understand what Substantialism means, take the following introductory lesson on sound from a beginner in this revolutionary philosophy in the far Northwest:

THE NEW PHILOSOPHY—SOUND.

BY A. F. DAVIDSON.

The only object we have in writing on the subject of sound, is, as far as may be, to elicit the truth. Prof. Tyndall is the great exponent of the "Wave Theory." This theory is time-honored; and the greatest of men have written upon it. We have been requested to say something on this deeply interesting and important science. We say, science, because the greatest scientists and savants of this and past ages have bent their mightiest efforts to formulate and improve it.

Now, with all due deference to those colossal giants of science, as Laplace, Sir Wm. Thomson, Rood, Mayer, Stokes, Lord Rayleigh, Helmholtz, Henry, Parker, Ganot, Peck, Savart and an immense mass of others of the "undulatory or wave-theory;" we yet think them advocating an unsound theory or science, so-called. The New Philosophy, or Substantial Theory of Sound, we think, the only correct one. On the side of the Substantial theory of acoustics our numbers are few. Nevertheless, defeat does not always belong to the few, nor victory to the many. Hall, Mott, Carter, Swander and a small, but increasing number of others are on the side of the Substantial theory of acoustics.

What is sound? Not "waves of air" nor "undulatory movements," but a phenomena-producing cause or force—a real, substantial though immaterial entity. It is a sensation-producing force; not a trope, or metonymy of speech; nor a "mode of motion." Sound is an objective cause, one of the physical forces. Simply, it is an objective cause producing a subjective effect; this effect is hearing. Light, heat, electricity, magnetism, odor, flavor, &c., are phenomena-producing causes or forces. Light is an objective force; on impinging the eye it falls on the optic nerve, producing the sensation we term light or seeing. Heat by impact on our tactile nerves induces the sensation known as warmth. Electricity and magnetism are also objective forces acting on us in various ways. Odor is a real entitative force and affects our olfactories. Flavor is that force, in the correlated phenomena-producing causes, when acting on our gustatory nerves, which causes a sensation termed taste. Clearly, then, sound is a real, immaterial, though substantial and objective entity, independent of us, and is one of the correlated phenomena-producing forces which pervade matter and space. One of the fundamental conceptions of the Substantial theory of acoustics is, "no effect can be brought about except through an adequate cause." Sound-force is always harnessed and ready for work. Whenever interrogated properly it answers properly. Sound is developed by the vibratory action of some sound-producing body, by which this peculiar form of objective force is generated, or, more properly, liberated from the great reservoir of the "conserved" forces.

Means must be used before ends can be accomplished. The flint and steel are cold, dark and silent, unused. Use them intelligently, by direct contact, and there flows from this relation a ray of light, a flash of heat, and a squeaking noise. No light, no heat, no sound addressed our senses ere we struck the flint with the steel. Was the light, the heat, the noise in the flint and steel? No. Did their contact bring something out of nothing? No. Where, then, was the light, the heat, the noise? In the great light, heat, and sound-producing laboratory of nature. The steel and the flint only called them forth; were means used to ends. Do "air-waves" generate sound? No. Do "rarefactions and condensations" cause sound? No. Are there any such things as air-waves, rarefactions and condensations? We ask, are there? Sound is a real force and is not generated by these means at all. There must be a keen distinction kept up between any form of force liberated, and the mechanical process liberating it. Sound is not the motion of air-particles, nor air-waves, nor rarefactions, nor condensations. Air is only a medium through which sound-force passes. The incorporeal force-element in nature, from which sensuous sound is generated by sound gathering instruments, exists, fills all matter and space; and, when used, falls back in the great reservoir of "conservation." Hence sound-force is never lost, never tired, never sick, never cross, never in bad humor, but full of fresh harmony and, if prettily courted and loved, is easily won and wed. Harmony is the embodied regalia of order, precision, accuracy and beauty. The new Philosophy is coming—coming with cheering sounds, coming with harmony enshrined in reality, coming with healing on its wings, joy in its countenance, purity on its pale, but beautiful brow, sparkling in its lovely eyes, breathing peace and good will to man in this bright and glorious world of ours.

A RACY DISCUSSION ON SOUND.

In the August ARENA we copied from the *Educational Advance* of Mayfield, Ky., a brief communication from a writer signing himself "Void," replying to a query which appeared in that journal as to "What is the true theory of Sound?" Our readers will remember that "Void" was literally disgusted to think that any one should be so stupid as to ask such a silly question, when everybody knows that the wave-theory is not only the true theory, but the only theory of sound; and he intimates that he would like to pull the nose of the man who would dare to question the truth of the theory which so beautifully accounts for the well-known fact that two able-bodied sounds will produce total silence.

But "Void" was not allowed to rest quietly upon his nose-pulling logic of sound-interference. In the June number of the *Advance* two of the sprightly young Blue-Grass school-teachers take up this gauntlet of "Void," whom they charge with being a second-rate Graves County school-teacher, and attempt to show him that he is not posted in current scientific events, or he would have known that there was a well-formulated and ably-defended Substantial theory of sound advocated in the "Problem of Human Life," *Microcosm*, and SCIENTIFIC ARENA, which has knocked the interfering wave-theory into diatonic smithereens, and yet, astonishing to record, this Graves County Void-of-light, would-be nose-puller had never heard of it!

One of these assailants of "Void," who signs himself "X. Y. Z.," goes on against this "one-horse" "school-teacher from way back" in the following style, which we quote:

"If 'Void' will write to Prof. J. L. Goodrich, of No. 23 Park Row, N. Y., or to Hudson & Co., same place, he can capture the $5,000 prize offered by Prof. Goodrich in the Sept., 1882, No. of the *Microcosm*, which has never yet been claimed by any one. Try it, "Void"—you doubtless need $5,000 in your business. "Void" innocently intimates that he would like to get out his little hatchet and go on the war-path as the great defender of the faith. Now, if he is so inclined, in earnest, let him apply to A. Wilford Hall, who can be found at any time at his desk in New York City," &c.

Not only does "X. Y. Z" give it to "Void" in a column and a half of scientific badgering, but another Substantialist signed "S. J." in the same number, takes a hand at the Graves county wave-theorist and replies to his positions in the following argument:

"In the course of his article "Void" accidentally blundered upon the fundamental principle of the wave-theory—its basic feature —*sound interference*. There is no question but

that this theory teaches that two unison instruments, sounded at a half wave-length apart, will produce silence; the condensations of one system will reach the other exactly in time to coalesce with its rarefactions, and, neutralizing each other will produce quiescence of the air, or silence. But is this the case? Why, certainly not; indeed, so far from its being so, not the slightest difference in the intensity of the sound will occur; any instruments can be used, and sounded at any distance apart, and heard at any angle, and this doughty champion of the wave-theory can get any one who has a sufficient knowledge of its teachings to make the experiment for him, and thus demonstrate to his entire satisfaction the truth of our statement. We quote from *Tyndall's Lectures on Sound*, pages 284, 285: "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 total silence." For example, Void can take Tyndall's two unison forks, or even a couple of common A—pitch pipes, of exact unison, and let whoever makes the experiment for him have them sounded at 30½ inches apart, as this is the length of a wave of that pitch, counting 440 vibrations to a second, and he can listen carefully from all directions in order to find any difference in the intensity; then have them sounded at half that distance or 15¼ inches apart, and listen in all directions, taking every precaution to detect if possible the slightest difference in the intensity, and he can then see for himself that the fundamental law of the wave-theory is not founded on fact. A theory being old, and time-honored, and moss-backed, is no more evidence of its correctness than the appearance exhibited by the sun and stars of revolving round this terraqueous globe, and the universal opinion once entertained of the reality of this appearance, can be considered to have been irrefragible evidence of this popular philosophy. "Verily the wave-theory is the only theory extant!" It is a little singular that even a second-class Graves county school-teacher should have the temerity to make such an unqualified statement. We believe in the substantial nature of all force, as brought out in the Substantial Philosophy originated by one of the profoundest thinkers of the nineteenth century—A. Wilford Hall, Ph. D., of N. Y., and we can if necessary fully vindicate our position, in future numbers of this valuable paper."

Now after these two broadsides at "Void" had been fired, one would suppose him about annihilated. But no, he is on hand as lively as at first, and slashes away in a four-column article at both his assailants in the following manner:

EDITORS *Advance*:

My reply to your query in a recent number of the *Advance*, "What is the True Theory of Sound?" seems to have stirred up quite a hornet's nest in certain quarters. One party, "X. Y. Z.," declares that I "must be a one-horse teacher from 'way back,'" and the other, "T. J." that I am a "second-class Graves county school-teacher," which, perhaps, he considered the *ne plus ultra* of approbrious epithets, as, in the estimation of people of the apparent brain calibre of "X. Y. Z." and "T. J, to be even a *first-class* Graves county school teacher lands one in the immediate neighborhood of the bottom rung of the intellectual ladder. But why were such names applied to my humble self? Simply because I expressed surprise that any one, after the wave-theory had stood the test of nearly 3,000 years, should seriously ask, through a respectable school journal, "What is the true theory of sound?" If this question had been asked some 1,500 or 2,000 years ago, no one could have felt, or given expression to, any surprise. Had it been put one thousand or even five hundred years ago it would have been perfectly allowable, but to think that, just here, in the latter part of the nineteenth century, after hundreds, even thousands of years have been spent in more perfectly formulating and perfecting in every particular the undulatory or wave-theory of sound any one should have the brazen effrontery to even hint that any other than this could be the true theory, seems almost incredible. Why, gentlemen, do you, in all seriousness, believe for a moment that Kuntz, Blacerna, Tyndall, Mayer, Helmholtz, and thousands upon thousands of college professors throughout the world to-day can be mistaken in believing and teaching the correctness of the wave-theory? Is it not an insult to the broad intelligence of the literary and scientific world to ask such a question as appeared in that number of the *Advance*, a paper "devoted," as it says, "to Education, *Science* and general literature?" The wave-theory is taught in every college in the land, and that, too, by ladies and gentlemen of sufficient mental calibre to discover long before this if there is "anything rotten in Denmark" concerning the theory under discussion.

"In addition to this it might be asked if there is not sufficient judgement, sufficient discernment, in the *people who patronize these colleges*—to say nothing of the granduates who issue forth from these institutions from year to year—to detect any error that might have unwittingly crept into its make-up? The *very idea* that the wave-theory is not substantially correct seems the *most preposterous of all things*. I am not, as "X. Y. Z." and "T. J." would have one believe, ignorant of the fact that another so-called theory of sound, emanating from the brain of one Wilford Hall, of New York City, has made its appearance; but sufficient evidence that this so-called substantial theory of sound *is little better than the maudlin ravings of a howling lunatic is found in the fact that no college of any respectability has declared in favor of the new theory!* Not a single scientist of any standing, in fact, not a single individual who is known outside of his own neighborhood or who, unassisted, *could find his way back again if he were dropped down a dozen miles from home*, has given in his adhesion to the new departure!

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"In conclusion, permit me to say that in my humble judgment it would be well for young men like "X. Y. Z." and "T. J."—for such I take them to be, judging from their peculiar style of composition—*to steer clear of such damnable heresies as those promulgated by Wilford Hall;* and I would further recommend that these gentlemen enter the next term of the West Kentucky College, where under the skillful guidance of Prof. McDonald they may learn more perfectly the nature and workings of the *truly wonderful phenomena of sound.*"

And thus the war goes on from month to month. We confess we enjoy this Kentucky fight hugely as carried on in that live educational journal; and we have no hesitation in thinking that "Void" is not as much of a vacuum as his name would indicate. As that impartial journalist gives both sides of the controversy, we shall keep our readers posted concerning its progress.

THE PULPIT AND THE PEOPLE.

BY THE ASSOCIATE EDITOR.

WHY should 55 per cent. of the people never enter a church even in our most religious communities? Why should the remaining 45 per cent. have so little interest in the affairs of the church?

A comparison of the seating capacity of our churches with the population of any given district will demonstrate the reliability of the above hints. And even the meagre capacity of our church accommodations is rarely tested by the attendance. We are quite accustomed to hear the disconsolate solution, "The people are drifting away from the churches." May not the drift be mutual? Are not the churches drifting away from the people? So long as the ministry fail to discuss in their pulpits the grave questions that are filling the common mind, and refuse to go to the platforms of popular gatherings for their consideration, the chasm between pulpit and people will continue to widen. It is no excuse that the public mind is filled with error; high salaried preachers in elegant but empty churches, be their diction ever so polished, can never lead the people out of their errors, while shrewd and earnest, if misguided men, speaking to the multitude, continue their undisturbed sway.

In the government of children we often find that they are best guided, not by lofty and distant direction but by a cordial intimate interest with them, by means of which they are readily led. The leadership of men is much the same in principle, differing most in degree.

Said a pastor of a year to his neighbor the blacksmith: "I have a little bill against you." "For what?" "Your share toward the support of the Gospel in our village," replied the preacher. "But I never heard you preach; I have not been inside the church since you came," protested the blacksmith. "Well," said the director of religious thought, "that is not my fault; there is the church; the doors are open every week, and you should have come. I want $10."

A few months later the pastor was hailed by the blacksmith, who said: "I have a small claim against you." "For what?" "Shoeing your horse," replied the neighbor. "But you are mistaken, I haven't had you shoe my horse; he has not been inside your shop." "That is not my fault," replied the son of Vulcan, "here is my shop; the door is open, and you should have brought him. I want $12.50."

What had these men in common? Bills due. Some more potent union must exist before pulpit and people will happily sing "Blest be the tie that binds, &c."

Another suggestive fact is seen in this: as the ratio of church attendance decreases, thus diminishing the power of the pulpit, the ratio of newspaper circulation increases, affording a consequent growth in the power of the press. The press goes to the people laden with thoughts upon the questions of the hour, with the result that the editor of an obscure country paper—patent inside at that—reaches more minds and wields a more effective leadership than the pastor of a city church. I heard the statement made in the Convention of Christian workers recently held in this city, that on the preceding Sunday morning (beautiful day) a church claiming a membership of nearly 3,000 mustered only *twenty-eight* hearers at that regular service! Fine church accommodations, pastor of long standing, writing "D. D." after his name, significant of his ability, and salary so large as to be conclusive. And this is not an isolated instance, but a common occurrence. George Francis Train on his bench at Madison Square, speaking only through the medium of a child, is a greater force in the community, with all his vagaries, than such a minister in such a pulpit.

The authority of the Gospel is not in question; but only the power of the pulpit. And these observations are designed to be suggestive rather than critical. The issue the pulpit may take with the press should not be that it treats of common subjects, but rather the *manner* of its treatment.

Many pulpits often make some common occurrence the basis of their spiritual instruction with the result of increasing the power of the pulpit in the authority of the Gospel. In this they do but follow the example of the Master Lover of men. He made the common things filling the minds of the people the pedestal upon which to hang the garland of eternal Truth. He sought constant opportunity to wean, and He never lacked occasion or hearers. The birds of the air, by His deft treatment, will forever illustrate the care of a heavenly Father; the lilies of the field, by the same process continually suggest His glory, while the disaster at the tower of Siloam serves to teach the common need of all men.

The great gatherings of people at the meetings of the Anti-Poverty Society, and in the Labor meetings, with the throngs greeting Henry George to hear him discuss his solution of the questions touching their immediate welfare, together with the immense increase in the circulation of papers and periodicals, are not casual but significant.

These men, putting themselves in the place of the masses, and discussing live questions from the standpoint of the people, are able to mould their thoughts and guide their decisions. Is not this privilege equally at the service

of the ministry? and would not the prompt comprehension of this opportunity greatly assist in a desirable improvement of the relations of Pulpit and People?

THE BREAKING OF DISTANT WINDOWS BY MAGAZINE EXPLOSIONS.

In the August number of the ARENA, page 44, we presented to our readers "A real physical problem," in the following words which we reproduce:

"It is an observed fact that in case of a magazine explosion the windows of houses near it are broken by the concussion; and in about nine instances out of ten the glass is broken outward instead of inward, and will be found in fragments on the sidewalks or in the yards rather than within the rooms.

"We now submit this to our readers as a simple physical problem to be solved. Let those who attempt its solution be explicit and very brief, as it only requires a very short paragraph to tell the whole story so a child can grasp it. After we have heard from our readers, their solutions with our own will be given in the ARENA."

Since the problem was thus stated we have received nearly forty answers, not one of which gives the true solution, though by a singular unanimity they all give substantially the same answer. For some unaccountable reason they all attribute the breaking of the glass outwardly to a vacuum produced by the explosion! Possibly some text-book has sometime or other thus explained it of which we have no knowledge, and by which the general impression of a vacuum thus produced has gone abroad. We cannot of course copy all these 40 solutions, but will give two or three which will fully represent all:

Editor Scientific Arena.

The solution of the "Physical Problem" in the August ARENA lies in the fact, that the displacement of the atmosphere in the case of a magazine explosion, is necessarily greatest in a perpendicular direction, owing to the resistance of the ground to the force of the explosion. The vacuum created by the explosion must therefore be filled by the air lying nearest the surface of the ground. When this air is confined within a house, it will force the window glass outward in making its way toward the vacuum. Where the glass is forced *inward* as in the exceptional cases mentioned in the problem, it is due to the lateral force of the explosion. C. H. HATHAWAY.

Dear Sir:—

In answer to the query concerning the breaking of windows through concussion caused by magazine explosions I should explain it in the following manner:

When the explosion occurs its force is exerted toward the point of least resistance, which is at first downward, but meeting the resistance of the earth, reaction occurs and it is changed upward, *principally*, and that which is in an *outward* direction not having time to diffuse itself through the molecules of air by their action upon each other toward the window owing to the partial vacuum caused by the explosion, reaction of said molecules is also caused in the molecular movement toward the point of explosion—or the vacuum—thus disturbing the equilibrium of pressure upon the window and by withdrawing it from the outside, and the sudden increase of pressure from within ruptures the glass in the direction named.

Truly Yours,
AMITYVILLE, N. Y. J. W. C. DEPUY.

Editor of the Arena.

Should a magazine explosion occur in space above the level of buildings in its vicinity, windows would be broken inwards by the concussion, for the reason that there would be a rush and compression of air in *all* directions from it, thus pressing against the walls and windows of buildings in the effort to attain an equilibrium. But as the explosion occurs upon or near the ground, the latter shuts off an entire hemisphere of space that would otherwise be affected by the concussion, thus concentrating the atmospheric movement into the hemisphere above the ground.

There would thus naturally be a great excess of upward over lateral movement of the air at the point of disturbance, causing there a partial vacuum. As a consequence there is a rush of air toward instead of away from the point, in the stratum at or near the surface, to fill it, the air confined by walls endeavoring to join in the general movement in order to preserve an equilibrium. The windows offering least resistance, are forced outward as a matter of course.

In brief:—The explosion causing a great excess of upward atmospheric movement over that in lateral directions, a partial vacuum is formed, causing a rush of air toward the scene, and that confined by walls of surrounding buildings, endeavoring to join in the general movement for the recovery of an equilibrium, gains exit by forcing the windows out.

Respectfully,
POWAY, CAL. G. W. PARNELL.

Now we must confess our surprise at this apparent conspiracy on the part of about forty intelligent scientific thinkers to establish an error in physical science without the slightest foundation in natural philosophy. How they could have supposed a "vacuum" possible as the result of the combustion of a large quantity of powder is a bigger physical or metaphysical problem than the one we proposed for solution. Let us say here, once for all, that no vacuum whatever is or can be created by a magazine explosion. True, the air is displaced or violently shoved away in all directions, but the place it had just occupied is by no means left vacant, for it is filled by the powder-gas generated by the explosion, which was the very substantial cause which shoved the air away in a condensed wave. A vacuum surely could not have shoved the air away! So the vacuum-theory is all wrong, since the powder-gas which took the place of the air is just as dense and just as far from constituting a vacuum as was the air which it displaced. The supposition that a quantity of powder-gas thus instantaneously generated, can act in one direction more than another, is anomalous to say the least. It must act necessarily in all directions, downward, vertically, laterally, precisely with the same force, until its expansive energy equals that of the normal air, when this added gas subsides and gradually mingles with the surrounding air.

What then is the reason why the densely compressed air-wave, driven off by the suddenly added powder-gas, nearly always breaks the glass of adjacent houses outwardly? We answer because generally or more frequently than otherwise the doors of houses are *closed* when an explosion takes place. When this is the case the compressed wave striking the glass against its outside, finds it cushioned against the confined air within which, though compressed somewhat by the concussion against the window prevents the bending of the glass sufficiently in that direction to break it. But instantly the wave has passed, allowing the air-cushion within to react against the window, which meeting no air-cushion from without, and finding no resistance but the normal and unconfined atmosphere it vibrates to a greater distance than it could inwardly. The consequence is, the glass breaks outwardly and is found on the side walk.

But it sometimes happens that doors and possibly a part of the windows are open when an explosion occurs. The windows which remain closed and which face the magazine receive the full force of the wave, but having no confined air-cushion back of them, the glass thus unsupported yields before the condensed wave and is crushed inwardly. Thus both phases of the problem are solved.

The reader will therefore observe how much better it is in our scientific investigations to take a plain, common-sense view of a physical problem than to attempt a solution which is obliged to start out with assumed facts which have no existence, and which a moment's reflection would have shewn to be fallacious.

LABOR AND INTELLIGENCE vs. CAPITAL.

THE members of both the editorial staff and the business management of THE SCIENTIFIC ARENA are greatly interested in the questions agitating the masses of wage-workers in this country and throughout the world, and it is by them accounted an honor to hold fellowship with these millions of mechanics and artesians and tradesmen and farmers who are more indispensable to the life of the Nation and true Progress than are the gold and silver and precious stones held and hoarded by titled potentate or millionaire. An old Arabian proverb reads: "There is more gold in the hoof of the camel than in the crown of the Caliph." The camel bears the merchandise, and interchange of product tends to real wealth. The gold in the Caliph's crown remains intrinsically the same, and adds not at all to prosperity of community. Various are the theories advanced to correct the evils which exist and which are assuming such importance and even *menace* to the social and political life of the nations. Every leader has an infallible panacea, as he thinks, for all these evils. While not committing THE SCIENTIFIC ARENA to any distinctive party or theory, we may admit discussion within proper limits. Elsewhere in this issue appears an article entitled "THE LAND AND TAXATION." It is worth reading.

We quote herewith an article, "WHAT IS WANTED," which appeared editorially in *The Philadelphia Inquirer* some months since, during the great "strikes." To some, this presentation of the subject may appear to have the sting of insinuation and the slur of the Pharisaical wealthy class. But if so, it may be retorted that the *wealthy* and intelligent classes are morally responsible for the conditions of ignorance existing. The inquiry, "Am I my brother's keeper?" has force. The great EXEMPLAR said —and should not this be the *basic principle* of all movements for reforms in society?—"Whatsoever ye would that men should do unto you, do ye even so unto them." E.

WHAT IS WANTED.

In the progress of the human race from the savage to the civilized state labor is the prime motor. Man begins to improve when he begins to work. Labor creates wealth and wealth fosters intelligence. These three constitute the triune power that elevates humanity from the condition of the brute to the highest social development. Intelligence directing labor in the use of capital—this is the formula by which civilization is established. If this simple axiom could be impressed on the mind of every workingman in America it would aid in solving all the labor problems that agitate the community and threaten the general welfare. To understand this clearly it is only necessary to consider what the workingmen want, what they are striving to accomplish by organizing, by striking, by boycotting, by all the costly means and agencies they employ, with such active energy. They set up sometimes one object and sometimes another—more wages, shorter hours, certain advantages, which may be disadvantages if they only knew it—but in the main, they want, what everybody wants, to better their condition. They are blindly reaching out for more of whatever good this world offers, for themselves, for their families, for their children and for their fellow laborers. Now, to command anything and everything this world has to offer, they lack but one of the three creative elements above referred to. They have the labor power, they have the capital power, but they have not the intellectual power; they lack intelligence. Some of their demagogue leaders tell them they need capital; that the wealth they have created they should take into their own hands, by violence if need be, and convert to their own use. As a fact, the working people of this country can control capital enough to run any of the great industries which they endeavor by strikes and otherwise to force into such courses as they dictate. They have spent money enough, actual cash outlay, in the past twenty-five years in fighting the coal trade to carry on all the coal mines in the country. So with the iron industry, the railroads and the other interests they have battled with—the loss, waste and destruction they have caused, and which they have to pay for out of their own hard-earned money, would have bought a controlling interest in the corporations they have been in conflict with. Instead of trying to force managers of corporations to conduct business to suit their views, they might own the corporations and run them to suit themselves, if only they had the brains to do the business. It is plain as daylight that it is not capital they lack, but the wit to use capital. The money they are spending this very day in supporting thirty thousand men and their families in idleness about New York harbor if used in keeping these men profitably at work would support a million. But to accomplish such a result requires the direction of intelligence, and that they haven't got. If the mighty agencies which the organized workingmen of the country can put in motion could only be used to educate labor, to acquire knowledge to extend intelligence, to build up the intellectual power, which is the third of the civilising trinity of forces, labor would be emancipated, and would rule the world within the coming century.

WHAT IS A MIRACLE?

(Continued from page 72.)

law, and in time they all died by reason of its execution upon them.

So in every case of a miracle wrought by God, either as Father, Son, or Holy Spirit. He abrogates none of His laws, which are founded in Eternal Wisdom, and does not suspend them, for they are of perpetual and unceasing operation. But He does employ such force from Himself as is necessary to perform His acts not performable by these laws, without for a moment removing or annulling them. All the activities of the Holy Spirit are on the same rational and scientific basis, and easily apprehended by those who desire to know the truth in its simplicity.

OSKALOOSA, KANSAS.

PATMOS: OR THE KINGDOM OF HEAVEN —THE TRUE CHURCH OF CHRIST.

Advance Review, by the Editor.

THIS is an unpublished book written by the Rev. E. R. McGregor, of New Market, Md. The work consists of an exegetical interpretation of the Book of the Revelations by St. John the Divine. It is perhaps the most elaborate and particularized application and explanation of every figure and symbol named in this closing and wonderful book of the New Testament ever written, exceeding in detail of elaboration the "Apocalypse Revealed," by Emanuel Swedenborg.

The writer sent us his manuscript some months ago for examination before offering it for publication, desiring, as he expressed it, to have our personal judgment as editor of THE ARENA upon its merits. But the work covering nearly 600 pages of manuscript, and the author being in no special hurry, we have taken our time and read as we could find leisure from our many pressing engagements, to ascertain that it is a masterly production on that subject.

As an exegetical effort there is no question but a warp of harmonious consistency runs through its interpretations from beginning to end. This is its most difficult phase, and what would almost seem an impossibility to the average biblical student, considering the diversified forms of allegory and symbol employed by the Revelator. But no difference whether the figures relate to the lamps, angels, seals, vials, trumpets or what not, the explanations never fail to agree with reason, and to weave in naturally and symmetrically as an unbroken concatenation, harmonizing every event intended to be set forth with both the spiritual imagery represented, and the prophetic temporal incidents foreshadowed.

Besides the exegetical and historical phases of the work, its literary character is of a very high order, showing the author to be a man of extended historic research and general reading, as well as possessing a command of classical English only possible in one thoroughly educated.

The work, as we now take it, is ready for some publishing house to bring out and place before the public, and we believe that biblical students, especially ministers, would find it a valuable accession to their libraries. If we mistake not, the profoundest commentators on this portion of the New Testament will, after reading "Patmos" carefully through, be forced to admit that Mr. McGregor has opened up many things in the Book of Revelations never dreamt of in their religious philosophies.

PROF. DRUMMOND'S BOOK.

NATURAL LAW IN THE SPIRITUAL WORLD.—Prof. Henry Drummond, F. R. S. E., F. G. S. James Potts & Co. New York, 1887.

THE wheels of advancing science have made many revolutions since Dr. Thomas Chalmers preached that series of week-day sermons on "The Christian Revelation viewed in connection with Modern Astronomy" which so greatly extended his fame as an eloquent divine. The special argument of the "Astronomical Discourses" was almost lost sight of in their gorgeous rhetoric; but never before had the analogies of the "Kingdoms" of nature and grace been set forth with such a wealth of illustration; and the wide prospect thus revealed to the gaze of intellectual Christendom was not again lost sight of. Since then many an amateur in many a science has sought to buttress divine relation by the phemomena of nature; and the "Analogies" had long lost their freshness when Professor Drummond announced his discovery that what had been regarded as analogical was simply identical—that many of the laws of the spiritual world, hitherto regarded as occupying an entirely separate province are simply the laws of the natural world.

Such an announcement from such a source could not but be listened to with interest and respect. Mr. Drummond stands high among England's scientific teachers; he is a devout and "orthodox" Christian; and his sweetness of spirit and beauty of style give grace to all his productions. Then, too, there is something of fascination in his alleged discovery. We would fain believe it if we might. "Science," as Mr. Drummond aptly says, "is tired of reconciliations between two things which should never have been contrasted; Religion is offended by the patronage of an ally which it professes not to need; and the critics have rightly discovered that, in most cases where Science is either pitted against religion or fused with it, there is some fatal misconception to begin with as to the scope and province of either." Mr. Drummond claims that the fact of the subject-matter of his book being law at once places it on a different footing from all Analogies. "Between laws there is no analogy," we are told; "phenomena are parallel, laws which make them so are themselves one." Science is again to become the handmaid of Religion, manifesting an honorable pride in the performance of her duties.

Already several editions of the book have been published, and the "reading public" is familiar with the instances of "uniformity of law" which Mr. Drummond has sought to make evident under the titles of Biogensis, Degeneration, Growth, Death, Mortification, Eternal Life, Environment, Conformity to Type, Semi-Parasitism, Parasitism, and Classification.

If the parallels so charmingly drawn between certain statements of scientific law and certain biblical truths were left to stand on their own merits as parallels, there could be but one opinion of the value of this book. Never before have correspondences of natural and spiritual phenomena been so cleverly and so delightfully described. And though many scientists would reject the author's definitions, and many theologians would reject his statements of doctrine, nevertheless all who are eager for harmony among the interpreters of God's two great revelations would hail with pleasure so scholarly and graceful an essay at peace-making. But at the very outset Mr. Drummond proclaims a great "discovery," and tunes every chapter to this key. He has framed a *new theory*, which is to solve all difficulties. We are challenged to investigate his arguments with scientific mercilessness, and any disposition on the part of the critic to deal with his phenomena as merely poetical illustrations is promptly resented.

Recognizing Mr. Drummond's sincerity, theologians and scientists have a right to demand that only such statements of law as are universally received shall be considered by him. But what are we to think when he bases one of his most notable chapters on Herbert Spencer's marvelous definition of life, as *the definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external co-existences and sequences*—when, as a scholar he must know that neither that nor any other definition of Life has yet been made that is generally accepted by leaders in the realm of science. He accepts as a scientific fact the theory of evolution—which at best is only a working theory, and is to-day rejected by many of the ablest scientific minds. Some of his descriptions of natural phenomena—as for instance the reversion to the original type of the neglected game pigeons, or the blindness of the little *Crustacea* of the lakes of the Mammoth Cave—are as unscientific as they well could be, and contrary, in some instances, to the facts. In hardly one of these eleven chapters are the phrasing of scientific law and the grouping of phenomena such as any recognized leader in the world of science would to-day accept. In doctrinal statement Mr. Drummond is hardly more satisfactory, and as a result the parallels he has drawn are more conspicuous for imagination than for accuracy.

But more serious, if possible, than even scientific inaccuracy or theological aberration is the fundamental error on which the entire argument is constructed. The "laws," he tells us, which make phenomena parallel, are themselves, of necessity, one. Take, for example, John iii, 8, to which he alludes as presenting analogous phenomena: "The wind bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh or whither it goeth: so is every one that is born of the Spirit." Are the laws which make these phenomena, one? Can any intelligent person trace the laws which cause the blowing of the wind—the laws of gravitation and attraction—and gravely claim that they are in any sense one with the course of action pursued by the Holy Spirit? The experience of him who feels the breeze fan his cheek to some degree corresponds with the experience of him on whose heart the Holy Spirit has operated; but is it one and the same law operating in two spheres, that makes these phenomena parallel? It is preposterous to claim that there can be no analogy between laws working in different spheres.

The Lord Jesus Christ first pointed out with clearness the analogies between birth, growth, decay and death in the natural world, and processes in the spiritual realm which, because of His similes, we have come to recognize by the same terms. To develop these beautiful analogies is a pleasant and profitable undertaking; and readers of *Natural Law in the Spiritual World* will feel that Professor Drummond has peculiar qualifications for such a task. But to attempt to identify the laws of the two worlds by overlooking their essential characteristics and divergences is perilous in the extreme.

The late Lord Shaftesbury condemned Professor Drummond's book as "a singularly pernicious production." Dr. Bonar says its influence is "as alarming as it is deplorable." And truth compels us to say that while its suggestiveness is invaluable to the well-established theologian there is great danger that with its fascinating but untenable "new theory," many immature minds will drink in the poison of pantheism or materialism.

PUBLISHERS AND PUBLICATIONS.

[WE purpose to make THE SCIENTIFIC ARENA valuable to the fraternity of Publishers as an intermediate between themselves and our extensive constituency of intelligent subscribers. Few mediums have a larger list of professional men—Presidents of colleges, professors, teachers, clergymen, physicians, engineers, lawyers, students, etc. We may point with pardonable pride to this fact; and a reference to the subjects treated in our columns, and the list of distinguished writers, will confirm our claim for the broad field occupied by the ARENA—"Scientific, Philosophical, Religious."]

"Beyond the Stars, Or Human Life in Heaven," is evidently the outcome of a heart and mind earnestly sympathetic, and deeply interested in the topics treated. The chapters on "The Relations of the Saints to the General Judgment," and "The Grand Consummation," are interesting as the views of one whose attention has been closely directed to these subjects by sore bereavement. Rev. Archibald McCullagh, D. D., of Brooklyn, is the author. A. D. F. Randolph & Co., New York, publishers.

"Woman, First and Last," (in two volumes, Price, $1.00 each), by Mrs. E. J. Richmond. Phillips & Hunt, New York. Cranston & Stowe, Cincinnati, Publishers, 1887. Vol. I contains sketches of twenty-eight notable women, selected as typical characters. Vol. II names thirty-seven, of more modern times. All are well chosen. The author tells us that her motive in these presentations is "to prove the power of woman for good or evil;" "to show that intellect

has no sex;" and we affirm that her work is well done. These volumes should be in every home. The publishers have done their part in giving to them attractive form.

"Thorn Apples," by Emily Huntingdon Miller. This is a 12mo., of about 300 pages, in attractive form. It was originally printed as a serial in "Our Youth." The story is very interesting, and well written. It will delight and profit the youthful reader. Price $1.00. Phillips & Hunt, New York. Cranston & Stowe, Cincinnati.

"Gurnett's Garden," and, "The New Boy at Southcott," by Mrs. Mary R. Baldwin. Phillips & Hunt, NewYork. Cranston & Stowe, Cincinnati. 12mo. Price $1.00. Interesting stories, well told.

"Beauty Crowned, or, the Story of Esther; the Jewish Maiden;" by Rev. J. N. Fradenburgh, Ph.D., D.D., member of the American Oriental Society, &c. Phillips & Hunt, New York. Cranston & Stowe, Cincinnati. 12mo. Price $1.00. This little volume contains much that is pleasing and instructive.

Elsewhere in this issue will be found a review of Prof. Drummond's "Natural Law in the Spiritual World," as also of another important work.

Our space is too limited for other book reviews intended for this issue.

We have just received the following:

The Divine Method of Life, in Nature and Grace, by John M. Armour, Author of "Atonement and Law." J. Pascal Armour, publisher, Philadelphia, Pa., 1887.

The Educational Jury at the recent Jubilee International Exhibition, Adelaide, Australia, awarded to the Messrs. A. S. Barnes & Co., of New York, the first and highest award in recognition of the superiority of the publications of the firm. The award is over all competing publishers, and the jury are very complimentary in giving this further testimony to the character of American School Books.

MAGAZINES.

No higher praise for the October number of "The Century" need be offered, than to state that it is fully up to the usual high standard fixed by the publishers of that magazine. Among the war articles are, "Marching through Georgia and the Carolinas;" "Sherman's March from Savannah to Bentonville;" and "The Battle of Bentonville," each of these well illustrated. An important article—"Abraham Lincoln; a History," by John Hay and John G. Nicolay, will interest many as a contribution to the history of the "Secession movement," now happily forever at rest. "Mrs. Stowe's Uncle Tom at Home in Kentucky" is very interesting. "Hand-Car 412, C.P.R." is a graphic sketch of an interesting episode. Attention should also be called to the brief article—"Shall Emigration be Restricted?"

We have not our copy of October "Harpers" before us. While therefore we cannot particularize as to its contents, the readers of THE ARENA can be assured that the "Harpers" always maintains great excellence. It is the just pride of the "Old Reliable" house of Harper Bros., that their imprint is placed upon only that literature which is worth reading.

"Scribners" for October gives as its leading article, finely illustrated, "The Paris School of Fine Arts." "The Sacred Flame of Torin JI." (as a story) consumes itself in this issue, and the *finale*—though doubtless expected by readers who have followed the sketch from its commencement is so well presented as to interest those of either sex who have ever felt the "sacred flame" which burned so intensely in the *hearts* of both the hero and heroine introduced. "Caverns, and Cavern Life," is a noteworthy article. The entire number is very readable.

"The Magazine of American History" is always good. Its competent editor, Mrs. Martha J. Lamb, has no superior in her chosen field. Her "Origin of New York" in the October issue, is of historical valne. "Daniel Webster," (with a fine portrait,) is presented in an article by S. W. G. Benjamin. Rev. Dr. Philip Schaff, gives "The American Chapter in Church History." Professor J. W. Andrews, L L D. writes upon "Kentucky, Tennessee, Ohio; Their Admission into The Union." Judge William A. Wood contributes a paper upon "The New Mexico Insurrection, 1846-1847." There is much other valuable matter in this number. Published at 743 Broadway, New York.

"The Popular Science Monthly" has a very full list of valuable articles. While not indorsing all the pages this publication contains upon theological questions and scientific theories, we cheerfully acknowledge that the papers usually presented to the readers of "The Popular Science Monthly" are very able and dignified, if not always heterodox. "What is Evolution?" (from advance sheets of Professor Joseph LeConte's work on "Evolution and its Relation to Religious Thought," in preparation by D. Appleton & Co.) should be carefully read. We share most profoundly the doubt implied in this quotation from the article (*italics* followed) "*If* life did *once* arise spontaneously from any lower forces, physical or chemical, by natural process, *the conditions necessary for so extraordinary a change could hardly be expected to occur but once in the history of the earth.*" The author also tells us that "when the evolutionist speaks of the forces that determine progressive changes in organic forms as *resident* or *inherent*, all that he means, or ought to mean, is that they are resident as all natural forces are resident." "This does not touch that deepest of all questions, the essential *nature and origin of natural forces*: how far they are independent and self existent, and how far they are only modes of divine energy." We can in this connection appropriately refer to Dr. Hall's treatment of this subject in "Problem of Human Life." See pp. 397-8-9. Review of Prof. Haeckel, Spontaneous Generation, etc. Professor Edward S. Morse contributes "What American Zoologists have done for Evolution."

"Christian Thought," Bi-Monthly, published by Wm. B. Ketcham, Bible House, New York, and edited by Rev. Chas. F. Deems, D.D., as the Organ of the "American Institute of Christian Philosophy," gives in the issue dated October a series of very important papers, deserving careful study. This number alone is worth the yearly subscription price. Do not fail to read articles, "Paul's Psychology," by Isaac S. Hopkins, Ph.D., D.D.; "Christian Evolutionism and its influence on Religious Thought," by Prof. Daniel S. Martin, Ph.D.; and "A Symposium," the latter being a collection of written opinions of various scientists upon the "questions whether persons of acknowledged scientific authority have specifically denied the Divine Origination of matter, or of man, and placed such denial on logical grounds; and if so, when and where?"

The October "Homiletic Review," published by Funk & Wagnalls, 18 & 20 Astor Place, New York, and edited by I. K. Funk, D.D., and J. M. Sherwood, D.D., contains among other contributions, "How can the Pulpit Best Counteract Modern Skepticism," by W. A. Snively, D.D.; "Criticism of Some of the Ablest Representative Preachers of the Day; John Hall, D.D.," by an eminent Professor of Homiletics, these two being continuations of a series of papers by the respective authors. Prof. J. H. W. Stuckenburg, D.D., writes about "Psychology for Preachers," and Chas. S. Robinson, D.D., upon the topic, "Man Created as A Living Soul." There is much else of value in this number of the *Homiletic*.

"The English Illustrated Magazine," "Lippincotts," "American," "Cosmopolitan," "Cassell's Family Magazine," "Quiver," "Words and Weapons," are commended to our readers. "The Medical Missionary Record," published by Geo. K. Dowkontt, M.D., at 118 East 45th St., New York, is replete with useful information, and deserves success. "Healing for Body and Soul," is its Motto.

"The National Builder," a Monthly journal devoted to Building, Decorating and Furnishing, published by the Hill Standard Book Co., Chicago Ill., is one of the best mediums of the character, in every way considered.

"The Southern Medical Record," published in Atlanta, Georgia, by T. S. Powell, M.D., and R. C. Wood, M.D., is well edited.

A German chemist has patented a process by which the coloring matter known as Turkey-red, is distilled from oleaginous seeds as, for instance, the castor bean.

Experiments have been made in the cooling of iron while undergoing an electric charge, with the result that the iron is thus rendered more ductile and tensible.

DR. WILFORD HALL'S SCIENTIFIC LIBRARY.

THE principles of the Substantial Philosophy, with their collateral bearings, which are unfolded in Dr. Hall's writings, have cost him more than ten years of unremitting labor, such as few men besides himself have ever performed. The results of this tireless scientific and philosophical research, as therein elaborated and set forth, can be found in no other library of books on earth; and those who fail of the present opportunity to secure these unique works, at the trifling cost proposed by his publishers, will realize a missing link in their chain of knowledge, which they may always regret and may never be able to supply.

EIGHT VOLUMES THAT WILL LIVE.

THIS library consists of the "Problem of Human Life" ($2), the five volumes of THE MICROCOSM, bound in cloth ($7.50, or $1.50 each); the first volume of THE SCIENTIFIC ARENA, bound in cloth ($1), and the "Text-Book on Sound" (50c.), amounting in all to $11.

By special request of Dr. Hall this entire library will be sent to any person by express on receipt of $5, if ordered soon, or before the plates shall pass into other hands—an event probably not far distant. If sent by mail the postage, $1.25, must be added. Should the person sending $5 on this special offer already have either of the above eight volumes some other book may be substituted, if in our list of publications found elsewhere on this page.

No person who has tasted the fruits of this comforting and elevating system of doctrine, as set forth in those volumes, should allow this opportunity to go by for leaving to his children an heirloom which may prove an almost priceless memento in coming generations. Bear in mind that this library can only be obtained by addressing Hall & Co., publishers, 23 Park Row, New York.

BORDERING UPON IDOLATRY.

THE philosophy of Substantialism, which advanced thinkers now agree is destined to revolutionize the present science of our schools, possibly before this generation shall pass away, took its rise less than a decade of years ago, in the "Problem of Human Life," a work which has been hailed with commendations from the press of the civilized world, such as no book has ever before received. The publishers of this work have filed away hundreds of such notices, many of which are too laudatory and too nearly bordering on idolatry to be printed. Indeed, the publishers of THE ARENA are constantly receiving contributions from enthusiastic admirers, well written, but so full of flattering praise of the editor's work, that he feels obliged not to allow them to be printed. The following, however, is a mere specimen of such press-notices of the "Problem," a book of 524 octavo pages, and of which between 60,000 and 70,000 copies have already been sold without a dollar's worth of advertising:

A SAMPLE OUT OF 240 NOTICES.

[*From the Christian News, Glasgow, Scotland.*]

"One of the most trenchant and masterly opponents of this theory (Darwinism) is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled 'The Problem of Human Life,' in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them."

[*From the Methodist Protestant, Baltimore, Md.*]

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[*From the Illustrated Christian Weekly, N. Y.*]

"A very remarkable book has come under our notice, 'The Problem of Human Life,' which we have examined with some care, in which the author reviews most successfully the works of Darwin, Huxley, Tyndall, Haeckel, Helmholtz and Mayer, demonstrating, as we think, the utter fallacy of scientific materialism."

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[*From the Presbyterian Weekly, Baltimore, Md.*]

"The trenchant criticism, logical force, scientific attainments, and the clear, popular style of the author, have combined in producing in 'The Problem of Human Life' a volume that meets a pressing want, and one that will be warmly welcomed."

[*From the Dominion Churchman, Toronto.*]

"We most cordially concede to 'The Problem of Human Life' the well-earned title—*the book of the age.* Doubtless the God of Providence has raised up the author to meet the wants of the Church in this time of need."

[*From the New Covenant, Chicago.*]

"We can truly say that we are amazed at the originality, thoroughness, and marvelous ability of the author of this work."

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[*From the Journal and Messenger, Cincinnati, O.*]

"'The Problem of Human Life' is a very unexpected contribution to scientific polemics, which, if its reasonings shall be justified, on thorough investigation, will prove to be one of the loftiest achievements of this age, and effect one of the mightiest scientific revolutions ever seen."

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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.

D. K. ELMENDORF & CO., Publishers,
POTTER BUILDING, 38 PARK ROW, N. Y.

Entered as second-class matter at the New York Post Office.

WHOLE SERIES, VOL. VII., No. 6.
NEW SERIES, VOL. II., No. 6.

NEW YORK, NOVEMBER, 1887.

ONE DOLLAR A YEAR.
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PROF. A. GRAHAM BELL.

BY T. J. SHANKS.

[We regret our inability to present Prof. Bell's portrait as an accompaniment to this sketch. The photograph was not received in time to engrave it for this issue of THE SCIENTIFIC ARENA. It may be given hereafter.—Publishers ARENA.]

PROFESSOR ALEXANDER GRAHAM BELL, the inventor of the telephone, is of Scottish birth. His father, Alexander Melville Bell, was long ago well known in England as the author of a system of "Visible Speech," and as a co-worker with Max Müller, Isaac Pitman and others in the spelling reform movement, which looks to the reconstruction of English orthography on phonetic principles. The elder Bell had several sons, in whom weakness of the lungs seemed a family trait. One after another died of consumption soon after reaching maturity. At last only one son, the subject of this sketch, remained. Hoping to save his life by a change of climate, the father resolved to exchange the moist and depressing atmosphere of Britain for the bracing air of Canada. Newfoundland was the first resting-place of the gifted pair. In that island they remained several months, and the health of the young man rapidly improved. Then they determined to settle in the Province of Ontario, and the small city of Brantford, near Toronto, became their home. Meantime the younger Bell had elaborated a system of instruction for deaf mutes, by means of which persons afflicted with total lack of hearing could be taught to read what other people were saying by watching the movements of their lips, and also to articulate in reply. This wonderful process was introduced into the Provincial Institution for the Deaf and Dumb at Belleville, and speedily adopted in similar establishments in the United States and Europe. This achievement would have sufficed to render the name of Alexander Graham Bell renowned throughout the civilized world. But it was only the precursor of a yet more marvelous scientific triumph which was to win him fame and fortune almost without limit.

At Brantford Professor Bell began experimenting in the direction of the transmission of vocal sounds by telegraphic wire. In due time he completed his invention substantially as it stands to-day. Residents of Brantford will point out to the tourist the house in which ths magical telephone was incubated, and it is said that the wire on which the original experiments were conducted is still standing. Reference to these circumstances is made in the illustrated work, "Picturesque Canada," edited by Principal Grant, of Queen's College, Kingston. Some time about the year 1875 the writer remembers seeing in the Toronto *Globe* an account of the attempts being made by the young Scotchman at Brantford to read human speech over an ordinary wire—attempts which seemed likely to be crowned with success. The editor of the *Globe* at that time was the Hon. George Brown, who took a deep interest in the developments of the embryo wonder, and upon the completion of the contrivance secured the patent for it in England. In the Centennial Exposition at Philadelphia in 1876 the Bell telephone was exhibited in the Canadian Department. The only device even remotely resembling it was an apparatus by which Professor Elisha Gray, of Chicago, was able to cause tuning-forks corresponding in pitch at the terminii of a wire to vibrate in unison.

In 1876 Professor Bell recorded his American patent, and decided to become a citizen of the United States. He had previously visited this country at intervals in connection with the introduction of his system of deaf-mute articulation in American institutions. Possessing an invention out of which he was destined to reap millions of dollars, he was without either the means or the business capacity to push it commercially. Fortunately he was soon brought into contact with a man who had both ample capital and the mercenary instinct. And "thereby hangs a tale." In the story at this juncture a domestic romance is interwoven. Gardner Green Hubbard, a wealthy man of business at Cambridge, Mass., had a daughter who was a deaf-mute. She had been sent to study articulation in Germany, but the manner of speaking she had thus acquired was far from natural. Professor Bell was engaged as her private tutor, his income as an instructor of deaf-mutes being his only means of livelihood. Accordingly he began giving lessons to Miss Mabel, then grown into an exceedingly pretty girl of fifteen. Says one narrator: "How it came about is not known to the parties interested. Certain it is that after some months Professor Bell abdicated his position as teacher to Miss Hubbard, in favor of one of the ladies to whom he had taught his system. 'I cannot teach her any longer," he said. Not that his knowledge was at fault, but that he had found that she might teach him something hitherto unknown. But the mischief was already done. He might stay away from her father's house, but all the same he was in love with his pretty pupil. And she, unwittingly, teaching him, had also learned the lesson herself. Her parents soon came to know of the state of affairs, and at first they disapproved; but their daughter's happiness was more to them than all else, and, in the course of a year or so, all obstacles were smoothed over, the engagement was announced, and a brilliant wedding took place."

Mr. Hubbard saw the possibilities of his son-in-law's invention, and quickly elaborated the organization which has since developed into what is popularly known as the great "Bell telephone monopoly." His own wealth was soon cast in the shade by the enormous returns from the mammoth network of telephone exchanges which arose with mushroom celerity throughout this continent. Professor Bell is probably a millionaire five times over. He lives in Washington. His habits are almost as simple as when he was a struggling enthusiast in the realm of abstract science. Still in the prime of life, and victor over his hereditary physical weakness, he is likely to survive to acquire as venerable an aspect as the immortal Morse, and in passing away to leave a name as distinguished.

THE NATURE AND SOURCE OF CENTRIFUGAL FORCE.

BY PROF. GEO. J. SMITH.

AFTER an experience of some years with text-books on Physics, Engineering and Mechanics, the truth has been evolved through perplexity and hard thought, that the question indicated in the title to this paper is one of doubt—dark, chaotic doubt. About the nearest approach to candor and clearness met with in the ordinary discussion of circular motion, is the declaration that the terms used are "very confusing." Reasoning on the question seems to be generally at sea, and the puzzled investigator is only consoled by the information that the expression, centrifugal force, is a survival from scholasticism, and is now obsolescent, or at any rate deserves to fall into disuse.

The difficulties of the problem are primarily due to the fact that but a single force, a force essentially in a direction tangent to the circle described by the body, is necessary to produce circular motion. And likewise when the string holding a rapidly whirling ball breaks, the ball flies off on a straight tangent, and not "from the centre," directly, at all. Reasoning hastily and falsely from these observations, some so-called physicists have called in question not only the existence of any "centrifugal" force, but even have denied the use of any hypothesis that it exists.

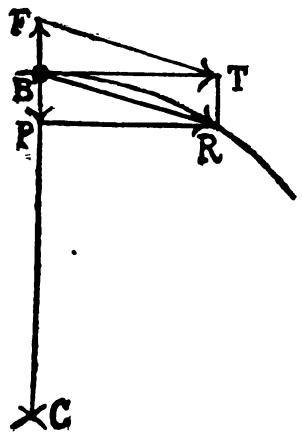
But for all this, the fact of the actual pull on the particles of a revolving body, not in a tangential line, but directly "from the centre," along the radii, is too evident—a matter of too unfailing observation—to be doubted. Anyone can of his own familiar experience testify to the actual strain or pull, *outward*, that he feels when holding a string at whose end a stone is attached and revolving in its circular path in the air.

The problem, then, is to discover the *source* of this outward or centrifugal tendency, which so clearly is to be felt. Suppose a ball at rest, but attached by a cord to a fixed centre. There is as yet no strain whatever upon the cord; but on the application of a single external force, whose uninfluenced effect would be to produce motion forever in a straight line, the cord constrains the ball to deviate from this tangential line, and move in a curve; while the pull outward, the centrifugal tendency, is simultaneously manifested. Now, since but one force has altered the condition of the ball from one of rest to that of circular motion, it is evident that all the phenomena of centripetal and centrifugal forces are to be traced ultimately to this initial force—acting, of course, in connection with the cord; while the strength of the cord is exerted as centripetal or binding force, to resist the centrifugal tendency. Thus it is scarcely necessary to state that these two latter forces are equal and opposite to each other, and that they are variable in intensity according to the velocity with which the ball moves and the radius of the circle—as will be shown further on. As with increase of velocity the centrifugal pull increases, the cohesive strength

of the cord is more and more taxed and exerted, till, with too great speed, the strain exceeds the capability or limit of tension-strength, and the string snaps.

Now, clearly, this occurrence is not brought about by the tangential force, as that acts at right angles to the direction of the string. But, though it must be a real centrifugal, or "centre-fleeing," force, that breaks the string, it must yet be a force that ceases to be effective as soon as the string parts. It is a force that dies in the climax of its strength.

Let us now proceed to consider the accompanying diagram, one which the writer has never seen published, but which makes the problem clear to him. The fault of the ordi-



nary figure used to illustrate centrifugal force is that it does not represent this force as at all dependent on the tangential force, as effect upon cause. This difficulty has been obviated in this diagram by merely adding the two lines BF and FT to the ordinary diagram found in the text-books. At B is a ball, constrained by the cord BC, when the initial rectilinear force BT acts, to follow the curve of which BR is an arc. It may be well to explain that the whole figure except the radius BC is conceived to be very small, so that the cord BR would not differ from the arc materially, and no error would result in the formula to be derived. The lines are thus to be conceived as highly magnified, as it were, and drawn so for convenience.

As the drawing is ordinarily explained, BR is the resultant of the tangential and centripetal forces, BT and BP, thus leaving the centrifugal, as a distinct force, entirely out of the question. But instead of taking BR as a resultant, let us, by the parallelogram FR, resolve BT, the original force, into BR and BT. To state that these two forces are the components of BT simply means that their action and effect on the ball would be equivalent to that of BT. It is then plain that the single force BT is in effect two forces: BR, the tendency forward in the curve, and BF, the centrifugal force, which immediately calls forth the resistance of the string, whose tension-strength is then exerted as the centripetal force, BP. Now, remembering BT to have been shown equivalent to BR and BF, observe that BF is neutralized and counteracted by BP, and hence BR alone is effective, and the ball pursues the curve.

The instant the force BF becomes too great for the strength of the cord, the cord breaks, and BF is no longer resisted. Of course BT is still equivalent to BF and BR, as it is to any group of forces whose combined action would produce it as a resultant; but now, evidently, the ball will not deviate from the tangent line one way or the other. It cannot follow either BF or BR, as both act at the same time, and are both undisturbed and unresisted.

This explanation of centrifugal force as a component of the original impulse, does not affect the ordinary formula for its value $C=\frac{v^2}{2r}$; v representing the forward velocity in the curve, and r the radius of the circle. By Geometry, BP : BR : : BR : 2BC. Whence $BF = BP = \frac{BR^2}{2BC}$. Centrifugal force = centripetal = square of the velocity divided by the diameter of the circle. Centrifugal force, in other words, is directly proportional to the square of the velocity and inversely proportional to twice the radius. In the rough, this is obvious from an inspection of the figure. BF = TR, and TR will increase as the curve is sharper, or the radius shorter. Also BF will vary as the velocity, represented by BT, or by BR.

The reduction of this vexed problem to the simple one of the resolution of a force by means of a parallelogram, it is to be hoped will do away with such confused notions as those we commonly meet—that when the string pulls the ball away from its straight path, the *inertia* of the ball resists the pull of the string or that centrifugal force does not in reality exist except as a sort of reaction.

As regards inertia, the fact of course is that this is merely a property of matter, that nothing but force can resist force, and that inertia could no more *resist* a change in the path of the ball than it could *make* such a change. A body perfectly free to move has the property of inertia, but no matter how immense its mass, the slightest force, the weight of a feather, would start it. Eliminate friction, and a man's hand could move a ponderous railway train on a level track. The idea of "overcoming inertia" is absurd, a contradiction of terms.

May we not fairly conclude that common sense and popular language are not at fault, in declaring centrifugal force to be the cause of the many phenomena long attributed to it? The "explosion" of a grindstone into fragments, or the heaping up of water around the outside of a bucket's interior, when the vessel and its contents are rapidly whirled or twisted around—the use of a term so convenient and so well established, in explaining these and scores of similar occurrences, surely need not be discontinued when it is both scientific and correct. Alas! the so-called scientific is not always the correct.

WILLIAMSTOWN, KY.

REMARKS BY THE EDITOR.

With all deference to Prof. Smith's learned statement of the case, we do not think the problem involved in centrifugal force requires one-half the words to make it plain that are here employed. Indeed, it seems to us to be the simplest thing in the world to put the whole matter in a nutshell so that a child can understand it. Let the reader judge whether or not we have exaggerated the simplicity of the problem and its solution after reading the following:

When the ball at B is given an impetus toward T, that is the only *active* force, in the true sense of the term, employed or involved in the whole problem. The string, BC, is not an *active force* at all, but is merely a *passive* force or a *resistance* which constantly serves as an impediment to the projectile force which would otherwise carry the ball on the rectilinear course BT.

Now two facts are self-evident though apparently paradoxical. This ball, though forced into a circle by the passive resisting force of the string, is nevertheless virtually going all the time in a straight line. Now how can this paradoxical statement be reconciled? In this way: The circle which this ball is forced to describe by virtue of the string's resistance (though all the active force in the premises, as stated, is the rectilinear force first imparted from B toward T) *is actually composed of a series of infinitesimal tangents at right angles to the continually changing radius, BC.*

No one disputes but that at any instant, should the string snap, the ball will go in the straight line BT. There are millions of these tangential points in a circle of a single inch in diameter, each one of which is the true and only direction of the ball at any instant under this only active force which propels it. The pull on the string, tending to break from the centre outward, is but this straight or constantly acting tangential force counteracting the interfering resistance of the string.

In a word, this substantial mechanical force which constantly acts on the ball from B to T, and which is constantly resisted by the passive string, is stored up in the ball as long as it moves under the original impetus; and should the string break at any one of the infinitesimal tangents constituting the circle, this active substantial force remains stored up in the ball and now carries it without the string's interfering resistance in the straight line BT, unless caused to vary or come to rest by gravity or some other interfering force or obstacle.

This is all there is in so-called centrifugal force. It does not act from the centre at all, *but is resisted from the centre by an obstacle*, which resistance or interference prevents or curtails its real and only tendency to move. Hence, the tendency being always in the straight, tangential line BT, it demonstrates that the only active force exerted, and which causes that tendency, must be in this same rectilinear direction.

We will only add that we have not always been thus clear in our apprehension of this question, though we will now stake our reputation for rectilinear thinking that we have here given the bottom solution of the whole problem.

"THE MONEY QUESTION SOLVED."

BY REV. J. W. ROBERTS.

UNDER this caption Rev. D. Oglesby prides himself, in the September number of THE ARENA, that he has solved the question which has troubled the financial world all along the ages. His article is open to criticism in many respects, but only a few points will be noticed in this paper.

1. His definition of money is erroneous. He confounds *money* with *value*, which it is designed to *represent*. Value, like reputation, is "not a material thing. It has no color, weight, or measure; no length, breadth nor thickness." Money is the *material* used to represent this intangible value, whether it be gold, silver, currency, or other medium of exchange. One man may estimate a piece of property to be of the value of $1,000, another $500; and the public at what it will sell for in cash, or money.

2. Money is not, as stated, "the evidence of sovereign authority or law in the markets of the world," or if in one sense it is an evidence of the existence of a government, this fact does not make the money of any "sovereign authority" valuable in the "markets of the world," but the ability of the maker to *pay*, gives its money currency and value. A government may have the best of laws, and execute them in the most efficient manner, and yet have no financial standing in the "markets of the world," unless in those markets it is known or believed to be financially solvent and able to meet its obligations.

3. It is said governments make the money. If money has no "material existence, no length, breadth nor thickness," will Bro. Oglesby tell us how governments can make it?

4. We are told that the one great error of all the ages is the idea that the individual can own money as other property; and it is declared that "The individual *cannot* own money as property, *because* it is *not* property. His right begins and ends with its *use*." If it "has no length, breadth nor thickness—is not a material thing," how can the individual use it? And if this proposition is true of *money*, which men make, how much more so of *land*, which God made? Does not this proposition embody the very worst form of agrarianism?

5. The brother's panacea for all the financial ills of the world is set forth in his "*only* true system of national finances," which is for the government to establish and operate banks of deposit and furnish the people *at cost* with the "money necessary to do the business of the community." Unfortunately we are not told *how* the government is to furnish the people with this money—whether it is to be *given* to each applicant, or whether the applicant is to pay an equivalent for it. If it is to be a free gift, or so nearly so as to require pay only for the "cost" of printing or coining, then every impecunious individual in the land will become a customer of the government banks, and silver and gold will soon be more plentiful than stones in the street, unless the supply is ex-

hausted. Then look out for a panic! If, however, an equivalent is required for the money, then, it is just about as we have it now. But our friend very considerately instructs the world how to use money after it is obtained:

6. "When any one has money, and does not need it to do business with, let him deposit it with the Government for safe keeping, and for others to use," &c. The world will doubtless take off its hat and bow thanks for this kind advice! But we suggest that if the writer referred to will substitute the word banks in place of government, he has very fairly described the existing method of doing business throughout Christendom. If, however, it is intended to compel a man to deposit his money without a consideration for some other person to use without giving an equivalent, it is only a proposition to establish legal robbery. If the propositions set forth embody the idea of giving away the money, they are a farce. If equivalents are to be rendered in all transactions, it is precisely what is now done. If an individual gets money from any source legitimately, and *pays for it*, it is his, and no just power can arbitrarily take it from him, or force him to use it in any way he does not choose. As soon as the government yields to the individual the money for value received, its power over it ceases, except to forbid and punish its criminal use or abuse.

The benefits of his system the writer thinks would be—

1. It would end all "panicky" or "hard times." How? If the money is not to be given away, how can it be any more plenty than now? If a man pays an equivalent for money, and then is compelled to give it up without an equivalent, the people will dash such a system of tyranny and robbery into pieces like a potter's vessel.

2. "It would open the vaults and safes of the money-mongers, and cause the money to flow out," &c. Where could the money flow to, and who would get it? Would those who have it "open their safes" and proclaim to the needy, "Come and get all you want as long as it lasts?" Or would the money-getters have to give an equivalent for what they get? If the latter, that is just what is now done the world over, as already stated.

3. "It would at once and forever wipe out and bring to an end the pernicious system of debt and usury for money." Again we ask, how? There is no logical connection between the writer's premise and conclusion; but there is an astonishing amount of gorgeous imagination resembling the "baseless fabric of a vision," or a decided leaning to that communism which would "rob Peter to pay Paul."

4. It will stop the accumulation of land in few hands, the writer thinks, but fails to tell how. It would naturally seem that if men cannot accumulate money, they will be more anxious to possess real estate, and will have to be prohibited from owning land as well as money. If the government can say a man shall possess or use so many dollars, then it can say he shall hold and use only so many acres of land—(the latter is far more sensible and reasonable than the former)—that he shall only raise so many bushels of grain or root crops to the acre (or if he raises more must deposit the overplus with the government for some other fellow's use), work so many hours a day, and so on to the end of the chapter: in other words, put an embargo on industry, economy and thrift, and offer a bribe to indolence. The "system" is an illusion or a hallucination, or else it needs explanation. There is no patent highway to the accumulation of property. It is only obtained by industry, economy, foresight, and forethought, and these qualities never can be legislated into a man or legislated out of him. Patent financial plans are like patent medicine nostrums generally, worthless for any practical good.

Laws can be made to prevent or punish the wrong use or abuse of property, whether it be in money, in burglar's tools, or deadly missiles or compounds; but the very cap-sheaf of folly would be for government to check enterprise and thrift by crippling legislation, or to pander to idleness by holding out the hope that it should make up for its lack out of the abundance of those whose possessions grew out of their labor and frugality. *Prevent*, as far as possible, the oppression of capital; *prevent* also the tyranny of labor; but foster to the utmost all real enterprise, whether of capital or labor.

It really seems that our good brother's "impregnable position" is based upon the sand, very loose sand at that, and that it possesses an infinitessimal amount of either "length, breadth or thickness."

OSKALOOSA, KANSAS.

THE NEBULAR HYPOTHESIS.

BY REV. JOHN CRAWFORD, D. D.

EVOLUTION may be divided into two departments, biological and mineral. In this article, I propose examining the latter, as set forth in what is called, the nebular hypothesis.

This theory, so commonly taught in our colleges as science, is found in nearly every text book of geology, is the sure stepping-stone to Darwinism, embodying *precisely the same principles*, and, like it, pointing the way to atheism.

It is substantially presented, as follows, by Dr. Webster:

"That the bodies composing the solar system once existed in the form of nebula; that this had a revolution on its own axis from west to east; that, by the effect of gravity, the matter composing the nebula gradually became condensed towards the centre; and that the exterior portions thus had the velocity of their revolution increased, until, by the centrifugal force, they were separated from the mass, and left behind in the form of a ring; that thus the material of each of the planets was separated, while the main body was condensed towards the centre, forming the sun; and finally, that each of the planetary rings, by a similar process, was condensed into a planet, depositing in the meantime rings, out of which its secondaries were formed."

I shall make another quotation from Dr. Pressensce, in his "Study of Origins," p. 139:

"We have first of all only a globe of fire. How is its solid crust to be formed? By the operation of the well-known law. Its heat disperses itself in the planetary space; the effect of this is to produce the solidification of its surface, as fine as the bloom of a peach. This is primitive granite. To complete its formation, it needs water and air," etc., etc.

These furnish a pretty adequate delineation of the nebular hypothesis.

It appears to me a monstrous absurdity, to represent the great Creator as occupying himself, for millions of years in cooling down a mixture of nebulous gas, to procure materials for the solar system; and this long before there was any intelligent creature to witness, or profit by the operation. It seems more likely, and infinitely more grand, for God to form these spheres at once, and by his creative fiat, as Moses has clearly taught.

This hypothesis, like Darwinism, proceeds upon the absurd supposition that God created the world by the operation of the same laws as those by which he governs it. Creation is obviously a *miraculous* act, to which no natural law can apply. The world was put under laws, adapted to its nature, *after*, not before, its creation. By what law of nature did our Lord multiply the loaves and fishes, or raise Lazarus from the dead?

If biological evolution is obliged to credit God with furnishing the first spark of life, mineral evolution must also credit him with providing the nebula, out of which to evolve the solar system.

But, suppose the entire materials of the solar system have been thus provided, is there any law in existence, which could give this mass its rotary motion, as this hypothesis requires? To produce this motion most certainly requires miraculous interposition; and, if so, the nebular process is no *scientific* explanation of creation.

Again, it is very doubtful whether any rotary motion *in vacuum* would separate this nebula into distinct belts. It would, indeed, shape the mass into an oblate spheroid, its diameter at the equator being in the exact ratio of the velocity of its rotary motion, but it would not separate it into distinct belts. For this another miracle would be required.

Granting however that this centrifugal force could separate these belts from the mass, they must either fly off at a tangent, or continue to revolve as belts, and with the exact rate of motion which they had at the time of their separation; and if so, by what law of motion were these belts, revolving in vacuum and at one uniform rate in every part, doubled up and rolled together into planets and comets? and especially as the diameters of these belts must be reckoned by millions of miles? Another miracle is here requisite.

Again, this hypothesis requires a *number* of belts, one for each planet and for each comet, and separated from the mass of nebula at different distances from the centre. But every portion of the mass, whatever the distance from the centre, must have taken precisely the same time for its revolution, just as the tire of a wheel can take no more time to revolve than the hub; and therefore all the planets formed from these belts should perform their revolutions in equal time.

How then does it happen that all of them, to say nothing of the comets, take very unequal periods to accomplish their annual revolutions? But to change these times must have required another miracle.

Again, all these belts must have been separated at the *equator*. All their orbits would consequently be in the same plane, and so all the orbits of the planets formed from them. But this is not the case, for their orbits cross the plane of each other at different angles. Here another miracle is required, to give tolerable shape to this miserable hypothesis.

Again, is there any known law which could give these planets, after their separation from the mass, their distinct rotary motion round their own axis? Another miracle required!

Once more, another supernatural interposition is needed to give each planet and comet an *elliptical* orbit. If they were originally belts, separated from the equator of the nebular mass, they must necessarily be perfectly circular, and consequently the orbits of the planets circular, not elliptical. How then are these planets at present eccentric in their orbit?

Again, if the planets and comets were separated from the nebular mass in precisely the same manner and by the operation of the same laws, as this hypothesis supposes, how does it happen that the comets are so very much more eccentric in their orbits than the planets? This difference must have been by miracle! It is unnecessary to pursue this examination farther.

It would be easy to point out the wisdom of God in all the details of the solar system, but no natural laws in existence could form such a system of worlds out of nebula. The idea is preposterous. The intelligence, wisdom and omnipotence of God are required at every step.

But what about the satellites? We might proceed to show that a similar set of miracles is also required to put them in order and in motion.

Now, if God must have done so much miraculous work in order to help out this evolution of worlds, why not give him full credit for the whole, according to the Scriptures?

Leaving the solar system, let us confine ourselves for a little to our earth. According to this theory, the earth is nebular cooled down, condensed, and its crust consolidated. If so, it must be a *homogeneous* mass. This, however, is not the case. It is composed of a great variety of materials, *not mixed and fused together*, but arranged in different positions and compartments.

Again, if the earth be a fused mass of homogeneous matter, cooled down from nebula, as this hypothesis supposes, *there could not possibly take place in it any further chemical changes.* Hence no more earthquakes, nor volcanic fires, or eruptions. This any mere tyro in chemistry ought to understand!

Again, it is admitted in the nebular theory, that "the whole space occupied by the solar system, and extending far beyond its limits, was filled with nebulous matter, in an exceedingly rare, and *intensely heated* condition."

Now, not to go beyond Neptune, the space within the bounds of its orbit amounts to 898,017,499,464,366,784,660,766,961,040 cubic miles! Then, take the sum of the materials, contained in the sun, planets, comets and satellites of the solar system; and dissipate these materials through this enormous space, and you will have a volume of nebula about 1,143,798,783 times more rare than the residium in the exhausted receiver of a good air pump, which can exhaust its contents to the 1,000th part of its former density.

Now, as heat cannot exist in a vacuum, how could nebula, so rarified, as to be little more than a perfect vacuum, be so "intensely heated," as this hypothesis sets forth? See an interesting article on this subject by Prof. Sutherland, in the Microcosm, from which I have copied the above figures.

Again, is there any known law capable of condensing this gas in vacuum, 1,143,798,783 times rarer than the contents of an exhausted receiver, so as to form the sun, planets and satellites of the solar system?

The belt which formed Neptune, for example, must have been separated, while this nebular mass extended as far as that planet, and was, consequently as rare as we have described. But how could this planet be formed, by any known law, out of nebula more than a billion times rarer than the contents of an exhausted receiver of an air pump?

I have not, by any means, exhausted the absurdities of this miserable hypothesis. I could as easily swallow all the scientific trash of Darwinism as the absurdities of this hypothesis!! It has often astonished me how any rational mind could entertain it for five minutes; yet, on the strength of this wild hypothesis, we are required to violate every law of language, in order to force the word of God into harmony with this shoddy science!

But I must draw this article to a close by examining briefly the arguments advanced in defence of this hypothesis.

Here I must confess the difficulty of finding any arguments worth the refutation. There are only three which are entitled to any attention. The first is founded on the *shape* of the earth.

We are frequently reminded that the earth is an oblate spheroid; and this proves, it is said, that it must have been once in a plastic state, or it could not have taken this form.

When our Lord made the loaves and fishes, he made them at once, ready for food. He did not, by the operation of law, evolve the loaves from wheat, and the fishes from spawn; and, in like manner, when he made a world, he made it at once, in the *proper shape*.

Had he created it a perfect sphere, the very first turn upon its axis would have given some twenty-five miles deep of water at the equator, while the poles would have been left dry. Undoubtedly an oblate spheroid is the only proper shape for the earth; but does it follow that God, in order to give it this form, must, for this purpose, spend millions of years in cooling down the materials of a heated nebula, and in spinning them upon an axis? Would this be like the Omnipotent and the All-wise? What if God should refuse to waste so much time, when no rational end could be attained by the delay; but, in spite of the scientists, just give the world its proper shape at the first stroke of his omnipotence. Why should the Almighty be delayed and hindered, when no rational end could be answered, by waiting the operation of laws, *not yet in existence*, that he might hide himself behind them, to gratify the taste of a few skeptical philosophers, of the Darwin and Haeckel type, who are hostile to every thing that indicates the presence of God in his own works?

The second argument is as follows: "When we descend below the surface (as in a mine) the heart increases as we descend. The world must, therefore, be liquid fire at the centre."

Now, as we come down from the mountain top to the valley, the heat increases, because the atmosphere is more dense at the lower level, and, therefore, contains proportionately more caloric: so, as we descend below the surface, the atmosphere becomes still more condensed, and so also more heated.

Again, the calm atmosphere below the surface is less likely to lose its heat by the currents of cool air making their way at the earth's surface from the poles to the equator: but,

In the next place, and chiefly, there have been and still are, immense volcanic fires in the earth's bosom. These fires are, for the most part, intermittent and *local*, and comparatively near the surface. They are not continuous, nor near the centre, but caused chiefly by entrance of water from above. Hence most of the volcanoes are either situated in islands or on the sea coast.

These internal fires are caused by chemical affinity, and take place from time to time, as various chemical ingredients are brought into contact, which could not be the case if the earth was one homogeneous mass, as this hypothesis supposes.

Now the heat from these great occasional fires is diffused through the entire mass of the earth's substance by conduction. That portion, however, of the diffused heat which approaches the surface is dispersed into space by radiation.

While the earth is continually receiving an increase of heat by its volcanic fires, it is cooling more rapidly at the surface, as any heated body must necessarily do, by radiation.

It is not philosophical, however, to conclude that. Could we go deeper into its interior than we are now able, the heat would continue to increase at the same ratio.

It is altogether likely that nearer to the centre it is much cooler than at a moderate distance from the surface, where its volcanic fires originate.

There is something extremely fascinating to a certain order of minds, in the contemplation of immense periods of time taken up in the slow development of creation; and in the marvelous potency of law which, according to this hypothesis, is supposed to evolve the entire planetary system, and for that matter, the entire universe, out of nebula, and the whole animal creation, including man, out of a moneron.

But is it wise; is it scientific, to lay aside the rules of sober inductive philosophy, by which alone true science has been, and ever must be, advanced, to build upon a mere hypothesis, based upon nothing but conjecture, and which, if it does not give the lie direct to the word of God, at least demands a mode of exegesis which bids defiance to every law of language, and which would not be tolerated in the interpretation of any other document?

The third argument is founded on the assertion of Sir William Herschel, that some fixed stars are so far distant that it would require one million nine hundred years for their light to reach our earth. Therefore, say the scientists, these luminous bodies must have been created at least that far back in eternity.

Now, in reply to this I would ask, is it reasonable to affirm that, when God formed these orbs, he created them with their light only *starting* on its course? Is it not much more likely that, when, on the first day of creation, he said, "Let there be light!" he *instantaneously* illuminated the entire heaven, as it now is, by the same miraculous fiat that called forth the fixed stars themselves?

Will these scientists never give the Almighty credit for performing one *complete* miracle? "The worlds were framed," not by the operation of natural laws, but by the fiat of the Almighty; and they were created perfect and complete!

Is there any reason, either in science or revelation, that God must so far economize his miraculous power as to wait one million and nine hundred years before these fixed stars could illuminate our globe?

I will yield to no man in admiration of *true* science; but I have a sovereign contempt for that *shoddy* science that is ever officiously stepping forward to help God in his miraculous operations! How often must these scientists be reminded that creation, from first to last, is miraculous—not produced by the operation of those natural laws, by which the Creator *subsequently* governs the world?

The scientist who would undertake to account for the miraculous, by the operation of natural law, has nothing of the true philosopher but the cloak and the staff. He does not know the proper bounds of scientific inquiry when he attempts to carry it into the province of miracles.

St. Thomas, Dakota.

MAGNETISM AND SUBSTANTIALISM.

Number II.

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

It is now quite well established that the sun is a great magnet, and that the earth is in constant magnetic sympathy with him. It is certainly natural to seek the origin of magnetism in the sun, the source of all living activity. There are a number of reasons to be given for this position:

1. When a bar of steel is exposed a sufficient length of time to the sun's rays, it is rendered magnetic. It is not possible to account for this phenomenon on any other hypothesis than that the sun is a great magnet. It must be that magnetism is substantial, or it could not influence a body the immense distance from the sun to the earth. If, according to the position of many scientists, the forces of nature are simply nothing, it is a burlesque upon logic to talk of the influence one body has upon another millions of miles away.

2. The compass needle shows daily oscillations which indicate its tendency to turn towards the sun wherever he may be. When the sun is east the needle has a slight oscillation in that direction, and when the great luminary is west the needle turns westward. When we add to this the fact that the vibration is increased in the summer and diminished in the winter, it makes it very certain that the needle tries to turn towards the sun. The effect of the sun upon the compass needle is very decisive proof of the fact that the sun is a great magnet.

3. The energy with which the needle seeks its place of rest is inversely as the square of the earth's distance from the sun. It thus harmonizes with the other great forces of nature—gravitation, heat, and light. These great forces of nature are really God's messengers sent out to accomplish His will in the great material universe. They are as real and possibly as immaterial as His great agents sent out into the spiritual universe.

4. The vibrations of the needle correspond with the spots upon the sun. Among the first things discovered by the telescope were black spots upon the sun. These spots are not permanent, but come and go; and they have a special relationship to the vibrations of the compass needle. About every eleven years the needle is subject to very violent disturbances, which are closely connected with the spots upon the sun. This is another good reason for believing that the earth is in magnetic sympathy with the sun.

5. The Aurora Borealis is now thought to be of magnetic origin, and is greatest when the spots upon the sun are most numerous. The Auroral displays are seldom seen at all when the sun is free from spots. These lights always being in the north, and the compass needle always pointing towards the north, are positive evidence that the earth is a magnet, and the relation of the Auroral displays to the sun spots make it very evident that the earth is under the magnetic influence of the sun.

6. Magnetic storms are always accompanied by great displays of the Aurora, and they are most frequent when the sun is most spotted, and seldom occur when he has but few spots. On the 1st of September, 1859, remarkable spots were exhibited on the face of the sun, and astronomers saw near one of the great spots a cloud of light sweep rapidly over the face of the sun. A magnetic storm was at that time in progress, and the earth was convulsed with electro-magnetism. These things occurring at the same time, entirely convinced observers that the earth and sun are in perfect magnetic sympathy; and that so far as our system is concerned the sun is as much the center of magnetism as he is the center of light, heat and gravitation.

As the sun is the great magnet of the system of which he is the center, so Christ, the Son of Righteousness, is the great magnetic center of the moral universe. The great Syracusan philosopher is said to have concentrated the sun's rays upon the Roman ships to set them on fire: so the love of God is brought to a focus in the cross of Christ, and it sets the hearts of men on fire. Jesus recognized the magnetic power of the Cross when he declared that his being lifted upon it would attract the world to himself. In the mission of Christ we have a magnetic chain of love descending from heaven to earth; from this chain there are magnetic cords extending to the nations; and from these cords there are magnetic threads reaching the individuals of nations. The Gospel is God's power unto salvation, and it is for every individual, male or female. Those who do not deny the reality of this power of God, should not deny the power of the great magnetic force in the material universe.

A GLANCE AT THE NATURE OF THE SOUL.

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

THE extreme limit of the Real, as distinguished from *its phenomena*, has ever been the question of supreme interest to those scientists and philosophers who have pushed their investigations farthest into the field of the shadowy and the tenuous. And we are not surprised that various conclusions have been reached; for in view of the different methods pursued, the different degrees of intelligence employed, and lastly and chiefly because thinkers have been swayed either unconsciously or otherwise by their prejudices, it is unreasonable to expect that on the deep question involved anything but disagreement would result. This must *necessarily* occur in an age like this, when so many men who make the greatest pretension to intellectual culture and advanced knowledge are not only trammeled by the most offensive intellectual pride, but are the slaves of a *pre-espoused* theory, like the Manicheans of the fourth century. Therefore the Huxleys run into gross materialism, the Cookes into the notion that only mind and matter exist in the universe, and the Tyndalls into the belief that the unseen is altogether a "*mode of motion.*" One result of this has been that,

1. *The definition of Substance has perplexed and puzzled thinkers.* Locke has unconsciously wrought much trouble in the settlement of the question by defining it as "*the unknown support of qualities;*" for not only did Berkeley discard it as it related to matter, but Hume divorced it from mind, and the subsequent statements of Reid and Kant, and Sir Wm. Hamilton, have only left to us for elucidation "confusion worse confounded;" while they furnish to Mill a foundation of miserably defective views upon which to rear a specious but dangerous argument; and to Spencer the opportunity to consign to "mind the unknown thing," even religion itself, as to a grave. "The truth is," says Doctor McCosh, "we cannot without protest allow persons to speak of *substance* as being something unknown, mysterious," &c. *Substance* is known as well as *quality*, and *nomenon* as well as *phenomenon*, for we never see an appearance apart from a thing *appearing*, and we never know *quality* without knowing *substance.*" Nor does it appear to us that the author of "The Divine Government" has given us a clear definition of substance when he styles it "an existing thing, operating with a permanence." In a technical sense substance is whatever is entitative, or has a real essential existence. In a generic sense it embraces alike immaterial and material things, including in its compass all persons and things from the Infinite Jehovah down to the animalculæ in a water drop, and all the subtle forces from cohesion up to life, mind and spirit. The material is not the only substantial, for as all *matter* is inert whatever affects it must be *substantial* in that *zero* cannot produce results.

This being true, we call attention to the fact that,

2. *We know some things about the soul.*

First: We know that it exists, independent of the body.

The appeal here is to *personal consciousness.* We take issue here with J. Stewart Mill, who insists that a feeling and a state of consciousness are *equivalent expressions.* We are not only conscious of feeling, but of self as feeling; and as the perception of self could not be given by feeling, it is evident that we are conscious of self, independent of feeling. Therefore feeling and consciousness are not equivalent expressions. And further, this self of which we are conscious, independent of feeling, appears in all our purely mental exercises. We know *self* as *thinking, self* as *feeling*, and *self* as *willing.* We do not always feel, but we are *always conscious* of a *present thinking self.* And of this conscious personality we ever feel that the body is at most but the minor part. I am "an abiding existence, with a series of feelings;" I have *organs* and *thoughts*, but I am *conscious* that *they are not me.* "I can conceive (said Socrates to Alciabes,) myself existing *without organs*, but not *without thought*; I am therefore *essentially a thinking being.*" And this thinking, unchanging thing, of the existence of which I am conscious as distinct from my body, I call soul. It is *an entity*, for *it* thinks and *remembers*, and a *shadow* could not do that; and when I consider that its phenomena are unlike material phenomena, that it distinguishes itself from matter, that it is self active, and that in its highest activities it is not dependent on matter; I am forced to believe that it exists *independent of the body.* Matter is but the creature of the soul; and Emerson well says, "the Gothic cathedral is a blessoming in stone subdued by the insatiable demand of harmony in man." Plato is right when he says "the soul has a life of her own." It exists independent of the body.

Second: The soul being a distinct substance, it doubtless has much to do, not alone with the whereabouts, but also with the appearance of the body. That souls have a form of their own we cannot doubt, for formless existence is *inconceivable;* there must be some form to Gabriel's wing and to Dives' face. Perhaps the souls of men bear some such relation to the body as does the sword to the scabbard. Indeed the philology of the Old Testament at least hints a resemblance; for in verse 14 of the 49th Psalm, where we read of death feeding on the bodies and of their beauty being consumed in Sheol. The word "*beauty*" which refers to the souls is *vetsuraum*, that is, their "image, form, pattern, this is their souls having the pattern of their bodies, shall spend their time in Sheol; and as the same Hebrew word means also "*rock*," we have the idea of an *indestructible soul*, in form resembling the body in which it previously existed. Now as in this world soul always controls the shaping of matter instead of vice versa, it is but reasonable to believe that to some extent at least the body while in this world (perhaps before birth) was shaped and formed as is the cell by the bee which is to occupy it. And this influence of the higher substance over the lower may (and does to my mind) very clearly account for the fact that Dives recognized Lazarus in the bosom of Abraham, that the King of Babylon was known at once by the "Chief Ones" in Sheol, and that the righteous there, as Ezekiel says knew at a glance their former acquaintances from earth. If this be so then Leigh Hunt is right when he said of his departed wife, "I have not seen her for many years, but with the same face she will go to heaven, for it is the face of her spirit." How beautiful the thought that perhaps each saved human spirit has measurably shaped, here in this world, the very body through which it will blaze in transfiguration glory bye and bye. Or if that be not true, it does reveal a possible manner by which heaven might provide the means of recognition of spirits in the future world, by making the body in this world measurably the counterpart or image of the soul. Such is the light which the Substantial Philosophy sheds on the great question of a future existence.

Great hearts alone understand how much glory there is in being good.

WHAT IS SCIENCE?—A LECTURE—No. 2.

BY THOS. H. MCMULLIN.

The Substantial Philosophy claims to be able to show by facts, phenomena and experiments amounting to an absolute demonstration, logically convincing the reason and judgment, that the air is not necessarily thrown into waves or given the slightest motion by the transmission of sound, and that a fog horn, operated by a ten-horse-power motor does not move or disturb the air sixty feet from its mouth; that the alleged condensation and rarefaction of the air into waves, its increase of temperature one-sixth, its vibration, undulation, and movement, in the transmission of sound exist only in the imagination of those who so teach.

When she has accomplished this easy task, the Substantial Philosophy teaches, and demonstrates that all these things, viz., sound, light, heat, electricity, gravity, magnetism, odor, life, mental power, are real, substantial entities. As to odor, its substantial, entitative nature is already universally accepted, although as intangible and imponderable as heat or sound.

Like these, it is recognized only by the special sense, with which we in common with other animals, are endowed for that purpose.

As to light, heat, and electricity, this philosophy is only a vigorous, but greatly improved revival of the anciently abandoned substantial theory, teaching that in the production of these things an actual, but immaterial entity is evolved, emitted, and propagated, and is transmitted, reflected or refracted, by laws peculiar to these several immaterial substances.

The Substantial Philosophy boldly denies the existence of a "physical agent" incapable of an actual existence, or the possibility of a mode-of-motion of a nothing, as is coolly taught by such men as Tyndall, Huxley, etc.

It unhesitatingly affirms that all force is substantial, and when current scientific teachers are heard to say, "Light is a "physical agent," she plucks from this deceptive definition a necessary concession that it is a substantial something, though not matter.

When Professor Tyndall says, "Heat is a mode of motion," Substantialism inquires—"motion of what?" and from the silence of this distinguished savant, she extracts an admission that a mere nothing cannot have motion and force!

When Prof. Helmholtz teaches that sound is transmitted by a wave-motion in the conducting substance, Substantialism goes to work and transmits all manner of sounds and musical tones, through all kinds of substances, air, water, wood, iron, glass, etc., and demonstrates before his very eyes that the conducting substances have no motion that the most powerful microscope can detect, when his theory demands the production of waves from 180 to 476 feet from wave to wave, or from crest to crest.

When these forces, physical agents, or so called modes of motion are demonstrated to be real entities, actual substances, then the Substantial Philosophy undertakes to develop, arrange, and state the laws governing the production, transmission, division, reflection, and refraction of these substances.

It is found, as heretofore stated, that the substance order, though material, has no perceptible weight, color, taste, touch, size, or form, and is unrecognizable, except by the special sense of smell. That the substance, sound likewise, has no taste, smell, color, weight, etc., and is unrecognizable, except by the special sense of hearing. That the substances, light and heat, likewise have no palpability or ponderosity, and are alone recognizable by the special senses created for those purposes.

That the substances electricity, gravity, magnetism, like air in an ordinary state of quiescence, cannot be recognized by the ordinary senses, as entities, but are demonstrated to exist as actual, substantial entities, by the immense and certain force and power manifested by them.

Thus, treating all these forces as things—as actual, real forms of substance—all the phenomena observed relating to their source, production, transmission, etc., are practically susceptible of a clear, rational, logical explana-

tion, involving no fallacies or absurdities whatever.

Without further amplification of details, let us apply these principles to some of the facts and phenomena of daily occurrence.

A grain of musk, a bunch of violets, a drop of ottar, fills a room with fragrance; a fox at full speed for miles, at each foot-fall leaves behind him an odor. The hound crosses the fox trail, and this emitted substance comes in physical contact with the nasal membrane, the fact of such contact is conveyed to the brain through the olfactory nerve, and the sensation of smell is the result.

Solar light and heat, filling our atmosphere, may any day be gathered and diverged to a focal point by mirrors or lenses, and thereby be made to burn wood, boil water, make steam, propel machinery, etc.

A visit to the telegraph office will discover an iron armature of a determinate weight in ounces, moving up and down, and upon the same principles, and by the use of the same force, trains rush along the track of the electric railway.

The boulder, poised high up the mountain side, pried from its balance, rushes wildly to the valley, breaking down trees in its descent, and crushing all in its pathway.

The music of the band comes over miles of intervening space at evening, all the tones blending in perfect harmony, yet clearly distinguishable by an effort of the listener.

Now, are all these results and effects, these corporeal disturbances of inert, physical matter; these receptions of actual sensations, due to actual and real agencies, or to mere motion —mere *non entity?* This is the real issue between the Substantial Philosophy and her opponents.

She says the fox "left a substance in his track," that there was a substantial emission from musk; that we concentrated substance when the sun's rays were collected and focalized; that an actual substance impels the electro-dynamic machinery; that a substantial entity forced the boulder down the mountain slope; and that our minds were pleased and charmed by an actual something being conveyed to us from the band of music. Are these assertions reasonable? Are they true? Shall we decide that because light, heat, sound, gravity, and electricity cannot be seen, handled, bottled, and carried around in our pockets, like so much solid or liquid matter, that therefore they do not exist? Shall men longer, in the name of truth and science, teach us that oceans can be evaporated, mountains rent asunder, and the multiplied thousands of physical, corporeal effects of these agencies that take place daily before our eyes, can be produced by mere nothings?—by modes of motion of that which is really nothing? Try to conceive of the absurd proposition of *nothing* in motion, and if you succeed you will be in possession of Prof. Tyndall's theory of light, heat, and electricity.

"The recently established law of the persistence of energy and the conservation of force proves that all force is substantial. Nothing can be conserved or preserved unless it be something that exists, and it is an axiomatic truth that nothing can exist unless it be a substance of some kind. If force of one form is converted into force of another form, then all force in whatever form it may be exerted is substance, since it is impossible to conceive of the conversion of one thing into another thing and neither thing be anything."* Yet this is the intellectual legerdemain to which thinkers are invited by scientific (?) teachers of the modern English school.

This philosophy of Substantialism is, however, not done with the scientists of this school, when the foregoing principles are demonstrated and accepted.

If the wave-theory of sound, the undulatory theory of light, with its imaginary ether, and the theory of heat, electricity and magnetism as modes of motion are really fallacies in science, then nothing remains to be accepted but the hypothesis that they consist of substantial emissions and are therefore real entities, as much so as is air or odor; "and if they are thus absolutely proven to be substances, there cannot be the shadow of a scientific objection raised against the substantial or entitative nature of life, spirit and the mental powers." What follows? It is a scientific axiom that no entitative substances can be annihilated, hence the immortality of the spirit of man, and a future state, follow as a demonstration.

"That a future life, involving all the intellectual advantages of such a state, is *possible*, no intelligent or candid scientist will question. That it is *probable*, thousands of the best and wisest among scientific investigators have fully agreed. That it is a *certainty*, millions of the noblest of earth have maintained, even with their dying breath. Under such circumstances it would naturally be presumed that the true scientist from his paramount desire to acquire information alone, would lend a helping hand to those investigators whose lives are devoted to the cause of demonstrating the soul's immortality, rather than almost virulently throwing obstacles in their way by belligerently belittling every consideration advanced in its support. This willing opposition to an assurance of grander scientific resources, and of a higher plane of intellectuality than earth affords, as the only conceivable means by which this knowledge of the mysteries of nature can ever be attained by man, proclaims in more than words, that such votaries at the altar of science are mere pretenders in their great profession and unworthy of the name of true philosophers. They are priests who hold the temple by force, but their worship is the sham of hypocrisy.

"When thousands of the best educated scientists of the world declare their unshaken faith that it is possible for an immortal telescope to be placed in the hands of every man at death by which the great boundless universe can be examined more minutely and satisfactorily than we can now scrutinize this earth, the Haeckels and Ingersolls of modern science—these pretenders to true philosophical research —are up in arms against it. They thus plainly proclaim to the world their intuitive love of ignorance, rather than an inherent desire for knowledge, by discarding with contempt the only possible hope of knowing more of the mysteries of the universe than is afforded by our present brief and circumscribed life."†

* "Problem of Human Life," page 27;
† "Problem of Human Life," page 524.

TRUTH, KNOWLEDGE, FREEDOM.—NO. 2.

BY PRESIDENT I. L. KEPHART, D. D., OF WESTFIELD COLLEGE, ILL.

To KNOW *the truth* is to be free. Not to know it is to be in bondage. To desire to know the truth is to desire freedom. To struggle for a knowledge of the truth is to struggle for freedom. To acquire a knowledge of the truth is to break the chains that bind us. To seek the truths of God, is to seek the liberty wherewith Christ maketh free. To come to an experimental knowledge of this truth is to rise into the full liberty of the children of God.

But as there may be a limit to man's knowledge, so may there be a limit to his freedom. And, as there are different departments which he may enter, explore, and become familiar with the truths pertaining thereto, and as he may devote himself to some one or more of these to the neglect of the others, so is it possible for him to enjoy the highest liberty in some directions, and in others remain in the most abject, degrading bondage. And, as in their relation to each other, and to man's highest welfare, knowledge of *the truth* in some departments is of more importance to him than knowledge in other departments, so can he better afford to remain ignorant of the truth in some directions than in others.

Nor is it merely *knowing*, but knowing *the truth*, that makes its possessor free. There is a knowledge that enslaves. A knowledge of cards may bring you into bondage to the vice of gambling. A knowledge of dishonest schemes in politics—of saloons, pool, and option, may curse you with the bondage of sin and death. It was his skill as an expert in the trickery of municipal politics that ruined "Boss Tweed." It was his skill at stock-jobbing, and his knowledge of the fashionable vices of New York, which brought "Jim Fisk" to an untimely death. And it is the knowledge of these that is to-day cursing and ruining so many otherwise great men all over the world, and threatening the very foundations of our free institutions.

But a knowledge of *the truth*—that is, a practical knowledge of the ways of purity, honesty, and of salvation through Christ, lifts its possessor into the pure sunlight of the liberty of the children of God. This is the very highest freedom.

Man is born into the world ignorant and helpless. Before him lies the material universe with all its wonderful laws of matter; the intellectual world with its subtleties of thought and reflection; and the moral realm with its persistent impressions of responsibility, and its stupendous possibilities for weal or woe. In himself also he finds a restless longing for that happiness which only loyalty to convictions of duty can secure. All these invite and urge him to investigation—to the acqusition of knowledge, with the promise of success in the pursuit, and the assurance of its consequent and desired reward—liberty.

He soon becomes a learner, and he finds that a knowledge of the nature of fire frees him from the danger and fear of being burned; a knowledge of productive labor frees him from the danger of coming to want; a knowledge of the nature of the soil and the method of producing crops frees him from the danger of toiling in vain; and a knowledge of the physical laws of nature delivers him from the danger of making mistakes disastrous in their results, and from the follies and crimes of bigotry and superstition.

Thus, as his knowledge of physical nature increases, his liberty is enlarged; and as, next to life, he desires liberty, the knowledge acquired increases his desire for more.

Nor can the extent to which the race has suffered for want of knowledge and the liberty it secures be estimated. It was this that held the Puritans in bondage to their dread of witches, and caused them to perpetrate the terrible crime of burning innocent old women at the stake. For want of knowledge, helpless persons were at one time compelled "to pass the ordeal" of walking, blindfolded, over hot plowshares, and others were cruelly put to death by being burned. For want of a knowledge of the laws of health, and of the unalterable sequence of cause and effect, otherwise intelligent persons have been held in bondage to a fear of evil omens. And even to-day, if we go into benighted Africa, we see the people held in bondage, through ignorance, to the fear of all sorts of supernatural visitations and cures for diseases.

Sir Isaac Newton was for years in bondage to his ignorance of the mystery of the motion of the heavenly bodies. The fall of an apple furnished to his struggling mind the key that enabled him to unlock the door of his prison-house, and through that door since then the astronomers of the world have been passing into the grand amphitheatre of freedom from doubt and uncertainty respecting that important branch of science. A correct knowledge of the motions of the heavenly bodies and the consequent results has liberated the world from the horrible dread and superstitious fear with which it was formerly convulsed every time an eclipse occurred. Instead of regarding these wonderful phenomena as evidences of the Divine displeasure, men gaze upon them with profound feelings of reverence and delight, seeing in them but fresh reminders of the unvarying certainty with which effect follows cause, and how the Infinite God sustains the ongoings of the universe.

Hence, we see that it is the function of knowledge of the truth to make its possessor free. We see also that there are three grand realms open to man for investigation. Now these realms, while they are separate and distinct, at the same time are interlocked in their relations to man. While each has its own specific truths, still they are more or less related to

each other. These truths may be known, at least to an extent sufficient to enable him to fully answer the true end of life's great mission. And, as before said, man may devote himself exclusively, enthusiastically, successfully to the study of one or two of these departments to the neglect of the others. But to the extent that he fails to harmoniously acquire a knowledge of the fundamental truths of *all* of these, and especially of the fundamental truths of the *moral, spiritual realm*, to that extent will his manhood be one-sided, dwarfed and crippled. This is the reason why some men, giants in science and literature, are mere pigmies in spiritual manhood.

In a thorough knowledge of the physical sciences, and in a clear apprehension of the laws of mind, Aristotle, Spinoza, Hobbs, Hume, Strauss, John Stuart Mill, Heagle, Tyndall, and Darwin tower above their fellow men as the big trees of California tower above the pines and firs of the Sierras; but in matters that pertain to God and the Soul, Christ and His salvation—in this realm of *highest* truths—the old slave with whom I conversed amid the din and roar of battle in front of Petersburg, Pa, was as much their superior as they were his in science and literature. They clearly comprehended the mechanism of the Solar System, of which he was profoundly ignorant; but he, in his own *soul-experiences*, understood the philosophy of that law of love embodied in the words: "We love Him because He first loved us." They fathomed the depths of the mystery of molecular affinity, heat, electricity, motion, and force; but were worried and discontented because, in the dying words of Emanuel Kant, they were "*in entire ignorance of what might await them after death;*" but that poor negro, having learned to know Christ (*the truth*) in the pardon of his sins, exulted in a sublime, soul-inspiring faith in the declaration, "Because I live ye shall live also."

Again, the truths of these several departments never conflict. It is only between the pseudo-scientific theories of the various departments of knowledge and the *real truth* that there exists any conflict. When the real truth is discovered, the apparent antagonism is dispelled, and the sublime harmony is apparent. A few years ago tyro geologists asserted an irreconcilable antagonism between that science and the Bible. But now that a discovery of *the truths* of Geology by Hitchcock, Agassiz, and Dana has swept away the smoke of the sham battle, scholars are astonished that Moses, in his day, could state with such scientific exactness the manner and order of the earth's formation.

THE GREAT ACCIDENT.

BY ROBERT WALTER, M.D.

THE position so generally assumed that man's present unfortunate state is the result of an accident which happened to our first parents, has so generally pervaded the theological and philosophic mind that the clearest declarations of scripture are ignored, and inconsistencies and absurdities sought to be established. The article in the September number of the SCIENTIFIC ARENA, entitled "Is Evil an Entity," is only another contribution to the literature of theologic inconsistency. "Is evil an entity?" if so "was it made?" and "who made it?" are the questions propounded; and the answer is, evil is an entity, which was not made nor created, but "became, so to speak." "The devil came to be, in other words," etc. We notice in the same issue of THE ARENA an able article intended to disprove spontaneous generation; but here we have a spontaneous generation in respect to a subject of infinitely greater importance than any which agnostic science discusses. Evil, we are told, was not created, nor made, but it "came to be." It is a creature without parentage; a something out of nothing, which "became, so to speak;" evolved from the bosom of infinite vacuity. Our learned author tells us that "the reading of God's word casts enough light on the subject." So say we; but we notice that it depends largely upon the part of the word read, and *how we read it*. But to the question: Who created Adam, the Garden of Eden, the tempter, the surroundings?

Let us note first that God *not only admits but claims to have "created evil."* He is not content with the word "made" nor does he admit that it "came to be," through accident or design, but he claims to have *created* it, using the same Greek word (Bara) with regard to evil that he does with regard to heaven and earth, the whales, man, and all created things. "I form the light and create darkness; I make peace and *create* evil. I, the Lord, do all these things." The same *bara* is employed as in the 1st chapter of Genesis, in Isaiah lxv. 17, and the numerous passages in which God is set forth as he who *creates*. In other words, the Lord proclaims himself the creator of all things, good and evil, in the same words that he proclaims the creation of the worlds and man. Amos, iii. 6, expresses the same sentiment. Ephs., i. 11, urges the same incontrovertible truth "of him who worketh all things after the counsel of his own will." Almost every letter of the Apostle Paul declares in unmistakable language the Author of all who is good, and who subjected "creation to vanity, not willingly, but by reason of him who hath subjected the same in hope, because the creation itself also shall be delivered from the bondage of corruption into the glorious liberty of the children of God." Roms. viii. 20.

Having said so much, we hasten to correct the possible impression that we belong to the Ingersoll school.

We assert that God made no blunders; that man is not the victim of a great accident; that life and death, heaven and hell are not spontaneously generated. Unlike mortals God saw the end from the beginning. "The Lamb was slain from the foundation of the world;" redemption is not an afterthought, but the complement and fulfillment of the designs of creation. For "in the dispensation of the fulness of times, he will gather together in one all things in Christ." Ephs., i. 10. He came "to reconcile all things unto himself." Col., i. 20. "To whom every knee shall bow and every tongue shall confess to the glory of God the father." Phil., ii. 10. Then "death shall be swallowed up in victory." 1 Cor., xv. 55.

WERNERSVILLE, Penn.

REGENERATION:

IN HARMONY WITH MENTAL AND MORAL SCIENCE, AND THE NATURE OF THE TRI-UNE GOD.

BY WILLIAM KENT, M. D.

IN order to assist the reader to a more comprehensive and impressive view of the whole subject, I shall refer back to man's creation, that his nature, relations, and obligations may be the more distinctly before the mind; and that the nature, necessity, and importance of regeneration may be the more clearly perceived; thus to place beyond a doubt that it is in perfect harmony with mental and moral science, and with the revealed nature and character of God.

Then said Elohim—*Gods*—"Let *us* make man in our *image* after our *likeness*, Gen. 1. 26. That it was not the style of Eastern monarchs to use the plural for the singular is evident from Gen. xli.15; Dan. ii.3, and vi.26; Ezra i.2, and vi.8. Hence we conclude, without doubt, that *Elohim*, being plural, expresses a plurality in unity of more than two persons; a plurality, afterwards, we believe, definitely revealed as the Father, the Son, and the Holy Spirit: three separate individuals, having distinct personalities, and each equal in every respect to the other; becoming *one* from choice; one in holy affection; one in design; one in counsel; one in *social* enjoyment and executive activities, whose supervision and care embraced alike the tiny insect and the outermost circumference of the universe of created being. One in the sense in which Christ prayed that his disciples might be one; one in the sense in which He and His church are one.

"The *plurality* of *uncreated* persons concerned in man's creation show that he was a new species essentially different from, and superior to, all other kinds on the earth."—"*To make* is *to create*; and to create in this sense cannot be the attribute of a creature; and therefore the plurality of persons must be divine, and man the masterpiece of their united creative labors."

The Creator of man is termed a Spirit; for "the Spirit of God" (Gen. i.1, 2,) is equivalent to "God who is a Spirit," John iv.24. As a Spirit He thinks, reasons, judges, speaks, wills, and acts. The three essential attributes of Spirit are—*will* to choose, *wisdom* to plan, and *power* to execute. These essentials characterized God the Creator in an infinite degree. Hence He is the Eternal, Almighty, All-wise, and All-sufficient Being; the Originator of all *immaterial* substances, as spirit, vitality, air, light, heat, sound, odor, flavor, magnetism, gravitation, &c.; and *material* substances, as earth, water, trees, rocks, organized bodies, &c.; the source of all *substantial forces* as *life-force*, that manifests itself in the selection, appropriation, assimilation, and vitalization of whatever is required to construct, repair, and preserve every bone, muscle, tendon and nerve in the vital organism in its proper condition, and *mind-force*, that directs and controls such organism; and the *fountain* of all life, vegetable, animal, and spiritual; for "without him was not any thing made that hath been made," John i.3.

To this August Infinite Originator of all things, man bore a resemblance; and is related to him as Creator, is under obligation to Him as Benefactor, and accountable to Him as Moral Governor.

"Let us make man in our *image* after our *likeness*, Gen. i. 26. "Image" is a word taken from *sensible* things, and denotes likeness in *outward* form; and here denotes that *appearance* the Divine Being presents to an eye fitted to behold Him. "Likeness" is a more general term, pointing out resemblance in any *quality*, external or internal, and expresses the *union of attributes* which constitute God's spiritual nature. Man resembles his Maker in the essentials of thought, understanding, reason, moral judgment, speech, will, and power, rendering him abundantly capable of *right* thinking, or of knowledge; *right* willing, or of holiness; and *right* acting, or of righteousness.

He "breathed into his nostrils the *breath of lives*, and man becomes a living soul." "Breath of lives" (ne-sha-ma), a term never applied but to God or man. Literally, He *breathed* out or *respired* into his nostrils the *spirit of lives*; and expresses the substantial spiritual element—the immaterial subject of thought and emotion—that bears the Divine image, which was not made, formed, fashioned like the body, but *breathed out* or *respired* into the bodily form of man, by God Himself. "And man became a *living soul*"—more correctly, a *living body*; i. e., the *life force* was already manifesting itself in selecting, appropriating, assimilating, and vitalizing the various elements required to construct, repair, and preserve bone, muscle, tendon, and nerve in the new made organism. The term is applied alike to man and animals. It is the connecting link between the immaterial spirit and the material body, and is essentially connected with feeling, appetite, and thought. This vital principls of animal nature depends for its normal condition on the ceaseless activity and properly oxygenized and electricized state of the blood; indeed it is essential to the continued union of spirit and body, Lev. xvii, 11; Deut. xii, 23, Gen. v, 9. By his body man is related to the earth; by his spirit to the Infinite Creator, and by the vital principle to the animal creation, over which he was appointed ruler as the Vice-regent of the Creator, to whom he was responsible for the proper use of his delegated authority.

Murphy's masterly work on Genesis. "Let *us* make man," strongly expresses a social element in the Divine natures, and is supported by the declaration, "It is not good—i. e., pleasant, delightful, beneficial—"that man should be *alone*, etc." It also expresses some of the first principles of *good society* and true politeness. Evidently man bore this part of his Maker's image. Indeed, life without so-

ciety would be an unmitigated evil to any rational being, be it man or God.

As God is Creator in an infinite and primary sense, so man is in a finite and secondary sense, as the amazing progress he has made in invention and mechanical construction testify. How imperatively necessary, then, that those wonderful and God-given endowments should be employed in his Maker's service! Hence the absolute necessity that man should, in his now fallen condition, be *re-made* as to his moral nature—become a *new creature* in Christ Jesus. LADNER'S LANDING, BRIT. COL.

THE ACTION OF BODIES UNDER THE INFLUENCE OF GRAVITATION.—No. 1.

BY PROF. H. A. MOTT, PHD., LL.D.

Editor of the Scientific Arena:

DEAR SIR:—I am in receipt of the following letter, with a request from you to answer the same:

PHILLIPSTON, MASS., Oct. 12, 1887.

Dr. A. W. Hall:

DEAR SIR:—Suppose a tower 1,029 feet high, situated at the equator. Then suppose a rifle ball to be fired due east in a horizontal direction, at the rate of 17 miles per minute, and another one due west at the same rate, and still another let fall vertically, all three at the same instant.

Now suppose the land to be perfectly level like the surface of a still lake. Which one of the three balls (if either) would reach the ground first, provided there was no resistance to the atmosphere? And how far above the ground would each of the other two balls be when the first one reached the earth?

I wish either yourself or some one else would answer the above questions in THE SCIENTIFIC ARENA. Respectfully yours,

A. D. CLIFFORD.

The Problem contained in the above letter is not difficult to solve, according to modern science, as the main points involved in the same may be found elaborated upon in most works on Physics. It is well known that a projectile may be thrown with such force as to be borne some distance in a straight line without having its direction *sensibly* altered by gravity or the air's resistance, as in the case of a cannon ball. When however, its velocity diminishes, the joint action of these forces causes it to assume a line more or less resembling the curve called the parabola. Naturally, the less the projectile force the sooner does the body deviate from a straight line to a curve.

If a projectile is discharged from a height it will describe the curve referred to, which as stated varies in form according to the velocity originally imparted, the greater the velocity the greater the distance the projectile will pass through; *but up to a certain point (according to the present teachings of science), whatever the distance traversed it will always reach the ground in precisely the same time that it would take to fall to the earth from the height at which it was discharged.*

Now, respecting the problem (if the above statement is correct, and such is the teaching of science,) a ball falling 1,029 feet will require 7·999 seconds to reach the earth $(7·999+)^2 = 63·913$; $63·913 \times 16·1 = 1,029$ feet. And the two balls projected at a velocity of 17 miles per minute, or 1,496 feet per second, one directly east and the other directly west, would reach the ground in 7 999 seconds or the exact time required for the ball to fall 1,029 feet. In this calculation no allowance has been made for the resistance of the air.

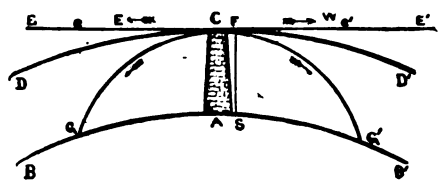
It must be remembered that the two projectiles fired horizontally, one east and the other west, have no further to fall than the height of the tower. It is true they will travel a greater distance; but this is due to the energy imparted to them by the powder. All that gravity has to do is to pull these projectiles down from the horizontal just 1,029 feet. As the earth is supposed to be flat in this proposition, the energy imparted to the projectiles by the powder is manifested by the increased velocity of the same; and according to science, accompanies the projectiles until they strike the ground—that is, assuming no air.

The velocity with which the ball let fall will attain at the instant of striking the earth will be 257·567 feet per second, and the velocity with which the two projectiles would hit the earth, would be 257·567+1,496 feet, or 1753·567 feet per second.

In this problem we have assumed the projectiles to have a velocity of 17 miles a minute; if we should impart to them a velocity of *five miles a second* we would obtain a different result.

By studying the curvature of the earth, we will find that it curves away from a horizontal just 16.1-6th feet in 4.9139 miles.* Now let us apply this deduction. From the top of our tower 1,029 feet in height, we will discharge our projectiles.

Referring to the Illustration: Let A C be a tower 1,029 feet in height, from the top of which two projectiles are fired horizontally, one east and the other west, at a velocity of 17 miles a minute, while one is allowed to drop at the



same instant from the top of the Tower F to the earth S. Again let two projectiles be fired horizontally from the top of the tower one east and one west with a velocity of *five miles* a second.

In the first case, as already elaborated upon, —the two projectiles will, according to modern science, reach the earth at G and G in exactly the same time required for the ball to fall from F to S.

In the second case we have a very different state of affairs, assuming *no air* in all cases. Suppose *e* and *e'* to be points on the lines C E and C E' five miles from C. Now since the projectiles would reach these points in one second, it follows from the law of falling bodies as taught by modern science that they will have dropped 16.0 feet below *e* and *e'*. But we have just seen that the earth itself curves away 16.0 † feet at this distance (4.9139 miles). Hence the projectiles are no nearer the earth than when they were first fired.

During the next second, while the projectiles would go to E and E', they would fall forty-eight feet (48.0 ft.) more, or 64.0 feet in all. But here again the earth has still been rounding off, so the distance D B and D' B' is also 64.0 ft. Hence the projectiles are still no nearer the earth than when they were fired, although they have been dropping away from the line in which they were fired exactly like a fallen body. Moreover, meeting with no resistance, they still go on with undiminished velocity; and, just as they have been falling two seconds, without getting any nearer the earth, so they can get no nearer in the third, nor in the fourth nor any subsequent second; but the earth will constantly curve away as fast as the projectiles can drop. They will therefore pass clear around the earth, and come back to the first point C from which they started in the direction of the arrows without any loss of velocity, (assuming, of course, that they will not collide.) The time of revolution will be about an hour and 24 minutes, and the projectiles will thus keep on revolving round the earth in this space of time. In other words, the projectiles will be satellites of the earth just like the moon, only much nearer and revolving much faster.

Just exactly why Mr. Clifford saw fit to choose a tower of 1,029 feet *in heighth* and a velocity of *exactly* 17 miles a minute for two projectiles going *directly* east and west *at the equator* is not made known in his letter; and for this reason I think it best to consider certain points which may have been in his mind at the time of writing. I refer more particularly to the velocity with which the earth is traveling from west to east and all bodies on the earth.

The diameter of the earth at the equator is about 7,926 miles and the earth revolves about its axis in 23hrs, 56m. 4sec. Hence the earth is traveling with a velocity of about 1,525.8 feet in one second.

Before utilizing this data I would like to refer to the falling of a stone in an elevator when in motion.

Assume an elevator 16.1 feet in height and descending with a velocity of 16.1 feet in one second—(now we know a stone will fall 16.1 feet in one second if held at that height above the ground)—the question is: How long will the stone take in falling from the top of the elevator to the floor when the elevator is *descending* 16.1 feet in one second? or, if the elevator is *ascending* at the same velocity, How long will it take for the stone to fall from the top of the elevator to the floor of the same?

At first thought a person would imagine that it would take more than one second in the case of the descent of the elevator and less than one second in the ascent. But such *is not the case*, as the stone, in the case of the descent of the elevator, starts with a downward momentum equal to the velocity of the elevator; and in the ascent the stone starts with an upward momentum equal to the velocity of the elevator: in consequence of which the stone will fall in precisely the same time in either case as it would if the elevator were standing still.

Now, in the case of a projectile fired directly east from a tower 1,029 feet in height, the projectile has a momentum east equal to the velocity of the earth, which is 1,525.8 feet per second. The projectile fired directly west has also the same momentum east. Hence it might be supposed that the projectile fired west would not travel so far as the one fired east. This, however, is not the case, for while some of the energy of the powder would be utilized in overcoming the normal momentum of the projectile fired directly west, and would tend to prevent it traveling so far, it must not be forgotten that the earth is traveling in an opposite direction at a velocity of 1,525.8 feet per second. which would counterbalance the energy that was neutralized. It follows, therefore, that the two projectiles would not only strike the earth at the same time, but at equal distances from the tower, as the earth is considered flat in the proposition submitted.

In a future paper I will discuss this subject from another standpoint.

Yours respectfully,

Nov. 3, 1887. HENRY A. MOTT, PH.D.

* At New York.

† At the equator; * 16.1-6th feet at New York.

THOUSAND-YEAR-OLD FROGS.

BY D. A. REES

Editor of the Scientific Arena:

IN your March number, I notice an account of a living frog having been *blasted* out of a bed of plaster paris in N. E. Texas. This is no uncommon thing in nature, as frogs, snakes, &c., are in the habit of lying dormant all winter, and coming out quite lively in the spring. More than forty years ago, in the State of Tennessee, I saw a post oak log split open which had a hollow knot in it which had evidently been entirely closed up for 10 or 15 years, out of which fell a very black slick frog, just the color of the inside of the knot, and after a few moments the frog jumped off about as nimbly as any other *tree* frog that had been on the outside world all its life. It is also quite common here in this part of Texas to find frogs, living, imbedded in packed gravel soil and even in solid limestone rocks at a depth of from 6 to 40 feet under the surface of the earth, and after exposure to the air for a few minutes, seem to be as much in their native element as other frogs. Now as to the solution of this frog problem, I have to say that I think those frogs, or the eggs of frogs, have been covered up where they are found say from one to ten thousand years ago,

Continued on page 95.

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

OFFICIAL ORGAN of the SUBSTANTIAL PHILOSOPHY.

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

PASTOR HENRY B. HUDSON, - - Associate Editor.

Whole Series, Vol. 7. New York, November, 1887. No. 6.

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"CHRISTIAN EVOLUTIONISM."

BY THE EDITOR.

THE above is the heading of a paper read before the American Institute of Christian Philosophy in this city last August, and which was recently published in *Christian Thought*. It is from the pen of Prof. Daniel S. Martin, Ph.D., of Poughkeepsie, N. Y., and is regarded by those who have read it as a very strong plea in favor of Theistic Evolution as held by Dr. McCosh, Joseph Cook, and that class of evolutionists.

The argument of Prof. Martin, however, does not enter into the scientific facts of biology or natural history in order to prove the truth of evolution as elaborately discussed by Darwin and Haeckel in their works on the Origin of Species, The Evolution of Man, &c.; he rather takes it for granted that the facts thus massed and demonstrated to exist have sufficiently proved the truth of the theory in its broad sense of the transmutation of species, the lower toward the higher, from the moneron up to man.

Prof. Martin starts out with evolution, to his mind, a proven theory, merely undertaking to show by reason and natural analogy based on admitted facts, that such development of the human race from the lowliest forms of animal life would in no way conflict with the teachings of the Christian Scriptures, nor especially with the account of creation as recorded in the book of Genesis.

It is not our purpose to follow the professor into the details of his Scriptural argument, but rather to examine his reasonings and conclusions based on the analogies of nature and the mechanical operations of intelligent man. This portion of his argument rests chiefly on the admitted facts of geology, palæontology, and the similarity of structure existing between the human and lower organisms.

Now these latter facts, as well as most of those relating to the records of the rocks, are freely admitted by the present writer, and have been abundantly conceded in the last six chapters of the "Problem of Human Life." The only question in the premises, and that which lies practically at the foundation of this entire discussion, is the following: Is it reasonable to believe that the various organic forms living and extinct were the work of creative intelligence by a succession of special acts,—by a separate miraculous interposition for each species,—or have they come into existence by evolution from a single animal species which had its commencement through the miraculous intervention of divine power?

Is it not more likely that God created each new species as it was needed, and as the earth was prepared for its subsistence, than that he made one single animal at the start, concentrating within its organic structure all the powers necessary for its transmutation into the next higher form, thereby giving to that form also power to develop into another a little higher, and so on till this order of transformation had finally culminated in man—the chief object had in view by Creative Wisdom at the start?

Is it probable, in other words, that a Being of infinite wisdom should prefer to anticipate and ordain countless millions of separate organic changes to take place at an equal number of separate and specific periods of time in the earth's future history, each of which would involve the exact equivalent of a miracle (being under special divine supervision) rather than to have performed a small fraction of that many miracles, in the successive creation of each of the different species that might be needed by an outright overt act?

We have shown in our early discussions of this subject that each of the myriad slight physical variations, which Darwin says would be required to constitute any single specific change, must be as much of a miraculous intervention on the part of an infinite and continually supervising Creator, as to have constructed an elephant at a single fiat out of a heap of boulders. And since all these slight variations were wrought at the start in designing the first animal structure and giving to it such enormous transmuting powers, was it not a waste of miraculous acts of creation thus to bunch together millions of such virtual miracles within the structure of a single moneron, when the distribution of only a few thousands, comparatively, of no greater efforts along through the ages as they were needed in the economy of nature, would have served just as good a purpose in stocking our earth?

Now we do not deny, but on the contrary have frequently admitted in our writings, that God could have peopled this earth with its present inhabitants by just such a system of evolution and transmutation as Prof. Martin's paper sets forth, and as held by all theistic evolutionists. We believe that God could not only have caused man to evolve to his present estate from the moneron up through countless forms of crustaceans, molluska, fishes, reptiles, birds, mammals, &c., by miraculous powers and transmuting patterns incorporated within that first "little lump of pure albumen," but we will discount theistic evolutionists by believing that God could easily have given the moneron the requisite miraculous power to transmute itself into a completely developed man at a single transitional change, without requiring him to pass through innumerable forms of lower animals as necessary stages of transmutation before standing erect and speaking with man's voice.

Prof. Martin thinks that such a system of gradual changes from the lowest forms of animal life till finally reaching the crowning work of creative wisdom, man, reflects greater credit on infinite power and intelligence than to have produced man at the time his presence was needed on the earth by a single fiat. We deny this conclusion, and will endeavor to show our reasons for such dissent.

If God's plan of producing upon this earth man as his crowning achievement was really carried on and consummated in the manner described by theistic evolutionists, in millions of transmutational changes, where a single miraculous intervention would have answered every purpose, then we are forced to believe that such evolution was either *necessary* or *not necessary* as a system of divine procedure. If it was *necessary*, then it places a limit upon divine ability to act in a direct method of accomplishing his works of creation, and thus reflects little credit on his infinite wisdom and power.

If on the other hand such a circumlocution of transitional changes were *not necessary*, then it was merely an exhibition of ingenuity, not to say vanity, in thus producing thousands of specific forms through millions of unnecessary organic changes each equivalent to a direct miracle, while such species might so easily have been produced complete by a succession of comparatively few single miraculous fiats as their places on the earth were required to be filled.

The truth is, the whole argument of Prof. Martin goes to show that according to theistic evolution the entire complex system of specific transmutations was designed and ordained at the creation of the first animal form, and as we

have intimated, that the countless millions of specific changes leading to man were so many miracles in design in constructing the first organism, and that this first animal was so miraculously planned as to be capable of transformation into each separate specific form ever to be required in succession in the mighty chain of organic descent by which to reach the estate of man.

This is clearly evident from the Professor's illustrations, employing as he does the ingenious labor-saving machinery produced by man, by which useful and artistic products are turned out through the intelligent powers incorporated into the lifeless machine in the original design of its construction. He then asks, as if he had triumphed over the opposers of evolution, if such commercial and useful products turned out by the machine were not in reality the works of its constructor as much so as if he had produced each of such articles directly by his own hands? We answer, yes, of course; but this is not the question at all.

If Prof. Martin will find a machine invented and constructed by any man which in addition to turning out useful products is capable after running for a time of constructing another and different machine for producing an entirely different class of useful products, then we will concede the semblance of applicability in his illustration; while at the same time we will have recorded the most foolish expenditure of mechanical ingenuity conceivable in thus forcing into the complexity of one single machine the ability to produce another machine when the two separate machines for their own special classes of products would have been so much more easily produced by separate intellectual efforts of their inventor and constructor!

If a man possessed even infinite wisdom, he would never waste his energy in making one machine so complex that it would in the course of years turn out a series of complicated machines each one capable of producing different commodities, when it would have required so small a fraction of mental energy to have constructed the various machines separately, unless such inventor or mechanic were actuated more by a vain desire to exhibit his ingenuity than to accomplish intrinsic good.

We repeat that theistic evolution is only Darwinism, with millions of miracles, instead of one, as Darwin contended, stored up by the Creator in the little lump of albumen, thus qualifying it to become "the primeval parent of all other organisms." The result, as we have shown, is the same in the end, consisting in just so many miraculous interpositions—one for each transmutation—whether performed separately, as needed, or all together at the original establishment of the system.

If each new organic species were virtually the result of a miracle stored up originally in the moneron, what dignity or grandeur does this exhibit over a distribution of these miracles as they are needed along the ages of the earth, thus evincing God's continual presence in nature? This is the chief and only claim for rationality laid by theistic evolutionists over believers in separate miraculous creations, as everywhere plainly and unanswerably taught in the Bible.

With Darwin it was different. He intimates that the first animal was given by the Creator certain powers of variation and development according to environment, and that under the general law of natural selection and survival of the fittest it might chance to vary or be transmuted into one form or another, according to surrounding conditions; and that after this first and only miraculous interference with the normal order of things, He retired from any special care or supervision of the evolutionary work. The result was that by good luck man was finally developed, thus permitting the "*Origin of Species*" to be written.

With Haeckel and his school of evolutionists it is still different. He denies the intervention of a God altogether, or that any intelligent power could have existed as the originator of the system of evolution by which man has finally been developed from the lower order of animals. He believes that the natural laws are eternal and self-existent as unintelligent methods of procedure; that neither life nor mind existed in the universe when this earth had cooled off sufficiently to form an abode for animals, and that by mere chance a certain speck of ocean slime happened to change by spontaneous generation or *archigony* from inorganic matter into a living moneron; that this living creature or one of its descendants by a similar chance environment changed its form slightly, and thus was transmuted into another form of animal life a little higher, and so on, by successive chance variations, under an almost infinite variety of contingencies, till at last man, the great accidental transmutation, from a very refined species of ape made his appearance, thus making it possible to have the whole natural process set forth in the "*History of Creation*" and the "*Evolution of Man*," by Ernst Haeckel.

If our readers are bent on accepting evolution rather than the Bible account of creation, we give them their choice of the three systems as set forth above and as now advocated by three respectable classes of scientific thinkers.

For ourself and the ARENA we deny all systems of evolution in the sense of physical and anatomical transmutations, as wholly unreasonable when compared to the true theistic doctrine of direct miraculous creations for each of the different animal species. This, we believe, we are able to prove in opposition to all schools of evolution, and we do not consider it boasting when we assert that no attempt at reply to our original arguments on that subject has ever been made, while thousands of careful thinkers regard any successful answer to those arguments as wholly impossible.

Prof. Martin, as stated, dwells lengthily and learnedly upon the evidence of "analogy," in favor of the doctrine of theistic evolution, comparing the supposed working of the system of innumerable transmutations without special miracles to the performance of the mechanic and the inventor in accomplishing the most wonderful results through the operations of complex machinery. We deny this analogical argument in toto; and will show that all true analogy is directly against the doctrine of evolution. But it is only fair to let Prof. Martin present this analogical reasoning in his own way, as it is really the only argument he presents worthy of a critical answer:

"Having sought thus to point out the theistic basis on which science must ultimately rest, I turn briefly to the question between Evolution and Special Creation.

"The illustration has already been adduced, of a complicated system of machinery, acting with such regularity and precision as almost to seem self-directing; and I have urged that the unseen human intelligence that planned its construction and that guides its entire working, is clearly recognized by every beholder. This example has been employed against the agnostic and the materialist. *I propose now to turn it against the opponent of evolution.* Will any man in his senses attempt to say that the products of that machinery are not the work of its constructor, because he has not actually shaped them with his hands? Is it not the characteristic, and the boast, of our modern civilization, that through machinery we are substituting mind-work for hand-work; and that this is a far higher stage and form of human activity,—a triumph of mind over matter? The point seems too plain to need argument. We say that St. Paul's Cathedral was built by Sir Christopher Wren. Does any one, save a child or a simpleton, imagine from this statement, that Sir Christopher Wren cut and carried all the stones, and laid the mortar, and performed with his own hands the thousand tasks of that mighty work? The triumphs of modern machinery are marvelous; and yet we can conceive of their vast extension. In a great manufactory, with its countless details of self-adjustment, or one of our wonderful ocean steamers, that speeds like a living creature across the deep, there are yet many occasions for the direct intervention of human agency, to modify the processes of production, or to meet the emergencies of sea and storm. But we can imagine even far greater advances in self-adjusting and self-modifying features. Invention and adaptaion have gone so far, that we may well conceive of their going farther still. I am not speaking of what may be actually realized, but merely illustrating for the sake of argument. By various discoveries and improvements in the applications of electricity, photography, etc., it is conceivable that a factory might be made to change its products according to the market, the season, or the fashion; or that steamers might have complex and delicate systems of signals, that should so act on the engines and modify their movements, that vessels should steer clear of one another in the darkest night or the densest fog, or bear away in safety from the unseen shore. We can imagine such adjustments carried so far, that the ship might be started on her voyage, and cross the ocean or sail round the globe, without a human being on board. Such a vessel might seem like a mere automaton, or be fancied by savages to be herself a living creature. Yet how far would such ideas be from the truth! In and before and above all conceivable adjustments, would be ever the master mind of the constructor; and the vessel would be simply the marvelous concrete expression of a plan and a purpose that could design and foresee and adapt for a thousand emergencies yet to arise. Now, which would give the grander conception of human capacity and achievement—such a vessel as I have thus imagined, or an old-fashioned sailing-ship, in which every rope must be pulled, and every sail hoisted, and every emergency met, by the visible labor of human hands on every separate occasion? No one will hesitate to answer. But when the same ideas are applied to the universe, how is it that they are met with objection? When the world of matter and life is regarded as a great connected system, bound together in orderly progress by a mighty interplay of laws and forces, through successive ages and stages of time and being—this view is deemed inconsistent with the recognition of its Divine origin and oversight. How strangely do the unbeliever and the religionist co-operate in these subjects, by a like inconsistency with ordinary reasoning and experience!"

Now, vividly as the Professor has drawn on his imagination to illustrate the working of a universal system of transmutation without miracles, by the possible invention of machinery that will change its products or its methods of operation under its original design and construction, we assert that every fact and

phase of this mechanical analogy is directly against the theistic theory of evolution. Let us take a simple illustration.

Should Prof. Martin chance to find in the buildings of a certain deserted island, various machines of complex construction used for different products, but arranged in rows and connected by gear and belting, would he for one moment suspect that these different machines were not the results of different inventive efforts, and constructed by the inventor and designer at different times? Could he from any principle of ratiosination work himself to believe that the inventor by any possibility had made the first machine under this line of shafting by a distinct inventive and constructive effort, and that in addition to so arranging its parts as to cause it to turn out its own special class of products, he had also incorporated into its mechanical powers, the ability to construct the machine next to it for turning out an entirely different kind of product; that this second machine thus made, had likewise incorporated into its design from the previous machine the power to make the next, producing still a different article of commerce, and so on through the entire row? No person "save a child or a simpleton" could even imagine such mechanical results possible. Thus the analogies growing out of the most ingenious efforts of human mechanics are directly opposed to theistic evolution.

Besides all this, when the first machine should reach the period in its working, according to the original design of its inventor, to produce the machine next to it as a transmutation of mechanism, would not the construction of this second species of machinery be as much of an inventive miracle on the part of its designer at the time of its occurrence, as if the inventor had personally then and there constructed it with his own hands? The professor will understand the force of this inquiry. How, then, do theistic evolutionists better their special pleading in favor of a less number of miracles without denying God's immanence in the natural order of things, and without relegating the whole evolutionary process to fortuitous causes on the principles of so-called atheistical science?

Prof. Martin, as it will be observed, is careful to speak of the "*products* of that machinery" as the work of the designer and constructor, as much as if he had produced them with his own naked hands. No one will dispute this fact; nor would any one dispute the fact that the honey was as much the work of God as is the bee, which was made capable of producing it. But we insist that this question of mere "product" is a palpable evasion of the point at issue.

We ask the professor if a certain machine constructed for producing a certain definite product, could by any mechanical possibility be made to turn out another and distinctly different kind of machine, capable of producing another product distinctly different? Such a result would simply be the *transmutation* of machinery from that manufactured by the first. But no mechanic by any possible stretch of ingenuity can incorporate the principle of transmutation into his inventions; that is, make a machine for producing one class of useful articles, which after running for a season can turn out a different machine for producing an entirely different class of useful articles.

We might, by a stretch of the imagination, conceive of mechanical *reproduction*; that is, of one machine being so ingeniously constructed as to turn out a similar machine, and both of them for the production of precisely similar useful articles of commerce, just as the great Mechanician of nature has formed living machines in the animal kingdom, capable of reproducing similar machines by the process of natural generation; but in all cases such machines are for turning out exactly similar kinds of products.

Animals in their physical organs and functions, the professor should remember, are but living machines of a highly complex nature, the very climax of whose ingenuity of construction consists in *reproduction*; that is to say, in the making of similar machines for turning out only similar products. But no transmutation is anywhere conceivable either in nature or mechanics. Would Prof. Martin, therefore, in looking at these connected machines on the island just referred to, see anything in the analogy of their relationship the one with the other favorable to the doctrine of theistic evolution, in the sense of transmutation?

Then, because these various machines happened to have a family resemblance in the arrangement of their parts, such as gear-wheels, levers, screws, cams, pinions, nippers, tapes, cutters, punches, &c., would the professor by any logical effort of his mind draw the inference that all these different machines must have developed by transmutation the one from the other, and without special acts of creation? Would he not rather as a scientific thinker, infer that they were all probably designed and constructed by the same inventive mechanic, the idiosyncrasy of whose mental habits had led him to follow nearly the same general design?

Again, would our theistic evolutionist, on examining the products of these various machines as they had fallen into the different receptacles and finding among them pins, tacks, brads, screws, nails, spikes, bolts, rivets, &c., jump to the conclusion that the machines must certainly have evolved one from another without special acts of invention, since it would be impossible to account for the fact of all these various products having heads and points unless these machines had been transmuted the one from the other?

Thus every fact connected with the mechanical operations of the human inventor and designer, instead of being an analogy favoring theistic evolution in the sense of transmutation, is directly opposed to it.

It matters not how much an inventor is capable of making a single machine perform in the way of producing any given commodity for the market, no inventor, even if he possessed the ability to do so, would think of so designing one machine as to make it capable of automatically constructing another machine for producing a commodity entirely different from the first. Why? Manifestly because it would be simpler and easier to design and construct each machine separately. So it would seem to have been for the Creator, judging by "analogy;" the very principle on which Prof. Martin bases his argument.

We do not deny evolution in its true and legitimate sense—in the sense of unfoldment, growth, development, &c. These various machines in our illustration, as well as their products and their methods of producing them, were *evolutions* from the intellect of that inventor, each one no doubt being a gradual unfoldment from the design of the one preceding it. Hence we have a rational explanation of their family resemblance. Would not this be a far more consistent solution of the similarity observed in the anatomy of the different vertebrated animals, thus regarding it as an evolution from design in the mind of God, thereby giving to them a family resemblance, rather than to suppose, as do evolutionists, that one of these living machines had been produced by the machine nearest to it in its design of construction? (See "Problem of Human Life," Chapter x., page 481.)

The truth is, so-called "Christian Evolutionism," whether intended or not, is virtual Christian skepticism of the worst kind, since it is the best calculated to mislead those already inclined to be skeptical, by throwing doubt and disparagement upon the plainly recorded miracles of the Bible. Is a man who will use all his ingenuity to fritter away the explicitly recorded miracles of Genesis in that plain account of the creation of men and animals, likely to prove a wholesome religious guide in his expositions of the scores of recorded miracles of the New Testament? Rather, is not a man who can formulate his best intellectual endeavors in set papers for a journal of Christian thought, for the object of proving that no miracles were necessary in the production of the human race, and that man was a natural development from the monkey;—is not such a man himself most likely to be skeptical at heart as to the truth of all miracles, whether recorded in the Old Testament or in the New? We pause for a reply.

PROPERTIES OF MATTER.

BY THE EDITOR.

Nothing in the entire realm of science and philosophy presents to the investigating mind such profound problems for solution as the strangely varying properties of matter, with which we are constantly brought into contact. Yet so common are these properties, and so familiar has every one become with them, as they manifest themselves in our every-day contact with the material world, that they pass entirely unobserved by the average thinker until attention happens to be called to them.

Take for example the well-known properties of hardness, softness, transparency, opacity, brilliancy, roughness, smoothness, compressibility, impenetrability, elasticity, fusibility, porosity, density, weight, extension, inertia, form, color, combustibility, ductility, brittleness, malleability, stiffness, flexibility, &c., and how little does the average mind ever stop to analyze them as the basis of our various mental concepts! Without these properties of matter human consciousness would be totally shut out from all relationship to the external or material world, and every physical law would be wiped out of existence. Yet not one of the properties named can be regarded as a form of natural force, or in a direct sense as a phe-

nomena producing cause. Hence, no property of matter can be regarded as a substantial entity, but merely as a relation or condition of material substance resulting from the action of one or more of the substantial forces of nature.

For example, hardness or softness in a material body, though only a condition of matter and not an entity in any sense, is caused entirely by the action of cohesive force in the manner in which it has arranged, and now holds, the material substance in contact with itself. This peculiar form of physical force has almost innumerable methods and processes of placing a given material substance together, by which a single substance may possess almost innumerable physical phases of sensible condition called *properties*.

As an illustration, a piece of glass may have form, color, weight, inertia, extension, hardness, brittleness, transparency, porosity, elasticity, fusibility, density, stiffness, flexibility, impenetrability, brilliancy, roughness, smoothness, and all of these be the direct result of the substantial force of cohesion in its multiform methods of arranging the infinitesimal portions of the substance of glass in their various relations to each other.

To say that all these distinct and highly varied properties or conditions of one particular material substance could have resulted without orderly and systematic arrangement by a real substantial cause and a real intelligence back of that cause, would be to affirm a result impossible to conceive under the circumstances. Indeed, a result so complex and involving so many and diverse properties of one single substance, each capable of forming the basis of a separate mental concept, can only be predicated of a substantial force with powers of action given to it and circumscribed in their operation by an Intelligence capable of the most intricate ability to design and execute.

No man can look at a piece of glass with the intellect of a true physical philosopher, without believing in the existence of a personal Intelligence above nature, any more than he can look at the same piece of glass and intelligently account for the multiform properties named without recognizing the presence and working of the regnant force of cohesion as their immediate cause. To deny the existence of a Supreme Intelligence above nature—by which its laws have been ordained and its forces have received delegated powers to act on matter equal with the denial of the existence of the forces themselves, is to stultify one's intellect and place one's self upon the level of the irrational brute.

Substantialism was the first formulated scientific attempt to cast the faintest philosophical gleam of light upon the true cause of the infinitely diversified properties of matter, as well as the first even to suggest the true nature of such varied material conditions and characterists, or to point out any rational distinction between these properties of matter and the physical forces which produce them.

Previous to the genesis of Substantialism, elasticity, for example, was indiscriminately discussed and treated of as a property of matter or as a force of nature, as the case best suited the purpose of the investigator, just as motion had been variously regarded both as a force and as its mechanical effect. At the advent of Substantialism this scientific confusion ceased, so far at least as the new philosophy could come into recognition among scientific thinkers.

It was this philosophy which recorded the first hint that elasticity, instead of being a force, was the peculiar arrangement of a given material substance by the force of cohesion through which any distorting mechanical force could store itself up in said body as a substantial but immaterial entity till, by its reaction, the elastic body, on account of this same stored-up energy, was again *forced* back to its original form.

A bent spring, for example, does not come back of itself, nor does it come back by the so-called force of elasticity; but is *driven* back to its previous shape by means of the substantial mechanical force which originally bent it, simply by this original force taking advantage of the property called elasticity, which property was due entirely to the peculiar manner in which the substantial force of cohesion had arranged and adjusted the substance of the spring in relation to itself.

An excellent contributor and one of the profoundest thinkers of the age—the Rev. Dr. Crawford—suggests that instead of the mechanical force which bends the spring having been stored up in it by which to restore it to its former position, might not the cohesive force itself cause this restoration when the outside resistance is removed? We answer yes, if we give to cohesion both the work of holding substances together, and the mechanical power of displacing bodies in mass. But Substantialism has preferred to keep the official work of the forces separate, limiting each to its special sphere of operation. Hence, as it took mechanical force in its dynamic character to bend the spring in opposition to the force of cohesion, it has concluded that it is simply this same dynamic force stored up through the property of elasticity which bodily returns the spring to its original shape.

All former science, failing of such rational solution of observed elastic effects, innocently made the elasticity itself the force by which, through some unaccountable play of the bombarding molecules of the spring and of the co-operation of an inter-molecular ether, the distorted body regained its original shape. Which theory of physical philosophy, we ask the brainy student of science, best corresponds with the simple, orderly, and harmonious system of nature as viewed in the light of common sense?

This revolutionary view of the office of cohesive force, as the direct or immediate cause of all the observed properties of matter, with their hitherto incomprehensible nature and character, well justified designating *cohesion* as the regnant natural force in the physical universe, and that force, *par excellence*, upon which and in co-operation with which the peculiar operations of all the other physical forces depend. The distinction thus marked out in favor of cohesion as the governing force in the physical realm, was also first intimated in the Substantial Philosophy, where its imperial position among the forces was variously illustrated in the solution of physical problems, for which science hitherto has never furnished, or even attempted to furnish an explanation. (See *Microcosm* Vol. IV. p. 88,—"The Immaterial is the Real"; and Vol. V, page 314,—"Energy, force, motion, property," &c.

Although cohesive force may justly be ranked as the governing force in the realm of physics being, as it is, the chief force upon which all the properties of matter depend, still the fact should be kept distinctly before the mind of the student that cohesive force, though permitted to occupy the throne, is by no means allowed to usurp the powers of an arbitrary despot, and thus exercise unlimited sway over all the other forces of nature. Cohesion is subject even in its strongest holds to the influence and oftentimes to the control of other forms of natural force, particularly that of *heat*, and in this subjection, in the orderly system of nature, the various properties of matter to a large extent are also involved.

Take the piece of glass before referred to, and by mechanical force pulverize it to an impalpable powder, by which a large portion of the regnant force of cohesion is dissipated and driven off into heat or directly back to the force-element of nature, and it will be found that nearly every property it before had as glass is destroyed. Its transparency, its brilliancy, its hardness, its elasticity, its color, its form, &c., are destroyed, or in other words totally annihilated, a fact which cannot be asserted of *force per se*, or any other entity. But subject this pulverulent mass to heat till fusion is superinduced, and cohesive force which had been partly robbed of its power, is returned to its throne, where again, by the withdrawal of the usurping force of heat, all the properties which before existed in that material body are re-established as the effects of the renewed reign of cohesion.

But should we extend the usurpation of heat-force beyond the limit of fusion, or till the material body is converted into gas, cohesive force is again curtailed of its power in another way and to a much greater degree, while other properties of this original form of matter are entirely destroyed and new ones take their place.

No mysteries in nature are more profound or bewildering than those pertaining to the changing relation of the properties of matter as manifested under the varying action of the physical forces, either singly or in combination with each other. Numerous illustrations of this statement can be furnished particularly in the effects of heat on different material bodies.

Heat force is the most powerful competitor in nature of the reigning force of cohesion, and in combination with it produces the most unaccountable changes. It has such strange control over the force of cohesion that oftentimes by entering a given body and leaving it, the status of cohesion depends upon the velocity alone with which the force of heat makes its exit.

For example, if we heat a piece of steel to redness and allow the heat to depart slowly, cohesive force will take advantage of this tardy egress of its competitor to arrange the metallic substance in such relation to itself as to give the steel the property of both *softness* and *toughness*. But allow this heat force to depart suddenly, as by dipping the steel into ice-cold water, and cohesive force is compelled to act quickly and arranges the particles of the metal in such relation as to produce the exactly opposite properties of *hardness* and *brittleness*.

Thus one class of properties are entirely destroyed and another class exactly the opposite

created by the velocity alone with which heat leaves a given body.

Why is this so? and what sort of solution can the molecular theory of science offer? a theory which does not recognize the forces of nature as substantial entities, but merely as the motions of bombarding molecules! Surely the so-called molecules can be no nearer together when the steel is hard than when it is soft, since the bar is of exactly the same size; yet in the latter condition it is many times more easily compressed or distorted than in the former!

Is it asserted in desperate defence of the molecular theory that the sudden departure of the heat from the steel gives a new impetus to the flying molecules, causing them to strike each other oftener and with greater force, thus causing the observed properties of hardness, brittleness, and incompressibility? Then why is it that a piece of *copper*, heated in like manner, and suddenly immersed into cold water, thus in like manner instantly expelling the heat, becomes *softer* than before instead of *harder?*

Plainly the molecular theory of material bodies, with its inter-atomic bombardment of the still smaller molecules of material ether, explains absolutely nothing of the mysterious problems everywhere cropping to the surface of material nature.

Nothing but the correlation, co-operation, inter-action, and inter-convertibility of the forces of nature as substantial entities can offer a shadow of solution of the material changes and mysteries everywhere met with in physical research. And let us assure the thoughtful and unprejudiced reader, as we have often done before, that no system of philosophical reasoning save that of Substantialism sheds the faintest ray of light upon these various classes of problems by which even a partially satisfactory solution can be reached. We therefore ask every reader to compare candidly the claims of the Substantial Philosophy with the present prevailing theories of science, and then decide upon their merits.

THE "HYDROSTATIC PARADOX" AND THE "LOCUST."

BY PROF. S. P. GREY, A. M.

A Wilford Hall,

DEAR SIR: After carefully reading your "Problem of Human Life," and many subsequent articles in the "*Microcosm* and "ARENA," pardon me for asking you to reconcile a few thoughts, which, to me, seem to conflict. I refer to the "locust argument," page 130, (Prob. Human Life) where and for many pages thereafter you show how the stridulations of this insect produce as pressure 5,000,000,000 tons on the four cubic miles of atmosphere adjacent to it. Now, Tyndall and others frequently refer to the analogy between "sound waves" in the air and the waves, produced by a disturbance in the water, which analogy you admit in the same discussion with the exception that your waves in either case may be soundless waves.

Now, accepting this hypothesis, that the mechanical relation of atoms in air and water are analogous, it follows that they might act or be acted upon in a similar manner proportionate to their density. This in fact is admitted by yourself and others, whose views are diverse on many other, and we think contingent issues.

Now, in your "ARENA" for last November I read with pleasure the solution of the "Hydraulic Paradox." I believe that to be the only rational solution that can be given. But that very solution leads me to ask, if the resultant force of (1) one pound would be equal to 1,000 or 1,000,000 pounds when distributed in water, why would not the same take place if applied to air? If I drop a pebble weighing one ounce into a tank containing 10,000 gallons of water I see a surface displacement of many times one ounce of water and infer that the same thing goes on at every possible interval until the pebble reaches the bottom of the tank, when every particle of water although weighing 100,000 *pounds* has been moved by a pebble weighing but *one ounce*, as is evidenced by the permanent elevation of surface. Now, if *one ounce* can exert a force of 1,600,000 ounces in water, why should not the force of an insect move sensibly many times its weight of air, the mechanical relations of the atoms being many times more subtle? May not sound be a change of condition rather than a movement or a substance?

SHELBYVILLE, TENN.

REMARKS BY THE EDITOR.

Prof. Grey has presented a plausible criticism against the substantial theory and in favor of the wave-theory of sound, and to the superficial investigator it would seem to be a serious objection to Substantialism. But when the mechanical phases of the problems are properly untangled no difficulty at all presents itself. Let us try to make everything clear to the Professor as well as to the reader.

In the first place, we are obliged to stand firmly upon the unquestionable ground of the solution of the "hydrostatic paradox," which the reader should examine before trying to grasp the full force of this argument. (See ARENA, Vol. 1, Page 89.)

According to that principle of mechanics, an ounce pressure applied to one inch of the surface of the water of a closed tank would cause an ounce of actual pressure on every inch, not only of the inner walls of this tank but on the surface of every body immersed in this tank if it were a million sheets of metal, so separated that the water could circulate between them.

Thus a single ounce of pressure might be repeated millions of times in actual pressure under the conditions named. For example, a locust weighing one grain lighting on a frictionless piston of one inch area entering such a tank, would produce a pressure of one grain on every superficial inch of everything inside the water or touched by it, even if this pressure in the aggregate should amount to millions of tons.

Take the illustration used in our solution of the "Hydrostatic Paradox." Let a million sheets of paper be piled one upon another, and let this locust light on the top of the pile, and by every principle of mechanics it will produce a pressure of one grain by action and reaction—down and up—on each side of each and every sheet of paper in the pile.

This is on the assumption, of course, that no motion or mechanical work is required to be done. Remember that there is neither motion nor mechanical work in simple pressure. But let a pressure of one pound on a frictionless inch-piston entering a tank, as supposed, move that piston one inch inwardly against the water, and here is mechanical work accomplished. Now if the surface of that tank were supplied with a million similar pistons, they would all be moved outwardly by the mechanical force exerted in the motion of the first piston, but each of the million pistons would be moved only the millionth of an inch by the leverage of the hydrostatic wedge-system as we have shown.

If a locust should exert one grain of mechanical force against a body capable of displacement one inch by that amount of energy, it is plain that the insect could produce that inch of mechanical motion, and thus do that much mechanical work representing one grain of energy through a distance of one inch. If this body to be moved by the locust were increased a million fold in resistance, the same locust could move it one millionth of an inch if its mechanical force could be exerted upon it through a frictionless system of levers or equivalent wedges, on the principle of hydrostatic pressure as explained in our solution.

We have now reached the true mechanical problem involved in the present theory of acoustics. The wave-theory of sound is a purely *mechanical* theory, and involves the performance of a definite amount of *mechanical work* in the condensation and rarefaction of the air permeated by the sound, in which mere *pressure* can take no part.

Fortunately for Substantialism, the mechanical work the locust is actually required to perform is definitely stated in the formulated theory as so many pounds of mechanical motion or condensation produced on a given quantity of air (4 cubic miles) permeated by the sound of the insect, in which every cubic inch of that mass of air is required to be compressed "$_{6}\frac{1}{5}$" of its volume in order to generate the heat necessary, according to the Newton and Laplace formula, to add $\frac{1}{5}$ to the velocity of sound, and which this generated heat caused by the compression of the air-waves can alone produce.

This formula of Newton and Laplace, as every physicist admits, is essential to the very existence of the wave-theory, and this $_{6}\frac{1}{5}$ alternate reduction and expansion of the volume of the air by the condensations and rarefactions of the sound-waves, has been mathematically worked out by Prof. Mayer of Stevens Institute, as the mechanical work which every sounding instrument, including the locust, has to perform in making itself heard throughout a given distance.

With these data the work is as simple as A B C in demonstrating that this locust, in thus compressing the four cubic miles of air permeated by its sound $_{6}\frac{1}{5}$ of its volume, by which to get the heat necessary for the formula of Newton and Laplace, must produce a mechanical squeezing pressure upon this mass of air of more than 5,000,000,000 tons, or more than the mechanical force of a million locomotives.

We need not go over these calculations and proofs here. They have frequently been given in our writings, and no professor has ever attempted to reply to them. Let Prof. Grey try his hand if he shall think them vulnerable to attack.

His reference to a pebble displacing a large surface of water by its ounce of weight, is all a mistake which so shrewd a thinker ought not to have perpetrated. The ounce pebble only displaces an ounce of water. Gravity, an ever ready and exhaustless mechanical force, takes up that displaced water where the pebble leaves it, and, in pulling it down to create a level, displaces other water next to it, and so on till the entire surface of a lake may be dis-

turbed; but it is all the work of gravity after the first ounce of mechanical energy is exerted by the pebble, which also in reality was the work of gravity. The truth is, this locust has long ago kicked the life out of the wave-theory of sound, and it is about time that Professors of science should recognize it.

PUBLISHERS AND PUBLICATIONS.

[We purpose to make The Scientific Arena valuable to the fraternity of Publishers as an intermediate between themselves and our extensive constituency of intelligent subscribers. Few mediums have a larger list of professional men—Presidents of colleges, professors, teachers, clergymen, physicians, engineers, lawyers, students, etc. We may point with pardonable pride to this fact; and a reference to the subjects treated in our columns, and the list of distinguished writers, will confirm our claim for the broad field occupied by the Arena—"Scientific, Philosophical, Religious."]

THE STEAM ENGINE. By Prof. Wm. Dennis Marks, of the University of Pennsylvania. Third edition; 295 pages 1887. Price $3.00. J. B. Lippincott Company, Philadelphia.

Numerous works on mechanics and on the steam engine have been published from time to time, but none have undertaken to give in a simple and practical form, rules and formulæ for the determination of the relative proportions of the component parts of the steam engine. It has been the object of the author to fill this want and the result is the present work which now appears in its third revised and enlarged edition. The present edition of this most valuable work contains a chapter concerning the limitations of the expansion of steam. The condensation of steam by the walls of the steam-cylinder is a fact whose existence has been repeatedly proved by many distinguished experimenters. The method adopted by the author is new and original and of the utmost value to engineers. It has shown that the wide differences in experimental results of tests of different types and sizes of engines are not irreconcilable, and that the builder of small engines of the non-condensing type is quite as right in adopting four expansions as the builder of enormous marine engines of the compound type is in adopting expansion of ten or more volumes. The work contains a rational and practical discussion of the dimensions of every detail of the steam engines. Engineers and students should be greatly indebted to the author for his masterly production. Every other page of the work is left blank, so that additional notes and formulæ may be introduced, which greatly increases the value of the work. M.

ANALYTICAL MECHANICS. By Wm. G. Peck, Ph.D., L.L.D. 319 Pages. Price $1.60.—A. S. Barnes & Company: N. Y. and Chicago.

It seems hardly necessary to more than mention the fact that this work is by Peck. Few mathematicians are so competent to write on mechanics as Prof. Peck. His style is concise, clear, and thorough. In the present work the methods of Differential and Integral Calculus have been freely used, but not to the exclusion of the more elementary processes of analysis.

The volume embraces all the principles of analytical mechanics that are needed by the student of Engineering, Architecture, and Geodesy. Goupillière's elegant method of treating the resistance of friction has been fully illustrated in the processes of finding the moduli of the elements of mechanism.

It would be incorrect in The Scientific Arena, which is the organ of the Substantial Philosophy, to fail to take exceptions to such definitions as are used in any work reviewed provided they are inconsistent with the new Philosophy.

Prof. Peck gives as a definition of a body, the following: "A body is a collection of material particles." This definition is correct so far as it refers to a compound body, but Substantialism teaches that an elementary body *is but one material particle*, homogeneous throughout, except as possessed of imperfections or porosity. Force, according to Substantialism, is entity; an objective thing, and not as Prof. P. G. Tait has defined it, as "the rate of change of momentum," defining also momentum as the time-integral of force.

Prof. Tait further says that "whatever force may be, there is no such thing as centrifugal force; and accelerating force is not a physical idea at all." We are glad that Prof. Peck has not attempted to found his work on any such erroneous statements.

Tait gives to Energy objective existence in as true a sense as to matter, while the Substantialist states that Energy is the power, ability or capacity of the objective entity force when acting through matter to do work; Force being the Entity, not Energy, which is the capacity of the entity. Tyndall states that "Heat, its essence and quidity, is motion and nothing else." Tait says that "heat is not the mere motions, but the energy of these motions;" while the Substantialist says *Heat* is an Entity and Objective thing; *Motion* is but position in space changing. It is a phenomenon due to the application of entitative force to a body; withdraw the force and motion ceases—motion being no more of an entity than shadow, and can do nothing in Physics. If motion can do nothing, a *mode* or *phase* of motion can do no more. The momentum of a body is due to stored up entitative Force it possesses. A cannon ball when discharged has stored up in it entitative force, which is gradually utilized or overcome. As "mechanics is the science that treats of the action of forces on bodies," it is quite proper for the student to understand at the start, that Force is the Immaterial Entity, and that a body or matter is the material entity; Matter and Force being the two great entities of the universe. M.

PROGRESSION: Or the Genesis of the Natural and Spiritual World. By Wm. M. Goggin. Publisher: Albert B. Tavel, Nashville, Tenn. Pages, 475. Price $1.50.

The author explains that he wrote this book for his own edification, and that he adopted a theory of interpretation of the divine economy revealed in the Bible, that many of the difficulties which have caused such diversity of opinions will be so far removed as to bring the different sects of Christianity to a greater unity of faith and practice, as well as tend to destroy or greatly lessen grounds, for scepticism. The theory which he adopts for the interpretation of the Holy Bible and of unfolding its mysteries, consists of a division of the attributes of God into classes: The first, that class which God has made manifest to the perceptive sense of finite beings, in his natural attributes, through the exercise of which he has created the natural world by the operation of natural laws derived from his natural attributes. The second and superior class, is his moral attributes, through the exercise of which he creates the spiritual world, or carries forward the natural world into a state of spiritual being, through the force of moral laws, which were derived from his moral attributes.

The author commences the first chapter by saying, "Nothing can be but nothing;" and asks the question, "Have we any grounds in revealed truth to conclude that God created the heaven and the earth out of nothing?" and after discussing this point states: "We must conclude that God created the visible universe out of his own spiritual and invisible essence, so that in the visible universe we behold the glory of the invisible attributes of the spiritual God."

The author is certainly correct in his statement, "Nothing can be but nothing." It would be just as impossible for the Infinite One to make something out of nothing as it would for Him to make another Infinite God.

Substantialism is very clear on this point, and simply claims as true what we are taught in the Holy Writ—that God is Infinite, and therefore must fill the whole universe. The visible and tangible part of the universe having been framed out of the invisible and intangible. The material substance having been made out of the immaterial substance of the Infinite which pervades the universe.

In this work is discussed the pre-Adamite man; Adam in his natural state before his spiritual creation, and Adam in his spiritual state after his spiritual creation; the dual life of Adam; the plurality of Adam in the unity of one person; regeneration of all nature.

The author endeavors to show a perfect system of development and unfolding of the divine economy under different dispensations, from the beginning of creation in the angelic world, to the end of time, taking in its course the career of Adam in two different and distinct periods of existence; tracing the various and intricate steps of the priesthood, by inheritance, without a broken link in the chain, from Adam to Christ.

Speaking of the Origin of Evil, the author disputes the idea entertained by many theologians that the evil spirit is uncreated, self existent and eternal; antagonistic to, and eternally at war with God. He says: "This idea of the origin of evil, and the eternal self-existence of the evil spirit, backed by hosts of self-existent evil spirits—little sub-devils—called the devil's angels, making war upon the dominions of God, is erroneous and is not sustained, either by the word of revelation or by the philosophy of the divine economy."

In presenting his views in this work, the author says:—

"I am aware that I must give expression to opinions that are at variance with the views of many sects, if not with all the Christian world, which may be regarded as equally erroneous."

"Evil," says the author, "is not a created thing, but is a state or condition of pain and suffering, resulting from moral wrong, done by the being created, having first been created pure and holy, and free from pain and suffering." "God did not create evil nor make the devil; neither are they self-existent and eternal." "Lucifer became the originator of evil, and the supreme ruler in its kingdom, by changing an evil *thought* into an evil *act*."

Respecting the destruction of the wicked and unbelieving by unquenchable fire, as mentioned in the Bible, the author holds that this unquenchable fire means total extinction of life and personal identity; a real extermination of soul and body. He holds that future reward consists in preservation of personal identity of individual being and eternal happiness in the presence of God; but the wicked shall not be enabled to preserve this identity, and as a matter of course, consequent annihilation would result.

The book is well written, and shows considerable thought and originality, but we are inclined to agree with the author that he has expressed many opinions greatly at variance with such as are entertained by the Christian public.

The author makes a few *misstatements*. For example, he says: "The atheist says there is no God." While we have very little in common with the atheist, still we think his position should not be misrepresented.* Mr. Bradlaugh says: "The atheist does not say, 'There is no God'; but he says, I know not what you mean by God; I am without idea of God; the word 'God' is to me a sound conveying no clear or distinct affirmation. I do not deny God, because I cannot deny that of which I have no conception, and the conception of which by its affirmer is so imperfect that he is unable to define it to me." And Thomas Cooper has said:

"I do not say—there is no God; but this I say—I know not."

Before publishing a second edition of the book it would be well to have numerous typographical errors corrected. M.

"Ten Years of Song," published by D. Lothrop & Co., Boston, is characterized by "The Literary World" as "a select sheaf of poetry which is to be reckoned among the better fruit-

* Our reviewer seems inadvertently to have confounded the terms "Agnostic" and "Atheist." Webster defines an atheist "as one who *disbelieves the existence of a God;*" and the Agnostic is designated as "one who professes to know nothing in regard to the being of a God," &c. Agnosticism confesses its "inability to affirm or deny in regard to God." (*Publisher Arena*).

age of our minor writers in verse." The author, Rev. Dr. Horatio Nelson Powers (now rector of the Episcopal Church at Sparkill, N. Y.), has given the public much in prose and poetry of very acceptable quality. The little volume herein referred to contains some real gems. It will make an appropriate holiday gift.

BOOKS RECEIVED.

We have received, too late for review in this issue of The Scientific Arena, the following:

"Pathfinder Physiology," No. 1. Child's Health Primer for Primary Classes, with Special References to the Effects of Alcoholic Drinks, Stimulants, and Narcotics upon the Human System. A. S. Barnes & Co., New York and Chicago.

"Pathfinder," No. 2. Hygiene for Young People; Adapted to Intermediate Classes and Common Schools. A. S. Barnes & Co., New York and Chicago.

"Steele's Sciences:" Hygienic Physiology; with Special Reference to the Use of Alcoholic Drinks and Narcotics. Revised edition. A. S. Barnes & Co., New York and Chicago.

"Anatomical Technology," as applied to the Domestic Cat; an Introduction to Human, Veterinary, and Comparative Anatomy. Revised edition. A. S. Barnes & Co., New York and Chicago.

"Unfinished Worlds," A Study in Astronomy; by S. H. Parkes, F.R.A.S., F.L.S. With illustrative diagrams. James Pott & Co., New York.

"The Science of Thought," by Prof. F. Max Müller. 2 vols., crown 8vo.; $4.00. Charles Scribner's Sons.

"The Ethical Import of Darwinism," by Jacob Goold Schurman, Professor of Philosophy in Cornell University. Charles Scribner's Sons, New York, 1887.

"Natural Law in The Business World," by Henry Wood. Paper covers. Price 30 cents. Lee & Shephard, Boston. Charles T. Dillingham, New York.

MAGAZINES.

"Vol. XXXV., No. 1," marks the November issue of "The Century Illustrated Monthly Magazine." This publication is undoubtedly the foremost of the magazine class. Rare executive capacity in its management in every business department; editorial talents of commanding character; and a corps of contributors selected from the best writers known; with ample capital for any contingency, thus insuring the unembarrassed exercise of all its interests (the last feature being indeed important, as many worthy publishers well know)—these happy combinations are found in "The Century." The leading paper is "The Homes and Haunts of Washington," illustrated. "College Composites" is interesting. "Revenge," a poem by Chas. Henry Webb, is so excellent we would copy it here had we space. We may remark that the prospectus for the present volume justifies great expectations.

November "Scribners' Magazine" gives the following list of articles: "Gorge in the Mountains of Northern Algeria;" "Wagner in Scenic Art;" "Seth's Brother's Wife" (conclusion); "The Physical Characteristics of the Athlete;" "To Rhodocleia, on Her Melancholy Singing;" "Tysar Y. Soult;" "In Grand Kabylia" (by Rev. Dr. H. M. Field); "A Confession;" "A Diplomatic Episode;" "In Her Garden;" "The Viking Ship" (very noteworthy); "The Haunts of the Halcyon;" a "Song;" "What Shall We Tell the Working Classes;" "An Old Lesson from the Fields;" "A Complete Misunderstanding." The illustrations are excellent, and profuse in number. The publishers promise even enhanced value in their Christmas Number.

"The Popular Science Monthly" for November contains a table of contents worthy of careful attention. No. 2 of the "Agassiz and Evolution" appears. "Specialization in Science;" "Science and Revelation;" "Astronomy with an Opera Glass;" "A Kitchen College;" "The Unhealthfulness of Basements," are named to show variety of topics treated. The supplies upon the "Editor's Table," with the other departments, are good, as usual.

"Harpers" maintains its rank, and each issue is a valuable volume in itself.

"The Magazine of American History" has a finely illustrated article upon "The Manor of Shelter Island, the Historic Home of the Sylvesters," with very much else of interest in its pages.

The large list of other Magazines contains subject matter worthy of attention; but our space is limited, and we cannot particularize.

THOUSAND-YEAR-OLD FROGS.

Continued from page 88.

by some flood of water or convulsion of nature and imbedded in the soil or rock while it was in a *loblolly* or pasty state, and finally settling around them; or if eggs, then the eggs have hatched while the mass was yet soft, the frog grew to its natural size, gradually pressing the soft mass away as the tender roots of vegetation do in growth, even to the bursting of solid rocks or the cement in walls. The next problem is, What is, or was the design of the All-wise in burying these living frogs and keeping them imprisoned for ages? This last problem I shall leave for some more far seeing scientist to unfold. Probably one of Darwin's disciples might give us some light on this subject.

Kerrville, Texas.

Literary "Molecules."

Great hearts alone understand how much glory there is in doing good.

There is nothing in the world so real and substantial as the love of God.

A Williamsport physician says there's money in his coughers.—*Williamsport (Penn.) Sun.*

In the bright lexicon of speculation there is nothing so uncertain as a sure thing.—*Harper's Bazaar.*

A telescopic attachment to the objective of the camera is the latest contrivance for the taking of long-distance photographs.

The number of deaths from "smoker's heart" indicates that cigarette smokers have more heart than brains.—*Philadelphia North American.*

Let not a man trust his victory over nature too far; for nature will lie buried a long time, and revive upon the occasion of temptation.—*Bacon.*

An inmate of a Wisconsin insane asylum was the recipient of the largest single pension ever paid by the Government. The amount was $12,500.

The Spirit of God lies all about the spirit of man like a mighty sea ready to rush in at the smallest chink in the walls that shut him out from his own.

During the past eighteen months 192 natural gas and oil companies were incorporated in Ohio. Applications for charters now average from two to three per day.

Railroad men claim that upon north and south running roads, the west rails wear out the soonest. They say the east rail will outwear five on the west side.

A constant source of amusement to every city during the Summer is the list of its citizens who figure as distinguished guests at far away resorts.—*Baltimore American.*

New York is credited with 308,000 wage-workers; Philadelphia, 270,000; Chicago, 106,000; Boston, 75,000; Cincinnati, 95,100; Pittsburgh, 78,100, and St. Louis, 62,000.

The muscular evolution can be traced from the Olympian races of ancient, to the Othumpian rings of modern Athens. All hail Boston under its new *regime!*—*Boston Traveller.*

A prominent Detroit business man received the following letter recently from his little son, who is visiting in the East:

Dear Papa: I have a chance to buy a Goat. The Goat will cost $2 50 and the harness will cost $2.50. If I buy the Goat I shall not need a Pony until another year. Write right off. Say yes or no. If yes, send me check for $5.

Your Boy Arthur.

DR. WILFORD HALL'S SCIENTIFIC LIBRARY.

THE principles of the Substantial Philosophy, with their collateral bearings, which are unfolded in Dr. Hall's writings, have cost him more than ten years of unremitting labor, such as few men besides himself have ever performed. The results of this tireless scientific and philosophical research, as therein elaborated and set forth, can be found in no other library of books on earth; and those who fail of the present opportunity to secure these unique works, at the trifling cost proposed by his publishers, will realize a missing link in their chain of knowledge, which they may always regret and may never be able to supply.

EIGHT VOLUMES THAT WILL LIVE.

THIS library consists of the "Problem of Human Life" ($2), the five volumes of THE MICROCOSM, bound in cloth ($7.50, or $1.50 each); the first volume of THE SCIENTIFIC ARENA, bound in cloth ($1), and the "Text-Book on Sound" (50c.), amounting in all to $11.

By special request of Dr. Hall this entire library will be sent to any person by express on receipt of $5, if ordered soon, or before the plates shall pass into other hands—an event probably not far distant. If sent by mail the postage, $1.25, must be added. Should the person sending $5 on this special offer already have either of the above eight volumes, some other book may be substituted, if in our list of publications found elsewhere on this page.

No person who has tasted the fruits of this comforting and elevating system of doctrine, as set forth in those volumes, should allow this opportunity to go by for leaving to his children an heirloom which may prove an almost priceless memento in coming generations. Bear in mind that this library can only be obtained by addressing Hall & Co., publishers, 23 Park Row, New York.

BORDERING UPON IDOLATRY.

THE philosophy of Substantialism, which advanced thinkers now agree is destined to revolutionize the present science of our schools, possibly before this generation shall pass away, took its rise less than a decade of years ago, in the "Problem of Human Life," a work which has been hailed with commendations from the press of the civilized world, such as no book has ever before received. The publishers of this work have filed away hundreds of such notices, many of which are too laudatory and too nearly bordering on idolatry to be printed. Indeed, the publishers of THE ARENA are constantly receiving contributions from enthusiastic admirers, well written, but so full of flattering praise of the editor's work, that he feels obliged not to allow them to be printed. The following, however, is a mere specimen of such press-notices of the "Problem," a book of 524 octavo pages, and of which between 60,000 and 70,000 copies have already been sold without a dollar's worth of advertising:

A SAMPLE OUT OF 240 NOTICES.

[*From the Christian News, Glasgow, Scotland.*]

"One of the most trenchant and masterly opponents of this theory (Darwinism) is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled 'The Problem of Human Life,' in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them."

[*From the Methodist Protestant, Baltimore, Md.*]

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

[*From the Illustrated Christian Weekly, N. Y.*]

"A very remarkable book has come under our notice, 'The Problem of Human Life,' which we have examined with some care, in which the author reviews most successfully the works of Darwin, Huxley, Tyndall, Haeckel, Helmholtz and Mayer, demonstrating, as we think, the utter fallacy of scientific materialism."

[*From the Brethren at Work, Mt. Morris, Ill.*]

"It is unquestionably the most startling and revolutionary book published in a century. There is no escape from the massive accumulation of facts, and the overpowering application of principles in which the work abounds from lid to lid. It marks an epoch in the centuries. It is a work of Providence and will not accomplish its mission in a generation. It unfolds truths that will stay as long as Christ is preached. Although strictly scientific, its one aim is the demonstration of a personal God, and a hereafter for humanity. We never tire reading it. It is an exhaustless mine of Christian truth. It is the literary *chef d'œuvre* of the age. It is worth its weight in diamonds."

[*From the Presbyterian Weekly, Baltimore, Md.*]

"The trenchant criticism, logical force, scientific attainments, and the clear, popular style of the author, have combined in producing in 'The Problem of Human Life' a volume that meets a pressing want, and one that will be warmly welcomed."

[*From the Dominion Churchman, Toronto.*]

"We most cordially concede to 'The Problem of Human Life' the well-earned title—*the book of the age.* Doubtless the God of Providence has raised up the author to meet the wants of the Church in this time of need."

[*From the New Covenant, Chicago.*]

"We can truly say that we are amazed at the originality, thoroughness, and marvelous ability of the author of this work."

[*From the Amer. Christian Review, Cin., O.*]

"The author, a man of acknowledged genius, and confessedly the brightest scientific star of modern times, has startled the religious world into transports of joy and praise. No religio-scientific work has received both from the secular and religious press such willing and unqualified praise as the 'Problem of Human Life.' It is the death-blow of atheisitc science."

[*From the Journal and Messenger, Cincinnati, O.*]

"'The Problem of Human Life' is a very unexpected contribution to scientific polemics, which, if its reasonings shall be justified, on thorough investigation, will prove to be one of the loftiest achievements of this age, and effect one of the mightiest scientific revolutions ever seen."

[*From the Christian Standard, Cincinnati, O.*]

"The scientists who have dealt so flippantly with the solemn questions of spiritual and divine existence, and talked so vauntingly of their scientific demonstrations, will find that they have caught a Tartar. We cordially commend this work to our readers for earnest study."

APPLETON'S ENCYCLOPEDIA—A MOST EXTRAORDINARY OPPORTUNITY TO OBTAIN IT.

THE reading public have been surprised and thrown under renewed obligations to Hall & Co., publishers, of 23 Park Row, for arranging with the agents of Appleton & Co., by which they are now offering full sets of the sixteen volumes of this greatest of encyclopedias (second-hand, but practically as good as new for the student) at a small fraction of their original cost. Indeed, they offer to give a set free to any one who will purchase at one time a given number of their own books. Here is their remarkable offer, as printed in different numbers of THE SCIENTIFIC ARENA:

"We have, by the merest good fortune, secured a number of sets of the above-named leading encyclopedia of the world, of different styles of binding, which we will now sell at the extraordinarily low prices as follows:

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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., 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.

D. K. ELMENDORF & CO., Publishers,
POTTER BUILDING, 38 PARK ROW, N. Y.

Entered as second-class matter at the New York Post Office.

WHOLE SERIES, VOL. VII., Nos. 7-8.
NEW SERIES, VOL. II., Nos. 7-8.

NEW YORK, DEC., '87—JAN., '88.

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DUALITY OF THE BRAIN—A THEORY OF MIND READING AND SLATE WRITING.*

BY R. C. WORD, M.D., PROF. OF PHYSIOLOGY IN THE SOUTHERN MED. COLLEGE, ATLANTA, GA.

More attention has been given to the brain and nervous system of late years than at any former period in the history of Physiological study. More has been discovered of nervous and mental phenomena in the last twenty or thirty years than was thought possible by our most learned predecessors previous to that time.

The Sensory and Motor tracts to and from the cortex of the brain, and the points of decussation for motor and sensory impulses have been defined with at least an approximate certainty. Much has been accomplished in the study of automatic and reflex influences. In the vocalization of motor functions in separate and distinct regions of the brain, and in the location of numerous important nerve centres.

Specialists in the treatment of nervous diseases are found in many places; journals in that department are being published, and the influence of the mind as a powerful factor in the successful treatment of disease is attracting the attention not only of the members of the profession but also of the laity.

Among the late acquisitions to our knowledge of mental phenomena is the fact that we have two brains, each capable of independent action and perfectly distinct, the one from the other.

A few years ago in a public lecture in Washington City, Brown Sequard discussed the question "Have we two brains, and if we have why not educate them?" He openly advocated the theory of two separate and independent brains in the human cranium, a theory which seems to conflict with the view commonly maintained "that the left side of the brain is the exclusive organ serving to the movements and sensations of the right side of the body; and that the right side of the brain exclusively influences the left side of the body."

Dr. Wigan of England, and also Sir Henry Holland, held a similar view in regard to the sufficiency of one hemisphere for the full performance of all the mental functions of the organ, and I well remember to have heard, long years ago, Professor Draper, of the New York Medical University, express a similar view on this subject.

Sequard, however, goes further than any other observer in the direction of the separate capacities of the two brains.

The fact is especially emphasized that an insane person sometimes knows he is insane,—he knows he has insane ideas. He is rational and at the same time he is insane. Here it is claimed that one side of the brain acts normally, and the other side abnormally. In furtherance of this view of two brains, a case of a boy is mentioned at Notting Hill, London, who had two lives. "In the course of the day, generally at the same hour, but not constantly, his head was seen to suddenly fall forward. He remained erect, however, if he was standing or if sitting he retained this position; if talking, he stopped for a while; if making a movement, he stopped moving. After continuing one or two minutes in this state of falling or dropping of the head, appearing as if asleep with his eyes closed, he would suddenly raise his head, open his eyes, being quite awake, and then ask if there was anybody in the room whom he had not previously seen, who the person was, and why he was not introduced to him; being all the time in a state quite different from that of wakefulness. "He had seen me many times," said Dr. S., "and knew me quite well. Being with him once when one of these attacks occurred, he lifted his head and asked his mother, "Who is that gentleman? Why don't you introduce him to me?" His mother introduced me. He did not know me at all. He shook hands with me, and then I had a conversation with him, such as a physician may have with a patient. In another instance, when with him again, while he had the same kind of attack, I found that he recognized me fully, and talked of what we had spoken of in our first interview. I ascertained from what I witnessed myself, and from what I obtained from his mother, a very intelligent woman, that he had in reality two lives, two mental lives, one in his ordinary state, and another occurring after those attacks of a kind of sleep for about a minute or two, when he knew nothing of what existed in his other state—in his ordinary life; that was all a blank. He knew nothing during that second state but what had occurred in previous periods of that same condition, but he knew full well all that had occurred then, and his recollection of everything was as perfect then as it was during his ordinary life concerning his customary acts of that state. He had therefore, as I have said already, two absolutely distinct lives, in each of which he knew everything that belonged to its wakeful period; and in neither of which did he know anything of what had occurred in the other. He remained in his abnormal state for a time, which was extremely variable, between one and three or four hours, and after that he fell asleep, and passed out of that state of mind pretty much in the same way that he had gone into it. I have seen three other cases of this kind."

Some years ago a case of this kind which occurred at Watseka, in one of the Northern States, created a great sensation, and was called the "Watseka Wonder." The spiritualists claimed that the patient was alternately possessed first by one spirit and then by another; the two states or conditions being very unlike, giving to the patient two lives, in which were manifested different actions and dispositions. In the one state there seemed to be no knowledge or recollection of facts or incidents which occurred in the other. These abnormal conditions would last sometimes for several days.

Other cases of the same kind are reported as having occurred in the observation of different practitioners.

Sequard does not controvert the generally admitted view that the right side of the brain presides over the left side of the body, and the left side of the brain over the right side of the body. He admits the fact and accepts it as a general rule, but meets it with a statement "that philosophers do not accept conclusions because there are some facts which support them," and gives facts which show different results. To instance: "Disease in one half of the brain has been known to produce complete loss of sight of one eye, sometimes of the same side, sometimes of the opposite side." And then again: "Disease of one half of the brain may exist without any effect upon the sight whatever." He holds "that an alteration in any part of the nervous system, whether in the brain or elsewhere, can by producing an irritation act on other parts so as to cause the loss of function in the part so acted upon, and that he has seen injuries of the spinal cord produce the loss of sight in the eye of the same side. Even the irritation of worms in children has been known to effect the power of sight. In the same way an irritation existing in certain parts of the brain may produce the loss of function in another part; which it is known also that any part of one side of the brain may be diseased, and the sight still remain good." "The conclusion then would seem inevitable that one half of the brain is sufficient for the preservation of the sense of sight on both sides, which tends to confirm the theory of the duality of the brain."

As regards voluntary muscular motions, though ordinarily controlled on the one side by the brain of the opposite side, it is affirmed that there are muscles in the neck, in the eye, in the throat and in the back also, which escape paralysis when one half of the brain is diseased, a fact not to be explained on the old theory. Seven instances are mentioned of the destruction of one entire half of the brain without any impairment of volitional movements on either side of the body. We cannot therefore look upon one half of the brain as being necessarily or exclusively the organ serving to the movements of the body on the opposite side. It is possible in some individuals at least for one side of the brain to control voluntary movements in both sides of the body.

Touching recent observations in respect to cerebral localizations, the location of the faculty of speech on the left side, and other facts indicating special and peculiar powers in the one side or the other, it is urged that these differences depend upon education and development and not upon any original difference in the two hemispheres.

Organs are developed in proportion to their use or exercise. Certain parts of the brain have been used for certain functions until they have become the better adapted to these functions.

A majority of people being right handed shows the predominance of the left brain, which indeed receives more blood than the right side and is the largest. For some reason the right side of the body is most used and the left side of the brain, which moves the right side, is more largely developed. Primitively it would seem that there was some natural cause

*Read before the Georgia Medical Association, April 1887.

for the greater development of the left brain. If persons are left handed it indicates exceptional development in the right brain. These differences have been, perhaps in most instances, handed down by hereditary transmission. Facts are given which show the power of use in establishing and transmitting these peculiarities, and to show that they do not depend upon any original or primitive differences, but that either brain can be educated to perform, and has often exercised, all these functions.

THE SOLAR SPECTRUM, AND WAVE THEORY.

BY PROF. G. R. HAND, C. E.

I PURPOSE placing the phenomena produced by the analysis of the Solar Spectrum, along side the supposed phenomena of the undulatory theory of light, and notice their incongruity.

By observation of transit and occultation, of one of the satellites of Jupiter, it has been ascertained that light travels from the sun to the earth in about eight minutes, or at a velocity of about one hundred and ninety thousand miles in a second.

Supposing light to be a material substance emitted from the luminous body, according to the corpuscular theory, and entering the eye at such a velocity, it was thought that the optic nerve would be inadequate to the task of sustaining such a shock. So the emission theory was abandoned, and the undulatory theory invented.

This theory is thus described: "The undulatory theory assumes that the space between the celestial bodies is occupied by a kind of imponderable matter, which is infinitely elastic, and of extreme tenuity, so that it not only occupies the space between bodies, but also enters into them and performs its function of undulation within them and between their particles. This subtile matter is called the luminiferous or cosmic ether, and the luminousness of a body is assumed to be due to a rapid vibratory motion of its molecules, which is propagated in the ether, in the form of waves." Amer. Cyc. Vol. 10.

In this long quotation, it will be noticed that as these Philosophers had not thought of immaterial substances they must invent some way to manage a material substance, and they "assume" a highly attenuated substance, "imponderable," and "elastic," invisible and intangible "matter," occupying the interplanetary and inter stellar space, and it is "assumed" that the molecules of this imaginary ether have a "rapid vibratory motion," and that their mode of motion resembles the advancement of "waves."

In addition to these "assumptions," after referring to the analogy in mode of motion of the wave theory of sound, it is stated that: "In the case of light, the propagation is also in the direction of the radii, [of the luminous sphere], but the motion of the particles of ether is supposed to be in a transverse direction." Amer. Cyclopedia.

There now, it is "supposed" that the motion is transverse, and it is "supposed" that they "do move," and they "suppose" that there are particles or molecules in the ether, that can be moved, and it is "assumed" that the ether does exist that contains the molecules, and that light is produced.

Plainly if minus multiplied by minus produces plus, may not "assumption" multiplied by "supposition" produce a plausible theory?

It is taught that the undulations differ in the rays of different colors, and that the color of a ray depends upon the wave length, which is thus defined: "That length of a ray which at any instant includes all the phases of an oscillation is called a wave."—Am. Cyc. In the stronger rays, as the red, there is greater length of undulation, while in the weaker rays, as the violet, there is greater rapidity of vibration. The length of undulations in the strongest rays, is placed at about the twenty seven millionth (.000027,) of an inch; and in the weakest rays, at about the fifteen millionth (.000015) of an inch, the intermediate rays ranging between these. The number of vibrations in the red rays, is placed at four hundred and fifty one millions of millions (451,000,000,000,000,) per second, and the violet rays at seven hundred and eighty nine millions of millions (789,000,000,000,000,) in a second. Thus the number running up into the trillions, becomes unthinkable, and almost turns the brain dizzy to look at the figures, and the velocities range between these extremes.

We are now prepared to analyze the Solar Spectrum, and compare notes.

Into a darkened room, through a small aperture in a blind, we admit a ray of solar light, which, passing through a horizontal prism, is dispersed into its seven primary colors, and arranged in a vertical diagram on the opposite wall, from the base to the apex in the order of refrangibility, viz: Red, Orange, Yellow, Green, Blue, Indigo, Violet. Any substance placed in either of these rays will appear to the eye the color of the ray in which it is placed. And a sheet of white paper passed through these rays from bottom to top, will change color in the order of colors named above, and in passing from top to bottom the successive order will be reversed.

A ray of white light before the dispersion is composed of all these colored rays combined; and after the dispersion they can be recombined, with a resultant white light.

Now interview this solar ray as it enters the dark room through an aperture not larger than the smallest gimlet hole. How many have you in family? There are seven representative adults in our family, each with a small family of minor children. How far have you come? Over ninety-two millions of miles. How long were you on the way? Only about eight minutes. Rapid transit, and so crowded. Did the children become restless? Yes, they were kicking, and knocking their heads together and jostling each other all the way at a rapid rate. There was Mr. Red, the strongest in company, swaying himself from right to left, and left to right, in a wide swath, and at the rate of multiplied millions of times in a second. How could you count his oscillations? Oh, no one could count them, we guessed at it. Did his action drive the rest off the track? No, they were all bobbing and dodging about too, in a narrower space, but more rapidly. As they did not beat time together, did they not sometimes beat their heads together? Oh yes, constantly, but they were accustomed to that.

You must be tired from your long journey; you may come in at this little gimlet hole and rest awhile. Our room is dark, but you bring your light with you. We must separate you and give you different beds. Mr. Red, you may take the lower berth. Mr. Orange the next, and arrange yourselves in the family order. Mr. Violet, you may take the upper berth, you being the smallest and most active, and that the narrowest berth. Separated, they still keep up their oscillations, though marching straight to their couches.

Now open all the doors and windows and let light in from every direction, and place reflectors on all sides, and see rays of light passing and crossing each other's track, and yet every ray going straight to its place.

Then imagine if you can, these rays of light to consist of dashing waves of unruly molecules mingling in turbulent masses, marching and counter marching, and yet each passing out of the melee undisturbed, and unmoved.

If the material substance composing this imaginary luminiferous ether, is homogenous, then we have the phenomenon of a mass of matter shaking its sides as in a paroxism of laughter, in vibrations of unthinkable velocity, and stranger still, moving at the same time and place with different rates of motion, without mutual interference.

Truly that must be a hard road to travel, that requires such a concatenation of inconsistent incongruities, to level up the road bed to an imaginary possible highway for the safe transit of light from the sun to the earth.

But an immaterial substance, like electricity, magnetism, or gravitation, conducted along, or through a conducting substance with lightning speed, is a thinkable entity, and a plausible "mode of motion," or triumphant imperial transit.

Light, as an immaterial substance, emanating from the sun, or other luminous body, and conducted through transparent or translucent substances, addresses itself to our understanding, and commends itself to our approbation.

Ever since God said "Let there be light, and light was," Light has been in existence upon our earth, and has continued to travel upon the great highways provided for it by Him who rides upon the storm.

Substantialism sees the chariot of light, without the incumbrance of the inexperienced Phaeton as driver, careering along its triumphant course to a sure destination, and Light and Sound, as twin sisters shaking hands together, as they move along on their missions of love, as representatives of written and spoken language, conveying messages of intelligence to the eye and ear of inquiring millions of the human race, scattered over the face of the whole earth.

Materialism may have the privilege of withdrawing its assumptions.

SANTA ANA, CAL., Nov. 10, 1887.

THE SUBSTANTIAL BODY.

BY REV. E. R. MCGREGOR.

"THE Bible is not a treatise on science," is a trite saying, but worth repeating in some connections.

As scientific and religious truths are intimately connected, both belonging to the same order of things, it is not surprising to find the one cropping out in the department of the other. For this reason we might expect to meet with hints, and even positive statements of scientific facts and truths in the Bible, although it treats of subjects belonging almost exclusively to the religious department; as, "Out of the heart are the issues of life," a scientific truth which has not been categorized, as such, two centuries. As, the lungs are the seat of life; an inference from the statement, "breathed into his nostrils the breath of life, and man became a living soul." Scientists have but lately discovered how breathing perpetuates life, also "the life is in the blood" which is distributed through the body by the channels of circulation; a mystery laid open, not a long period ago, by science.

Now as science is reluctantly but gradually wheeling into line with the new doctrine of Substantialism, and affirming, rather positively under that cover, that we have two bodies, one purely physical and material, and the other spiritual and immaterial, a form made up of the vitalizing forces of nature, or spiritual, as contra-distinguished from the *material*, we are interested to know whether there are any hints or statements in regard to such a dualty in the Bible.

A leading statement in this discussion is the following: "Things that are seen were not made of things that do appear." The more literal and better translation gives us "so that not from things seen were the things seen, made;" from which the only possible inference is, the things that are seen were made of things not seen. This brings to view two classes of things, those seen, or of which the senses take cognizance, and those unseen of which the senses do not take cognizance; or, in scientific phraseology, the material and the immaterial. The worlds were framed by the fiat of the Almighty, or brought into sensible forms, from substances to which the human senses have no access. Rocks were made of gaseous vapor held in invisibility by intense heat. Water was made of oxygen and hydrogen, both of which separated are invisible, and both of which may be so sublimated as to be beyond the reach of any senses.

We have, then, for our ground work forms material and forms immaterial, though still substantial. Our next statement or hint is contained in Paul's wheat illustration of the resurrection body.

The grain that is sown has a germ in it containing life force which is the perfect type of the grain to be produced. This germ contains

the substance of the stalk, leaf, head, kernels, and their wrappings, each particular distinct from the other, yet all forming a harmonious whole, each working on the materials at hand to produce its like, presenting perfectly the form of the original type, building up an external body corresponding in every particular to itself, stalk to stalk, leaf to leaf, head to head, kernel to kernel. We have here a duality in grain. If the fact be patent in grain why not in the whole vegetable and animal creation? Take the embryo of the animal: Is not the power present to produce every function of the animal? Does not that power take a thousand different forms corresponding to the thousand different parts to be produced? Does not one form of force produce the bone, another the muscle, another the brain? One type of force produce the finger; another the eye; another the arm, another the foot the heart? etc.; all combined in such order as to form a harmonious whole of forces, the whole corresponding in form to the external material form in which it enwraps itself? Here to-day is the embryo, a combination of varied forces. In a few months we have the physical being in perfection which it has manufactured out of the materials at hand. Nor is its work suspended here. It is everywhere present in the body to build up, develop its parts, supply waste, repair disasters, and preserve the original identity; and, as no force can operate where it is not, this embryo power must have its agents everywhere in the body, head, breast, arms, legs, hands, feet, toes, vitals and what not, to do their assigned work; and when contemplated as a whole, the reason sees an internal substantial form as entire and perfect as the senses see a material form.

But not to hasten our conclusion. Take the human physical body which the Creator formed of the dust of the earth. It is no more than a perfect machine awaiting the advent of the motive power. There is no power present to develop a hair, a finger nail, or a flake of cuticle. The Creator "breathes into its nostrils the breath of life," and man "becomes a living soul." What now takes place? Not only does Adam see, hear, feel, walk, and think; not only do the lungs inhale and exhale, the heart beat, the blood flow, and digestion begin, but in every part of the organism waste sets in, and recuperation is set up. Where there is waste through an exhausted particle, immediately a force is present to push it out of its old place and to put a new particle in its stead. That power is omnipresent in the body, for everywhere waste and recuperation are succeeding each other. What power is that but the embryonic, through its type forces operating on every part of the physical system? And were it possible for the physical organism to vanish into nonentity, there would be left, at that instant, the embryonic power in form answering to every particular of the former physical body, fingers, arms, feet, limbs, body, head, eyes, nose, etc. "Man became a living soul," means that the substantial form composed of life and type forces, was created and put within the material organism to operate its wonderful machinery, and conduct its processes. If not that what was it?

Again, in the 8th of Romans are brought to view three departments of the human being, or the Christian man. The corruptible, the creature, and the child of God. The creature, from its connection with the corruptible, to which it is in bondage, is a constant sufferer. The child of God has escaped the bondage and is free, or in a condition in which the corruptible does not affect its happiness as it does that of the creature. After the child of God had been set at liberty the creature was still connected with the corruptible, not from any fault in it, but for a Divine purpose; but the time was hastening when it would be severed from the source of suffering and be delivered into the glorious liberty of the children of God. Its adoption would also take place. The body would be redeemed. Then it would be seen that past sufferings were nothing in comparison with the glory it enjoys. Is it difficult to identify these three departments of the Christian man? The corruptible, which causes so much suffering, is the physical organism. The child of God is the thinking, willing, emotional force or mind, that has received the spirit of adoption whereby it cries to God, "Abba, Father." The creature is the body, the animal or the embryonic power composed of life and type forces. At the dissolution of the physical or material organism, the substantial body would be dissevered from it, and in connection with the child of God evermore be happy; or in other words: The mind constituted of intellectual and moral attributes, sanctified, with its substantial form, would enter upon a higher sphere. We now have the mind enwrapped in its substantial form in a world known as heaven. May we look in and see what becomes of them. In 2nd Corinthians the view is opened:—There is a house there not made with hands eternal. It is contrasted with the house we live in, which is tending to dissolution, and is consequently ephemeral. While living in our present house we groan, being burdened; we instinctively yearn to get into our new house. We do not desire to be unclothed and remain naked, but clothed upon. We want a new house, but we want the mortal to be succeeded by the eternally living. The house we live in is the material organism. which is mortal. It is composed of earthly materials built up by the embryonic power.

The building of God is made of better materials. In quality they are divine and eternal. It only needs that the mind, in its substantial form, be placed in contact with these materials to make for itself another house, and so not be found naked.

That immaterial organism will be exactly adapted to that world, as the present is to this world. But we do not grope in the dark at this stage of the discussion. We know of four individuals in that world who have forms, and human forms at that: Enoch, Elijah, Moses, and Christ; but they are not composed of flesh and blood; or of earthly materials, as flesh and blood do not exist there. They are the forms in which they enwrapped themselves upon their entrance there. Dare we take a step farther and say that every mind in that sphere is connected with its own embryonic power or substantial form, and may at will clothe itself with any material form it pleases. What about the Angels in company with JEHOVAH, who visited Abraham as man and partook of his repast? They put on for the occasion human physical forms; so we infer that any angel or glorified saint may put on or off, at pleasure, any material form requisite for any mission in this or any other world they may be sent on.

There generalizations serve to simplify the whole subject of the resurrection. They show that the discussion of the subject in the 15th Chapter of First Corinthians is along this line. The wheat illustration is to the point. The grain you sow is not the grain that you will reap.

It perishes, but while perishing the embryonic power builds, out of the old and other materials, a new grain identical in form and quality. "So is the resurrection of the body." "It is sown in corruption: it is raised in incorruption." "It is sown in weakness: it is raised in power." And as there are all kinds of bodies, according to the nature of the sphere of existence—human, beasts, fishes, birds—so there are also celestial as well as terrestrial bodies; spiritual as well as natural; and as the Lord bore the earthly but now bears the heavenly form, so we, his image, his counterpart through grace, bearing, as he did, the earthly, shall also bear, as he does, the heavenly—the spiritual—a body adapted to our next sphere of existence. It will not be a flesh and blood body.

The mortal shall be exchanged for the immortal. The genesis of the resurrection seems to be the following: The spirit, or mind, is from the dawn of its existence, intimately connected with a substantial form, which is a perfect system of organized forces. This power builds up for an earthly residence a material organization. At the wreck of the material body, the spirit, in its substantial form, passes to the heavenly world, where it puts on a material form adapted to the state of existence there. At the resurrection it puts off the temporary body it had assumed for that sphere, and puts on an immortal, indestructible form, composed of earthly materials; so that the saying shall come to pass: "O death, where is thy sting? O grave where is thy victory?" The victory will be ours through our Lord Jesus Christ. That will be a physical organism exactly adopted to the new Kingdom of heaven prepared for the blessed of the Father. The spirit is made free by grace during the lifetime. The creature is redeemed and adapted at the dissolution of the mortal body. The material form is redeemed and glorified at the resurrection.

SOUND DIFFICULTY.

H. F. HAWKINS.

SOME time ago I pulled down from its place one of my old school books, "Peck's Ganot," edition of 1873, and concluded to study anew the wave-theory of sound. On page 157, we find this language: "Each complete vibration of the sonorous body generates a condensed and a rarefied pulse, and these taken together constitute a *sound* wave." From this we understand that, each sound wave produces a separate and distinct sensation in the auditory organs—"Bending the tympanic membrane once in, and once out." When we listen to the sounding fork, then, it is not *one* sound we hear, but a succession of sounds, following each other so rapidly that the ear cannot detect the intervals between them. The same author on page 163 tells us: "It is not possible to pronounce or hear distinctly more than five syllables in a second." No matter how short the syllable or sound may be, it therefore requires 1-5 of a second for it to make its impression upon auditory organs sufficiently to be recognized by the senses. Any less time would not produce the sensation we call sound.

On page 169 our philosopher tells us that: "M. Savart investigated the subject of sound with respect to the number of vibrations, corresponding to the most grave and acute sounds perceptible by the human ear. * * * * He concluded that the gravest perceptible sound was produced by 16 vibrations per second" and the most acute by 48,000 vibrations per second." Yes! "He concluded," and we also "concluded" that if it required 1-5 of a second to perceive any sound even the very shortest, it was worse than foolishness to talk about perceiving a sound in 1-16th of a second, much less in 1-48,000th of a second. There is no help for this if Prof. Peck is correct, for he tells us each vibration produces a sound wave and that the gravest sound has 16 vibrations, and the most acute 48.000 per second, while we can only perceive five sounds or syllables. Hence his gravest sound is 3—1-3 times, and his most acute sound is 9,600 times, too short to be perceptible! Silence!

SPONTANEOUS GENERATION.—No. 5.

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

MANY of the advocates of Spontaneous Generation, seeing the manifest absurdity of holding that life-forms have been originated from dead, helpless, and inert matter, have assumed that the potency of all vitality or life-force comes from the molecular energy of the sun. Even Prof. Tyndall, in one of his works used quite extensively as a text-book, tells us that molecular forces determine the form which the solar energy shall assume. He says:

"In one case this energy is so conditioned by its atomic machinery as to result in the formation of a cabbage; in another case it is so conditioned as to result in the formation of an oak. So also as regards the reunion of carbon and oxygen—the form of this reunion is determined by the molecular machinery through which the combining force acts; in the one case the action may result in the formation of a man, while in the other it may result in the formation of a grasshopper."

But this by no means removes the difficulty. It only shifts it to another point. Where is the evidence that in the solar energy there is anything like life germs or anything that can possibly do the first thing toward originating life? Its being necessary to warm and assist life germs, after they have been originated, is a very different thing indeed from originating them in the first place. Besides, if such potency

were true, the question arises, who conditioned the solar energy, and adjusted "its atomic machinery?" to say nothing about the fact that if there is machinery involved in this problem, there must have been a Machinist who has so marvelously adjusted the solar energy as to produce in one case a cabbage, and in an other an oak, and in an other case a grasshopper, and in another a human being. It actually seems almost incredible that any man claiming to possess respectable attainments in philosophy should write such nonsense as the above in the name of and in behalf of science. It is really difficult to conceive of a more unphilosophical and confused statement of groundless assumptions than is presented in the foregoing quotation. What has the reunion of carbon and oxygen to do with the origination of life? Something infinitely superior to any possible chemical combination or any possible combination of material elements of any kind, is absolutely required to produce vitality. Dr. J. W. Dawson, who quotes the above paragraph of Tyndall in one of his New York lectures, has well said:

"This statement is so absolutely without foundation in fact, and so full of errors that one scarcely knows where to begin to criticize it. In the first place, though a cabbage could not grow without solar energy any more than it could without water, or potash, or many other things, it cannot be in any sense called a form of solar energy. Neither have we any evidence that solar energy acting *forever* could produce a cabbage without a previous cabbage seed. Nor is it true that the difference between a cabbage and an oak is merely a difference in solar energy, unless indeed we assume that the germ of the cabbage, and of the oak, with all their diverse vital powers, have also been created by the same solar energy. But in this case we should have to assume that the omnipotent solar energy even when unconditioned by any machinery whatever, could produce these diverse forms and structures. Further, it is untrue that either a man, or a grasshopper, can be produced by a reunion of carbon and oxygen; or that any reunion of elements could have such affect without the previous existence of men and grasshoppers." (New York Lectures pp. 17, 18)

There is absolutely no evidence to be found that *life* was ever evolved in a single case from *death*, or dead matter. Nor is there any reason or logic in the supposition. Nay more, it bears upon its very face all the characteristics of an absurdity. In all known cases *life* has *only* come from *pre-existent life*. An incalculable amount of toil has been expended in investigations, experiments and researches, by evolutionists, to discover one case of the evolution of life from inorganic matter. But thus far all such attempts have resulted in absolute failure. The origin of life to these atheistic evolutionists is the one great inexplicable mystery. This is the fatal Charybis upon which the ship of evolution is hopelessly wrecked. Hence its motley crew stand confounded with such questions as these. If life came from inorganic matter, where is the evidence of it? Why does it not originate life now? etc.

TOMPKINS, COVE, N. Y.

POPULAR MUSIC AND COMMON-SCHOOL SINGING.

BY JEROME HOPKINS.

To MY mind, *Music* in its grandest, broadest sense, is not a mere sensuous enjoyment, but a powerful (perhaps *the* most powerful) *negative* agent for moral purity known to civilized man There was a time when I used to scoff at such doctrine, and I have had many a laugh over the childish simplicity of that over-praised book, Mr. Howei's "*Music and Morals*;" but additional study has strengthened the conviction that no other Art is comparable to Music as a moral aid to the masses, and as a valuable safe-guard to life and property.

Analytically speaking, sounds are either articulate, cacophonous, or musical. When articulate they of course can convey ideas, moral or immoral, poetic or dydactic, sacred or profane; when *cacophonous* or *discordant*, sounds become a *torture*, although they may mean something. When *Musical*, sounds may be unmeaning (that is may not convey, *ideas* like articulate sounds) but they are at least *soothing* or *innocently exciting*, and *cannot* be "demoralizing;" moreover the highest type of Music disassociated from words (namely, the instrumental,) is absolutely the only one of all the Arts *untainted*, purely psychological, and etherially, poetically celestial in its birth and mission.

The art of Painting can be, and in numerous cases *is* the minister of vice and impurity. The Art of Poetry is notorious for pandering to unworthy ends, and the same is true of Sculpture and has been so for centuries. But Melody and Harmony from their very nature, are *absolutely pure*, nor can they be made impure without intermarriage with motion or with articulate sounds. If, however the articulate language is *itself* noble, it is rendered doubly so by an alliance with Music; and noble Music set to noble words, has long been esteemed by the noblest men, as part of the noblest civilization of modern society.

It has been stated that Music is a *negative* agent of morality, and the reason for this is that while engaged in making Music, people cannot very well be engaged in making mischief.

Now it behooves an intelligent and progressive people (such as we profess to be,) to consider the best and most economical way in which to infuse this great and purifying element into the Body Politic. It certainly does *not* become us to ignore it, or to rob her citizens of its benefits, while every other civilized nation has valued and fostered it, and at vast expense.

Now to the question, "Is Instrumental or Vocal Music most available to the mass of the People?" I reply unhesitatingly that *Vocal* Music is, *by all odds*, for the multitude cannot make good Instrumentalists, but they *can* make thousands of good *singers*. While singing, they cannot be hatching social or political conspiracies, and it is as a preventive of such conspiracies that France sustains to-day over 3000 "Orphean" or Singing Schools for the working people; and (in the words of Lord Erskine) the result is that there *is* some taste among such "which we are quite *without*, for Nature, which to them gave *gout*, to *us* gave only gout."

We have all noticed the subjects of free instrumental concerts for the Parks a good deal discussed in the N. Y. papers from time to time, and strongly advocated for Sundays.

But I have never thought much of such a way of making the million musical, and don't know of many *worse* ways of teaching a person how to sing or play than by taking them to concerts. You might as well expect theatricals and picture galleries to teach one how to read and paint.

If one is studying *language* or painting, *then* plays and pictures become an aid to study; but to squander thousands of tax-payers' money on Sunday bands, as an incentive to loving couples "sparking" in public, and as an attraction to thousands of lazy loafers who lie about on the grass to have their ears tickled, I don't believe in it, for it don't help public morality, nor does it help to make people either singers or players. If the same money were spent in providing Free Singing Schools, it would yield a return of sixty fold more solid value to the city, and would be backed by philosophy and common sense.

"*But that can't be done*," say hundreds of social students and thousands of old fogies.

"Besides, *the public money is not for the purpose* of *making musicians*," say our *honest* political economists and officials. To which I reply that if the public money is used to support paupers and punish criminals, it is a strange thing if the public money cannot be used to *prevent* people from *becoming* either paupers or criminals, indubitably the *best* economy of the two. *Furthermore* if the public money is not to be used "to make musicians and singers," it surely ought *not* to be squandered in hiring brass bands to *amuse* idlers on the Lord's Day, and draw them into Parks away from Churches and Sunday Schools, and yet that is *precisely the way in which the public money is used in New York*.

Now in order to erect a new house where an old one stood, it is necessary first to pull down the old one, and this is the apology for my disrespectful treatment of the venerable and venerated stupidities which prevail all over this country where I have traveled, with regard to the musical cultivation of the masses by public money. No one pulls down old houses for the fun of it, but from necessity. The first public mistake consists in an entirely wrong view of the true motive and position of Vocal Music in the community and in regarding it *only* as an Art, an amusement and a *luxury*, instead of as an important element of civilization, a *hygienic exercise* and a *moral pass-time*, which last qualifies it to be one of the best conservators of *good manners* and *antidotes to rowdyism*, known to polite nations.

When viewed in *this* triple sense, Vocal Music becomes a thing of *distinct positive* value, and deserves to be called as much of a *necessity* as geography or grammar, surely as much so as orthography and writing, for none of these are needed in "making a living," as is proven by the biographies of some of our best and most successful citizens who could scarcely more than read and write. Now I am no advocate for training children for the *ballet*, the theatre or the opera, except in cases of transcendent genius, (and genius is in no danger of becoming so common as to be troublesome) but it seems to me to be poor consistency to deny to children the innocent gambols permitted to kids and kittens, or to offend "these little ones" by shutting their musical little mouths when they want to imitate larks and canary birds, as the strangely inconsistent Elbridge T. Gerry in New York has been trying to do for years, in spite of the protest of parents and guardians, and yet we call this a "free country."

Notwithstanding the grand pretensions of American Society to-day as the peer of European circles in all our large cities, I maintain that *in the Arts*, there exists a blackness of ignorance simply appalling to the earnest student, and if this is true regarding the *practice* of the Arts, it is far more true in their *creation*. For example, let us suppose that a young stranger comes here, and on looking for a "job," is asked what he can do? "O I can compose poetry," is the answer. Now I need only prove the cheering prospect of such a youth for *starvation*, by asking which of my readers would be likely to give him a job, at composing poetry? If it was to *clean the sidewalk*, he might get several jobs.

Another starving stranger might assure you that he could paint pictures, but *his* chance of finding a job would be about equal to the other's.

The most of all to be pitied, however, would be the beggar who assured you that he could compose Operas, for, *can it be* that a solitary one of my readers would have the slightest possible use for an Opera? Why, to offer them a jack knife or a pair of shoe strings would be sensible, but a new Opera! would resemble a white elephant as a commodity. So the composer would have the best right of the three to starve, and yet—yet—pray realize the fact that it is the *Poets*, the *Painters*, and the *Composers* to whom mankind raise the proudest monuments after Statesmen, Warriors, and Philanthropists'.

It may be some consolation to know that these three hypothetical, but very respectable beggars would be almost as badly off in Berlin London or Paris as here, but not quite.

There *is* a small ghost of such a thing as public appreciation of *new* poems, *new* paintings, and *new* operas *abroad*, but there is not so much as even the "ghost" of it on *this* side of the water, for whatever appreciation of Art exists *here* is the private property of *individuals*, and never becomes the property of the *public* until fashionable nabobs and newspaper scribblers permit the common people to use the eyes and ears which God gave them.

(CONCLUDED NEXT MONTH).

THE ATTRACTION OF GRAVITATION.*

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

PART I.

WORKS on Physics since the time of Newton have taught that Gravitation acts instantaneously. It has been held, that were a new body created in space, 1,000 miles from the earth †, *its* attraction would be felt at the Sun just as soon as at the Earth, though the one would be 91,430,000 miles ‡ off and the other only 1,000 miles.

Such statements when presented as facts, cause the inquiring mind to think. When we consider light we find that it has a velocity of about 186,680 miles § per second through our atmosphere. What its velocity is through space is not known, yet there must be a difference, as the velocity of light is instantly doubled and in some cases tripled while passing through the superficial stratum of transparent bodies.

As for example, the velocity of light is increased to about 280,000 || miles per second in glass.

When we consider sound we find its velocity depends upon the conductor.** In air the velocity is 1029 feet at 0° and in iron 17,000 feet †† per second.

In the case of Electricity, we also find that its velocity depends upon the conductor it has to traverse. According to Dr. Siemens ‡‡ the velocity of electricity in copper wire is 31,000 geographical miles per second.

In considering these facts I have been led to ask the question—whether gravity likewise has a given velocity? and while directing my attention to this subject I accidentally found that Laplace in 1773 had decided in the affirmative.§§ He figured the velocity of gravity at 50,000,000 times the velocity of light, which would make the velocity of gravity about 9,334,000,000,000 miles per second, or about 1-45 times as many miles per second as there are required *pulses* of *light force* to enter the eyes in one second to produce the sensation of red.

It must be conceded as reasonable to assume that *if* gravity has a given velocity, when a body has acquired such velocity its motion cannot be further accelerated and it would of necessity have to travel at the velocity of gravity. Now, in attempting to determine whether gravity has a given velocity or not, it will devolve upon us to consider the velocity with which the heavenly bodies travel in their orbits through space. But before approaching this subject let us consider the greatest velocity that the gravity of the sun can impart to a body which he is capable of pulling to his surface. In considering this problem we must bear in mind that an attracting body can destroy in a projectile thrown from it, no greater amount of velocity than it can impart to a material mass falling toward it, and this limit is reached if we suppose the falling body to commence its motion at an infinite distance.

The expression for the velocity acquired in falling from an infinite distance to the Sun's surface, his mass being assumed to be unaltered, according to Laplace is

$$v = \sqrt{\frac{2\,m\,g\,r^2}{R}}$$

in which m is the sun's mass, that of the earth being unity; g is the measure of the force of gravity at the earth's surface, being the velocity it is capable of imparting in one second or 32,088 ft. (at equator); r is the earth's radius (20,823,596 ft at equator) and R the radius of the sun (2,274,911,760 ft. or 430,854·5 miles) then we have

$$v = \sqrt{\frac{2\,326800 \times 32{\cdot}088 \times (20923596)^2}{2274911760}}$$

hence $v = 2{,}009{,}006{\cdot}7$ feet or 380·8 miles per second. If we use the *abbreviated* formula*

$$v = \sqrt{2\,g\,r.}$$

which is applicable to falling bodies when gravity is variable, and make $g = 890{,}16$ ft (force of gravity at surface of the sun) and $r = 2{,}274{,}911{,}760$ ft (430,854·5 miles the radius of the sun) we deduce the corresponding terminal velocity $v = 2{,}012{,}503{\cdot}6$ feet, or 381,15 miles per second.

It follows therefore that the velocity acquired by a body falling from an infinite distance to the sun's surface, under the influence of solar attraction, would be less than 382 miles per second; and 372·5 miles of this velocity would be acquired after passing the limits of the earth's orbit, and the body would be about 27 days in reaching the sun after passing this limit, while light is only 8·16 minutes in traversing the same immense space.

Applying this deduction, we find that if a body possessed a projectile force which would propel it at a velocity of 382 miles per second, (or a greater velocity than 381.15 miles per second,) such body would pass out of our system entirely and would continue on in space until it came within the influence of a mass capable of exercising a gravital force of greater intensity or strength than our sun, when it would eventually be pulled into an orbit and revolve around this new body if the intensity of the gravital force it exercised was sufficiently great.

We will now show that the velocity of the heavenly bodies controlled by our sun, in their orbits is not as high as 381·15 miles per second.

When we study the heavenly bodies, whether it be a star, or planet, or comet, or satellite, they appear to have received their own individual momentum, which defines their speed and determines their orbit. And no two of these are known to be absolutely alike.

When we study the orbital velocity of the planets, we find that:—

The Earth travels	18·38	miles	per	second.
Mercury	" 29·55	"	"	
Venus	" 21·61	"	"	
Mars	" 14·99	"	"	
Jupiter	" 8·06	"	"	
Saturn	" 5·95	"	"	
Uranus	" 4·20	"	"	
Neptune	" 3·36	"	"	

And we also find that the sun and his retinue of planets are journeying through space towards a point situated in the constellation Hercules; that in one year a distance of 153 millions of miles is traversed, the rate being about four miles (4·75 miles†) per second.‡

When we consider the satellite of the earth—*i.e.* our moon, we find its velocity to be only 0·62356 mile per second.

The greatest velocity we have found then among the planets is the velocity of Mercury in its orbit, which is 29·55 miles per second, the planet having a mean distance of 35¾ millions of miles from the sun, and the least velocity is that of Neptune in its orbit, which is 3·36 miles in one second; the mean distance of Neptune from the sun being 2,780 millions of miles.

Let us now consider the velocity with which comets travel and afterwards the stars. The great comet of 1680 "dashed in upon us," says Parks,§ from a region outside the supposed limits of our system, scorning to travel by any known pathway cutting across all orthodox and established orbits, rushing, like some wild phantom that had broken loose out of the abyss of space, close up to our central sun (166 times nearer the sun than the earth is||) steering short round in a sharp and violent curve with a speed of one million two hundred thousand miles an hour [or 333·34 miles per second] at the turning point and then going off not recklessly at a tangent as if uncontrolled by law, *but in a path exactly similar to that of its arrival*, showing for the first time to the watchful astronomer [Newton] who had found a key to the hitherto sealed up mystery that even his lightning-winged traveler was being guided and curbed by a definite check-rein never before suspected."

The no less remarkable comet of 1843 approached still nearer the sun than the comet of 1680, when at its perihelion it was less than 70,000 miles from the sun's surface. "Its* orbital velocity at that time was 350 miles per second; and it accomplished a semi-revolution around the sun in the astonishingly short interval of two hours."

So much for comets; now for the stars. In Groombridge's Catalogue a small star numbered 1830 is found to be rushing through space at the speed of 200 miles per second.† Referring to the inconceivable speed at which this star is moving, Prof. Newcomb, after an elaborated calculation, remarks—"It, then, the stars in question belong to one stellar system the mass or extent of that system must be many times greater than telescopic observation and astronomical research indicate. We may place the dilemma in a concise form as follows:—Either the bodies which compose our universe are vastly more massive and numerous than telescopic examination seems to indicate, or 1830 Groombridge is a runaway star, flying on a boundless course through infinite space with such momentum that the attraction of all the bodies of the universe can never stop it. Which of these is the more probable alternative we can not pretend to say. That the star can not be stopped, nor bent far from its course until it has passed the extreme limit to which the telescope has ever penetrated, we may consider reasonably certain. To do this will require two or three millions of years. Whether it will then be acted on by attractive forces of which science has no knowledge, and thus carried back to where it started, or whether it will continue straight forward for ever, it is impossible to say." As this star according to Prof. Newcomb has "the highest velocity of any heavenly body,"‡ it is unnecessary to consider any other.

As regards meteorites, however, it may be well to say that the difficulty in obtaining their exact velocity is very great, there is, however, on record, an account of a meteor which was observed 90 miles above Frome, in Somersetshire, it moved until it disappeared 27 miles over the sea near St. Ives, in Cornwall. The whole length of its course was about 170 miles, which was performed in a period of 5 seconds, thus giving an average velocity of 34 miles per second.§ For the application of the facts presented, I have concluded to discuss them indirectly from the standpoint of the intensity of gravity due to the earth's mass.

In the formula

$$v = \sqrt{2\,g\,r.}$$

If we make g=32,088 ft. and r=20,923,596 ft. their equatorial values then $v = 36644{\cdot}135$ ft. or 6·9401 miles. Hence the terminal velocity of a body falling from an infinite distance to the earth will be less than seven miles per second.

It follows from this, that if a body were projected from the earth with a velocity of seven or more miles per second, such projectile would pass away and out from the *controlling* influence of the earth—for we must bear in mind the fact already stated, that an attracting body can destroy in a projectile thrown from it no greater amount of velocity than it can impart to a material mass falling toward it from an infinite distance.

So that if a projectile were fired vertically at a velocity of 9·9401 miles per second, while the gravity exercised by the earth would in time neutralize (so to speak) 6·9401 miles of its velocity, the projectile would still have a velocity of two miles per second to propel it away from the *controlling* influence of the earth. If, however, the projectile has an initial velocity less than 6.9401 miles per second such projectile will be *controlled* by the gravity exercised by the earth and if the velocity is not too high, the projectile will strike the earth on its return journey. If, on the contrary, the velocity is such that the gravital attractive force of the earth is unable

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* Read before the N. Y. Academy of Science, in Columbia College, Dec. 5, 1887.
† Natural Philosophy, p. 47.—Quackenbos.
‡ Ency. Brit., 9th Ed. Astronomy.—Proctor.
§ Prin. of Phys.—Daniel, p. 433.
|| Johnson Cyc. Light.—Barnard.
** The air acts only as a conductor for the transmission of sound-force.
†† Sound.—W. H. Stone, p. 51.
‡‡ Sci. Amer., Nov. 18, 1876, p. 328.
§§ Prin. of Light and Color, p. 108.—Babbitt.

* Analytical Mechanics.—Peck, p. 133.
† Astronomy.—Norton, p. 260.
‡ Unfinished Worlds.—Parkes, p. 201.
§ Unfinished Worlds, p. 115.
‖ Astronomy.—Norton, p. 139.

* Astronomy.—Norton, p. 139.
† Ibid.—Parkes, p. 202.
‡ Letter to the author, Nov. 7, 1887.
§ Astronomy.—Ball, p. 49.

to make it fall to a greater extent than the curvature of the earth falls away, then between this point and 6.9401 miles velocity an orbit will be made for the projectile and it will continue to revolve round the earth.

And here we come to an extremely interesting point, which may be stated as follows:—After an orbit is once formed for a body—does such body have an accelerating fall? As this point is best discussed by taking the moon into consideration, we will refer to this satellite for our answer. We will all remember that Newton claimed to have demonstrated that the fall of the moon from an imaginary fixed tangent was an accelerated fall, and therefore the attraction of gravitation at the moon is just the square of the earth's radii from the earth to the moon, less than at the earth's surface.

The correctness of this position was, I believe, first questioned by Dr. A. Wilford Hall. Let us therefore stop and consider this statement for a few minutes:—

In attempting to demonstrate that the moon not only actually falls but has an accelerated fall. Newton assumed a fixed tangent from which to measure, and then assumed that the moon falls toward the earth or leaves this line vertically, in following its curved path, at a rate of acceleration or increase of distance corresponding exactly to the acceleration of the fall of a stone on the earth's surface, only the moon's fall from its tangent is but the one 3631·6774th $(60·2634)^2$ as much as the fall of the stone here in the same time. In this way it is aimed to show that the earth's gravity is but one 3631·6774 as strong at the moon's orbit as at the earth's surface, and hence that the gravity of the earth decreases as the square of the earth's radii counting the radius 3962·9 miles and 60·2634 of these radii from here to the moon. This latter result is *practically* correct, as the distance from the earth to the moon is very great, in consequence of which the side pulls exercised by every particle of the earth on each side of a vertical line connecting the centres of the two bodies are very acute, making the combined pull almost the same in effect as if exerted in a line joining their centres.

I say that this result is *practically* correct, yet no evidence as to its correctness can be obtained from any imaginary accelerated fall of the moon from a fixed tangent.

It is claimed, then, that the moon is kept in its orbit by the attraction of the earth pulling it from its rectilinear course, and that the fall of the moon in a second of time is nearly the 3631·6774th part of the 16·1 ft. fall per second of a body on the earth's surface.

Prof. J. Muller* has said if Newton had done nothing more than demonstrate this—"this single discovery would have sufficed to immortalize his name."

Newton immortalized his name in many other ways than this, so that if this so-called demonstration can be shown to be incorrect, the further perpetuation of his name will not be affected.

I propose to demonstrate that the fall of the moon from an unimaginary fixed tangent does not correspond with the fall of a stone at the earth's surface when reduced $(60·2634)^2$. In the first place, let us ask why a second of time was chosen and not ½, ¼, or 2, 3, or more seconds to estimate the fall of the moon. "One would think," says Dr. Hall, "that a second of time was an eternal adjunct of nature's operations, exactly adapted by the Creator to the stone's fall and to Newton's method of demonstration." We must not forget that *seconds* are arbitrary divisions of time, instituted for human convenience and that they have no necessary connection with the phenomena of nature. To how few, if to any, has it occured that it made any difference, if a second or any possible division of a second or number of seconds were taken! The fact is, if the calculations are made accurately, Newton's supposed demonstration is shown to be fallacious, no matter what length of time is considered.

I propose to show that there is no actual fall of the moon from a tangent, and consequently no actual acceleration but an apparent fall constantly taking place, since the moon's line of tangential force is a real line; but as it keeps constantly shifting *every instant of time*, to keep pace with the moon along with its orbital path, changing its direction every instant, the moon cannot of course *actually* fall *from it*, though it apparently falls from it, since it continually falls from the line the tangent has occupied the instant previous. That we can not assume a fixed tangent even for a small fraction of a second, to measure the moon's supposed fall, must be evident, since the pull of the earth's gravity or line of direction would be backward, instead of at perfect right angles as it must be, all the time, in order to produce circular or orbital motion. Hence the true tangent of the moon or its rectilinear tendency must be changed, every instant of time, to keep up this right angled measurement of pull, and consequently the apparent fall of the moon from such ever changing tangent, must be an absolutely uniform motion as the work of gravity alone.

G. R. Hand has stated*—"In the case of the stone, the two moving forces, momentum and gravity, act in the *same direction*, while in the case of the moon, the two acting forces operate at right angles to each other. Should either force cease acting on the stone at any instant, the other would continue to carry the body *in the same direction;* but should either force cease acting upon the moon at any instant, the other would carry it to the direction of its own force and at right angles to the line of the ceasing force. "Is not this," says Hand, "enough to suggest the absurdity of Newton's demonstration and show that no natural or necessary relation exists between the acceleration of a falling body here, and the so called fall of the moon from its tangent?" Surely, for the moon to fall and acquire acceleration the tangential or projectile force of the moon must vanish or stop acting for a time—for if it did not, then there could be no possible fall or acceleration whatsoever!

It is perfectly evident, then, from a close study of the subject that the apparent fall of the moon from its tangent can not be as the square of the time even for a "very small arc," but may be the same in one second as in another second if mathematically calculated, since the tangent constantly keeps pace with the moon.

To employ ever so small an arc is to vary the direct pull of the earth just that much, while to draw a new tangent for the moon to fall from every second or so, is to suppose the earth's attraction to act on the moon's fall by fits and starts, beginning each arc or second strong, and getting weaker towards its close. But to suppose the tangent to change at every instant of time and thus keep the line of direction of the earth's attraction at its maximum, or at perfect right angles to such tangential force, is to keep the moon's apparent fall from the tangent constantly and mathematically uniform.

A tangent line cannot therefore be imagined fixed even for the thousandth part of a second, unless we also imagine gravity to cease acting for the same time, in which case the tangent would of course be fixed, and the moon, in proof of it, would instantly commence following it in a straight line.

I have made the following mathematical calculations to demonstrate the fact that the moon has no actual accelerated fall, but only an apparent fall, from which the attraction of gravity, at the moon compared with that at the earth's surface, cannot be deduced in the manner in which Newton claimed.

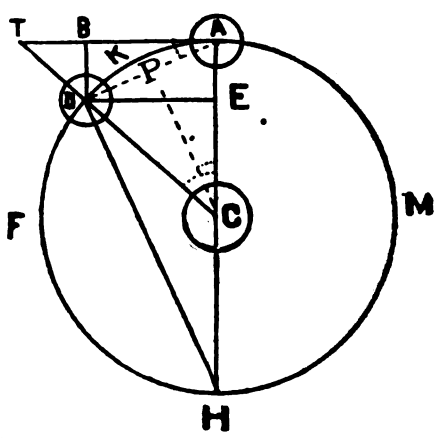
Let us assume the orbit of the moon (as Newton did) to be a circle: Then let us consider the $\frac{1}{27}$ part of its orbit over which the moon passes in 614.7452925 minutes or 36,884·71755 seconds.

From Fig. I (see note) we find that BD is equal to 1150·086 miles. Now the fact is, if the fall of the moon was an actual accelerated fall corresponding to the fall of a stone towards the earth, reduced the square of the earth's radii between the earth and the moon, then the fall instead of being 1150·086 miles should be 16·981 miles less or 1,133.105 miles, (assuming gravity not to be variable). Newton's mistake was in not considering the difference in the length of the cord AD and the length or path of the arc AKD. It is true this difference is very small for such a short interval of time as one second, but such difference becomes greater for every additional second. As for example, when we consider 36,844·71755 seconds the difference amounts to 7.334842 miles, a distance the moon requires 11.6023 seconds to move over.

If the force of gravity were to cease acting for one second, the moon instead of following its orbit would travel to some point such as T. If, now, gravity again came into action, since the direction of gravity is toward the centre, the moon would be attracted in the direction of the line TC and would follow that line if its tangential force were destroyed sufficiently long for it to reach the point D.

It would be of interest to know, then, the length of the line TD., which naturally is greater than BD or AE. Assuming the same state of things for a period of 36,884·71755 seconds we would deduce TD equal to 1172·59 miles instead of 1133.05 miles, a difference of 39·485 miles. If we consider the $\frac{1}{3681 \cdot 81 \cdot 81 \cdot 81}$ part of the orbit which is passed over in 40.072285 minutes, by calculation TD would be equal to 4.77645 miles instead of 4.836 miles.

Newton argued from Fig. I that as AFH is a semicircle the angle ADH is a right *angle*, therefore by geometry $AD^2 = AE \times AH = AE \times 2r$. Then he says if AD is taken very small, as for instance the distance the moon would travel in one second, the cord AD may be regarded as identical with the arc AD. Here is exactly where the the error comes in, for while in such a small arc as 0.623565 mile, there is only a



very slight difference, yet there is some, which difference becomes clearly manifest when we consider the arc traversed in more than one second; as for example 36,884.71755 seconds, which difference amounts to 7.334843 miles. To be scientifically accurate it must be conceded we cannot admit errors into our deductions.

I am quite familiar with the fact—that for theoretical purposes the moon's orbit may be considered a figure having an infinite number of sides, the same as a circle may be considered a polygon with an infinite number of sides; still if we give a definite length to the sides, as we must when considering the so called accelerated fall of the moon in one second of time, an important error creeps in. For in one second the arc over which the moon has passed is 0.623565 mile and the cord of necessity must be less. This cord being the resultant of the two forces operating on the moon. Newton's method so far from determining, that the so called fall of the moon from an imaginary fixed tangent was an accelerated fall, simply determined the curvature of the moon's orbit, the same as we will have to do when considering the curvature of the earth as a sphere. And as we have shown that the fall of the curvature of the moon's orbit from a fixed tangent to its surface does not correspond to the fall of a stone at the earth's surface, reduced $(60.2634)^2$ radii.

We therefore claim to have demonstrated that the moon does not have an accelerated fall from an imaginary fixed tangent, (so to

§ Prin. of Phys. and Meteorology.

* *Microcosm.* Vol. II, p. 55.

speak) but only has an apparent fall, its motion being uniform except as *accelerated or retarded* by the sun and earth, owing to its orbit being elliptical instead of circular.

Hence the attraction of gravity at the moon compared with that at the earth's surface can not be deduced in the manner in which Newton claimed.

[NOTE.]

Mean distance of moon from earth } 238,818 miles. (Proctor).

Diameter of moon's orbit=477,636 miles. Circumference of moon's orbit=1,500,541·2576 miles=7,922,857,840·128 feet.

Lunar month=27d. 7h. 43·7m. (Proctor). Complete revolution in 2,360,621·9232 seconds.

Velocity of moon along orbit=3356·2586 ft. per second =0·6235653 miles.

LET US CONSIDER $\frac{1}{64}$th of the moon's orbit, which is equal to 123,794,653·436545831 ft., and which is passed over in 36,884·71755 seconds.

Now a stone falling towards the earth for 36,884·71755 seconds would fall through a space ($s=\frac{1}{2}$ ft.²) or $(36,884{\cdot}71755)^2 \times \frac{32{\cdot}2}{2} = 21827579445{\cdot}007152$ feet, or 4,115,071·86458 miles.

The moon is 60·2634 radii (Proctor) from the earth, (Radius of earth at equator is 3962·9. Proctor). To determine then, the distance the moon should fall in 36,884·71755 seconds to correspond with the fall of the stone, we must divide 4,134,011·25852 miles by $(60{\cdot}2634)^2$ or 3631·6774 we thus obtain **1133·105 miles.** (Gravity not taken as variable).

Referring now to Fig. I.: We find the *arc* A K D is greater than the cord A P D, and it is plain to see that no matter how small an arc is considered there is always a theoretical difference, which if overlooked, and if the error is multiplied, it soon becomes appreciable.

What we want to know is: 1st. The length of the arc A K D. 2nd. The length of the cord A P D. 3rd. The difference, and 4th the height of B D or A E.

We have

$$\angle A C D = \frac{360^\circ}{64} \text{ or } 5^\circ\ 37'\ 30''.$$
$$\angle A C P = P C D = 2^\circ\ 48'\ 45''.$$
$$D C = A C = 238{,}818 \text{ miles.}$$
$$\frac{A P}{A C} = \text{Sin. } 2^\circ\ 48'\ 45''$$
$$A P = \text{Sin. } 2^\circ\ 48'\ 45'' \times A C.$$
$$A D = 2(0{\cdot}049068 \times 238{,}818 \text{ miles}).$$
$$\text{Cord A D} = 23438{\cdot}623248 \text{ miles.}$$
$$\text{But arc A K D} = 23445{\cdot}9570902 \text{ miles.}$$

$\therefore$ Arc A K D > Cord A D by **7·334842 miles.**

Now the moon travels 0·623565 mile per second.

$\therefore$ To travel 7·334842 miles 11·6023 seconds would be required.

At the earth a stone would fall 2167·2751 feet in 11·6023 seconds or 0·41027 miles. (Gravity not considered variable).

To find the height of B D or A E, we have

$$\frac{B D}{D A} = \text{Sin. D A B}$$
$$\therefore B D = D A . \text{Sin. } \angle D A B.$$
$$D A = 23438{\cdot}623248 \text{ miles.}$$
$$\angle D A B = 2^\circ\ 48'\ 45''.$$
$$\text{Sin. } 2^\circ\ 48'\ 45'' = 0{\cdot}049068.$$
$$B D = 0{\cdot}049068 \times 23238{\cdot}623248 \text{ miles.}$$

$\therefore$ B D or the height of the fall from the imaginary fixed tangent from B to D is **1150·086 miles.**

But we found that the moon should fall only **1133·105 miles** to correspond with the fall of a stone at the earth in the same time or in 36,884·71755 seconds (=614·7452925 minutes or 10·245754875 hours).

The moon therefore falls (so to speak) 16·981 miles further. Now if A D is to be considered equal to the arc A K D, then as the moon has to travel 7·334842 miles further, occupying 11·6023 seconds, while taking this path instead of taking the path of the cord A D—then we should not consider 36,884·71755 seconds in the above case, as regards the fall of the stone to the earth but should consider 36,884·71755 seconds less 11·6023 seconds or 36873·11525 seconds in which time the stone would fall 4,115,071·45131 miles, which, when reduced, the square of the earth's radii between the earth and moon, gives 1133·104 miles as the fall (so to speak) the moon should make to correspond with the stone's fall. Thus it is shown that the moon falls (so to speak) 16·982 miles more than it should to correspond with the law laid down by Newton.

If A K D=$\frac{1}{64}$th part of the moon's orbit, passed over in 40·072283 minutes or 2404·3371 seconds.

We have

$$\text{Cos. of A C T} = \frac{A C}{T C} = \frac{60{\cdot}2634r}{(60{\cdot}2634)r + d}$$
$$\text{Cos. A C T or } 0^\circ\ 22'\ 0'' = \frac{360^\circ}{981{\cdot}818181}$$
$$0{\cdot}99998 = \frac{238818}{238818 + d}$$
$$d = 4{\cdot}77645 \text{ miles.}$$

Stone's fall towards earth in 2404·3371 second reduced $(60{\cdot}2634)^2 = 4{\cdot}836$ miles.

Prospectors for gold in Calaveras county, Cal., have discovered a curious mountain. Its substance was found to be various varieties of ochre. The find was a veritable mountain of paint, containing all the primary colors with all their various shades.

MORMONISM.

BY J. R. PRIOR.

MORMONISM as it exists in Utah is an ecclesiastical despotism under the cloak of personal liberty. It is not simply a religious sect, but as well a sort of political and business institution. This it was originally intended to be by the founders and this for their own self aggrandizement. Religion was only one part or element of it. The religious sentiment of the human heart was originally and is to-day made use of by the leaders as means to a selfish end. The unscrupulous demagogues who concocted this outrageous scheme, called it a Church the more effectually to control their deluded followers.

A careful study of the nature and working and history of Mormonism establishes the truth of this position beyond the possibility of doubt. Mormonism as a religious and political institution has highly criminal and very immoral features. As a political power it claims to be a civil government with all the machinery and functions and powers and rights of any supreme government. It recognizes allegiance to no government and assumes its authority direct from God through the head of the so-called church. *Its subjects are the sworn enemies of the United States government.* Its design is to overcome and destroy all the governments of the earth and to hold absolute and universal sway.

Among its criminal and immoral features are, polygamy, blood-atonement, daniteism, a system of spies and decoys, and the manufacture and sale of intoxicating liquors.

The distinguishing doctrines of Mormonism, such as marriage for eternity, husband saving wife, men becoming gods; that there are many gods and that the gods marry and have many wives each; these I say, are shameful and debasing and corrupting in the extreme.

The Endowment House ceremony strips Mormonism of all religious sanctity and shows it to be a scheme of purely human, or more properly speaking of devilish origin.

The outworking of these principles is terrible, and necessarily produces the most dreadful social and moral evils. Error always works evil, and the worse the form of error the greater the evil. Hence the awfully blighting effect of Mormon teaching and practice.

The government, of course, interferes with Mormonism only in view of its treasonable political nature and its many criminal features. In these respects it is not only the right but the imperative duty of the government to deal with Mormonism, and that too with an *iron hand.*

How, now, can we get rid of this monster political and social and moral and religious crime and pollution?

First. By the establishment of Christian schools and giving the people the pure Gospel. This is being done now with considerable enthusiasm. But frequently the schools have too great a secular element and not enough religious. Again, there is too much sectarianism on the part of the different denominations in attempting to plant the Gospel in Utah. These two evils should be avoided.

Second. The duty of the government in using all the means at command is imperative.

Among these are some which have so been neglected. 1. Prohibiting Mormon immigration. A very easy thing. 2. Disfranchising the Mormons or if necessary all the people of Utah. This is very important. 3. *Securing an amendment to the National Constitution against polygamy.* This is very urgent.

Now it is the solemn duty of the Christian people of the country and all good citizens to see to it that Congress act promptly in carrying out these necessary measures. Especially the last named calls for *immediate action.*

A map of the world made in 1529, received at the State Library in Albany, although made long before Henry Hudson was born, shows the Hudson River on it. It is a fac-simile of the map by Ribero, called the Borgian map. Who discovered the Hudson River is, therefore, still an open question.

CARMEN MYSTICUM.

Dear Lord, since Thou did'st make the earth,
Thou mad'st it not for grief, but mirth:
Therefore will I be glad,
And let who will be sad.

For if I load my life with care,
What profits me the buxom air,
And what the sweet birds' choir,
Or heaven's azure fire?

But if I cannot choose but weep,
Weeping I'll think I do but keep,
Till Thou shalt bid me wake
And triumph for Thy sake.

Lord, as 'tis Thine eternal state
With joy undimmed to contemplate
The world that thou hast wrought
As mirror for thy thought.

So every morning I would rise,
And offer thee for sacrifice
A spirit light and clear
As Thy wide atmosphere.

For, Lord, since all is well with thee,
It cannot well be ill with me.

"D" in *Spectator.*

ROBERT ROGERS.

WE were pleased to have a very pleasant Christmas visit from the former office editor of the *Arena* during the vacation of the college he is now attending near Washington City. He is there taking a regular five years' course of instruction preparatory to a career of usefulness which none will doubt who knows his remarkable intellectual ability.

Good manners and good morals are sworn friends and firm allies.—*Bartol.*

Dr. Riegler, of Pesth, Hungary, has succeeded in photographing a projectile fired from a gun during its passage through the air at the rate of 440 meters per second.

A Yale diploma, 122 years old, was recently picked up at an auction sale in New York. It belonged to Rev. Elam O. Potter, who was graduated in 1765, under President Clapp.

Recent delicate scientific experiments have discovered the fact that the surface of the land is never absolutely at rest for more than thirty hours at a time. Thus, those great earthquakes which make epochs in history are merely extreme cases of forces that seldom sleep.

The Italian Government has ordered the excavation of the site of the lost city of Sybaris, in that part of Southern Italy known as "Magna Grecia." The city lies seven feet under the water of the river Crati, where it has reposed for twenty-five centuries. The results are expected to be as interesting as those attending the resurrection of Pompeii.

Dr. Jessup, of Beirut, writes that "the Sultan of Turkey has set his seal of imperial approbation upon thirty-two editions of Arabic Scriptures, allowing them to be sold, distributed, and shipped without leave or hinderance." Two hundred and ninety of the books issued by the Beirut press have passed under examination in Damascus by the government officials, and have received authorization.

In the course of some improvements which are being carried out in the market place at Mayence, some masonry, belonging to the old Roman times was laid bare, and in it a very well-preserved legionary monumental stone bearing the inscription, "Leg XIIII G. E. M." The stone was nearly 22 inches long by nearly 12 inches broad. Quite near it was a Roman fireplace with the ashes still *in situ.* The chimney, also well-preserved, was made of earthenware pipes, which fitted exactly into one another.

THE SCIENTIFIC ARENA.

[Successor to THE MICROCOSM, Founded 1881.]

OFFICIAL ORGAN of the SUBSTANTIAL PHILOSOPHY.

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

PASTOR HENRY B. HUDSON, - - Associate editor.

Whole Series, Vol. 7. New York, Dec., '87–Jan., '88. Nos 7-8.

Subscription Price, $1.00 a Year.

Subscriptions must begin with June or December.

Remit by Postal Note or Money Order, Express, or Check, as convenient, to

D. K. ELMENDORF & CO., PUBLISHERS,

P. O. Box 1,200. 38 PARK ROW, N. Y.

For Advertising Rates Address Publishers.

(For "PUBLISHER'S NOTES" see also first and second pages of cover.)

THE SCIENTIFIC ARENA will continue to be the official organ of the Substantial Philosophy. Dr. A. Wilford Hall, Ph.D., LL.D., will remain editor-in-chief. Rev. H. B. Hudson continues associate editor. They, with the publishers, will exercise every proper means to add to the already large list of distinguished writers who contribute to the columns of THE ARENA.

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PROF. THOMPSON'S BOOK AND THE CHRISTIAN STANDARD.

A REPLY BY THE EDITOR.

We have examined with some care a small book written by Prof. Thompson in which he virulently attacks the Substantial Philosophy and especially the substantial theory of sound as advocated by ourself and by many converts to that system of scientific doctrine. This attack was begun about a year ago in a magazine called the *Disciple*, and was recently finished in the book referred to.

We replied in the *Arena* of last April, to his first article in the *Disciple*, and, as our readers well remember, showed that his entire effort at proving Substantialism "an old and long since exploded doctrine," as he then and there charged, was an abortive failure. He had found 'tis true, several old authorities who supposed that heat, light, electricity and magnetism were constituted of *material* particles, and one or two who supposed that *sound* might be constituted of the material substance of the sonorous body itself emitted through the air by its vibratory motion.

With these ridiculous proofs before him he triumphantly claimed to have shown that the Substantial Philosophy was but a revamping of such old, weak, and exploded fallacies of science. After thus having vented his puerile conception of Substantialism by mistaking its teaching for that of material sound, heat, and light-particles, he very naturally concluded that those gross and material views of the forces of nature had legitimately and truly given place to the present motion theories of modern science.

In our reply to that mistaken charge, which every reader of this article should re-examine if practicable before proceeding with this answer, we showed that Prof. Thompson (who wrote under the pseudonym of "Clarence" till the *Disciple* management suppressed it) had totally misapprehended the nature of Substantialism and of our new departures concerning the physical forces, and that instead of teaching, as he had stupidly supposed, that these forces were substantial emanations in the sense of *material corpuscles*, the whole nature and spirit of the new philosophy, as reiterated in various forms of speech throughout our writings for the last seven years, distinctly set forth that every form of natural force, physical, vital, mental, and spiritual, is an *immaterial* or *incorporeal* substance, and in direct contradistinction to *matter* even in its most refined and attenuated condition.

Thus his sagaciously but ignorantly planned "explosion" of the Substantial Philosophy as a long since abandoned theory, recoiled upon his own head, and showed that Substantialism, as opposed to the present mode-of-motion theories of force, was not only a radical departure but an entirely new scientific and philosophical doctrine. Whether this doctrine be reasonable or defensible is another thing entirely, and depends upon the solid scientific facts and arguments which have been brought and which we are still bringing to its support. This will briefly but tellingly be considered near the close of this reply.

"Clarence" (now changed to Marcellus Thompson) attempts in a subsequent number of the *Disciple* to answer our exposure of his maladroit escapade in thus inconsiderately caricaturing the Substantial Philosophy as a very gross form of materialism, which had, as he avers, been long since abandoned. And what kind of an answer does he give? Does he come up to the work like a man of honor and acknowledge after our conclusive proofs that he had been mistaken as to the teaching of Substantialism, which as we had shown by a dozen quotations from our writings totally repudiated the *material* nature of the forces? Not a bit of it. He was too much of the pettifogging trickster in his scientific discussions to be capable of such a fair, honorable and magnanimous course. Did he give even a single proof from any old authority to show that previous to the issue of the "Problem of Human Life" any writer had even hinted that sound, light, and heat were *immaterial* substances, thus to weaken our claim as the founder of a new scientific philosophy? No; he was at the end of his scientific tether in that direction, though we have evidence that he spent weeks in searching through all the old libraries in reach to try to find something which even by forced interpretation might help to justify his reckless assertion at the start of his crusade, that the Substantial Philosophy was "an old and exploded doctrine." He therefore gave that up, as shown by his silence, as soon as he had received the broadside from the April number of the *Arena*.

What next was it possible for him to do? He must do something or quit the field in disgrace. So he commences a search through our own writings for some defect in our language or inadvertency of expression in the terms we had employed, by which if possible to parry the blows our reply had given to his fabricated charge. And as a matter to be expected in a work so extended as was the "Problem of Human Life," so new to science, and in the line of which not a syllable had previously been written as a guide to the author's thoughts or pen, he naturally enough found some trivial errors and slips of the pen in the use of scientific terms—mere lapses into the old phraseology of science with which the author had previously been long familiar, and from the employment of which he had not at that early writing wholly recovered himself. The mental transition from the mode-of-motion theories of science to the new philosophy was too great and sudden a change for every word to be weighed or measured accurately, especially in the metrical edition of the "Problem," before Substantialism in its formulated sense had even been thought of. Hence in several instances the terms "matter" and "material" occur where the more generic words *substance* and *substantial* should have been used, an error which we had repeatedly corrected in our later writings during the last seven years, and which corrections necessarily grew out of our complete analysis of the entities of the universe with a view to the proper formularization of the Substantial Philosophy. What more reasonable or natural than this?

Prof. Thompson well knew of all these corrections of terms, having our revised use of such words right before his eyes in extended quotations from our later writings as given to him in our April article to which he was pretending to reply. Yet so intent was he upon suppressing the truth of what Substantialism really does teach that he goes on reiterating and gloating over those slips of language, written before the Substantial Philosophy was more than in its incipiency, knowing—yes absolutely *knowing*—that he was deliberately and wickedly misrepresenting Substantialism as now everywhere set forth in our writings.

If those early inadvertencies of language, without having seen our corrections, had been the cause of first misleading Prof. Thompson, why did he not say so in his reply, and like a fair-minded man admit that according to the Substantial Philosophy as since formulated, and as our quotations abundantly proved, he had been wholly mistaken in supposing it to be an old and exploded doctrine? No, he lacked the moral honesty to make such a manly and just confession, but prefers to darken the waters like a philosophical cuttle-fish by a persistent reiteration of our early but inadvertant use of the term "matter." If he is possessed of any such mental attribute as conscience, we predict that it will make him very uncomfortable when he shall come to read this merited exposure of his dishonesty.

Even the "Problem of Human Life," in which those very inadvertant terms occur, is full of the most explicit teaching, setting forth the physical forces, including sound, heat, light, electricity, magnetism, &c., as "incorporeal and immaterial substances" in contradistinction to gross matter, thus proving to a novice in philosophical research, not only that

the instances he quotes were inadvertencies, but that the old material theories such as those of sound, light, electricity, &c., which Prof. Thompson cites from Rossiter, Newton, Olmstead, and others, had no resemblance to Substantialism whatever as finally formulated. It is only a conscienceless quibbler and trickster who would try through a score of pages to force an identity when he knew that even remote semblance was wanting. And yet the editor of the *Christian Standard*, and some other editors, ignoring this self-evident want of all similarity between Substantialism and those old material theories, stultify either their intelligence or their moral sense by repeating the same stale slander, that Prof. Thompson had exploded Substantialism as an old and abandoned theory.

Now in thus frankly admitting, as we have already done on two separate occasions years ago in the *Microcosm*, that there were slight errors of the kind named in our first book on the subject of the physical forces, we do nothing more than other voluminous writers on scientific and philosophical subjects have done before us, especially when attempting to set forth doctrines new to the world.

Darwin, for example, in his revised editions of the "Origin of Species," takes back many things he taught, not by inadvertance merely, as in our case, but in the most positive and deliberate manner in his five earlier editions of that radical and revolutionary work; and not a man of any honorable feeling, who reads his book, but considers it creditable, rather than otherwise, that he has done so. It would be only the contemptible quibbler who would quote and reiterate and gloat, like a cormorant, over Darwin's mistaken views after his attention had been called by the author himself to the fact that they were mistakes and that he had abandoned them. Yet this fresh young critic, knowing that we had repeatedly corrected those defective expressions, quotes whole pages from our metrical book—by the way a purely fanciful production—in order to reiterate what he knew to be a deliberate perversion of our views as held and advocated for more than seven years past. If the opponents of Substantialism can get any aid and comfort from the criticisms of such an abettor of materialism after this exposure of his animus, they are welcome to it.

In addition to those repeated corrections, we say here that we contemplate when time and opportunity shall afford, and have so contemplated for years, the complete revision of the "Problem of Human Life" for permanent preservation, in which its minutest arguments, calculations, explanations of facts, and especially its employment of terms shall be made to agree with the late and revised explanations of Substantialism as they have appeared for seven years past in the *Microcosm* and *Scientific Arena*.

Now a word as to the animus of Prof. Thompson in his criticisms of our publications and especially of the Substantial Philosophy. His original aim, according to his own admission, was virtually to show his smartness, or to obtain experience in writing against the popular doctrine of Substantialism, just as Tom Paine exercised his literary and critical powers in writing against the truth of the Holy Scriptures. It was the mere sport of a boy in firing from a safe distance at larger game than he expected to bring down, just to get his hand in and acquire the name of having made such prodigious attempts. He says:

"Not that I thought this ancient doctrine [the wave-theory of sound] was in any danger have I written this review, *but I have written it because I thought it a good subject on which a young man might exercise his inexperienced pen.*" Page 154.

And we assert our belief with the firmest conviction that it was not because he did not believe the Substantial Philosophy to be true that he wrote his diatribe, but for the same purpose as he states above, to get a little experience in opposing a true and important doctrine that was fast making headway against current science and by which he hoped to gain a little temporary notoriety from the magnitude of the undertaking he had essayed. His whole effort, however, is manifestly one of sarcasm and ridicule which any young man of the least versatility of language could easily accomplish just as successfully as he has done in a set effort to disparage the effect of the best philosophical and scientific books in the language. Any conceited young man, inflated with a desire for notoriety, could easily pen such language as the following:

"Dr. Hall has spoiled a great many pages of nice white paper *trying to make people sick by writing such stuff upon* it." "The Doctor has *wasted a great deal of printer's ink* in telling the world," &c. "In his book Dr. Hall has simply set up a man of straw and knocked him down again." "The doctor's vanity is astounding." "The writings of Dr. Hall are exceedingly intolerant in tone. The spirit in which the "Problem of Human Life" is written is *abominable*. Eliminate the *abuse* and the volume would shrink to about *one-half its present size*" &c.

We leave it to more than sixty thousand intelligent men who now own and read the "Problem of Human Life" to decide if there is one single passage to be found anywhere between its two lids which breathes half as intolerant, abusive, or "abominable" spirit as the language quoted above. With vastly more truth could it be said, if all the misrepresentation, ridicule, and reiterated criticism of inadvertant expressions, known to be such by the critic, were eliminated from this book of Prof. Thompson's there would be nothing left of it except the cloth, the boards and the gilding.

Take the fact that once by typographical error "four *square* miles" is used in the "Problem" instead of four *cubic* miles as was intended, and though in a score of instances in the same connection we had reiterated "*cubic* miles," basing our whole locust argument upon it, this malicious caricaturist regarded the slip of the proof-reader too sweet a plum to let pass, and he harps upon it, as if it were all that was needed to save the Wave-theory from destruction. Hear him:

"This wonderful mathematician who is to show that all others are frauds, does not know that there is any difference between a "square" and a cubic mile!" Page 76.

The exclamation point is his, and we can now retort in his own sarcastic language, merely changing the last word: "He seems to be *surprised* at his own *dishonesty*."

Take another example of his unscrupulous criticism, which is a fair representation of three-fourths of all his attempts to disparage our work. We quote:

"Blunders like the following, not being in the direct line of this review, need no discussion. On page 197 he speaks of a 'lump of ammonia.' *But ammonia is a gas, and we cannot have a lump of it.* On page 251 *he speaks of the air in hydrogen gas, and founds an argument on the supposition.* But pure hydrogen contains no air, and the atmosphere contains no free hydrogen. Such phrases as these are allowed to stand in the revised edition of 1878 which he says was wholly rewritten, and hundreds of Substantialists who think that their intellects are so exceedingly keen, that they can find a blunder in almost every line of a book written by a wave-theorist, have gone over these phrases many times and seen nothing wrong." —*Introduction*, page 9.

Now in our very heart we are sorry for this witless sciolist whose ambition for notoriety, inspired by an inordinate egotism, should thus have led him to the exposure of himself as here exhibited. In the first place it is absolutely and maliciously false—every word a fabrication—that we taught any such nonsense as that hydrogen gas contains air. On the contrary we were showing the absurdity of the idea that sound could travel through iron, water or other substances by means of air-waves, or by any other process than by the actual condensation and rarefaction of the iron and of the other conducting substances themselves; and we added that it would be just as ridiculous to assume that sound passes through iron by throwing the air contained in its pores into waves, as to suppose that sound passes through hydrogen gas by means of condensing the air contained in it. Here are our words in full, copied verbatim from the "Problem," page 251:—

"Besides, if it was *air* in the iron instead of the iron particles themselves which constituted the sound-waves, how does it happen that sound travels *seventeen times faster* in iron than in air, as calculated by such scientists as Newton, Laplace, Chladni, Savart, Despretz, Helmholtz, and Tyndall? (See Tyndall's *Lectures on Sound*, p. 39.) As all these substances just named are placed in contrast with air, each transmitting sound-waves with a different velocity, it is no more logical or reasonable to claim that it is the *air* in iron which furnishes the undulatory motion for sound than to suppose it to be the air in *hydrogen gas* which meets the same necessity, since sound passes nearly four times faster through such gas than through air."

Yet with this plain and unmistakable language before his eyes he deliberately, and as we believe with malice aforethought, falsifies our expressed views, thus showing himself to be unworthy of confidence in anything he is capable of writing. Those who may chance to examine his book need no better guide to its average accuracy even in its most unequivocal statements, than this specimen falsification. Let the rule be applied to every charge he records and the reader will know how to make the proper discount.

Then note his ridicule based on the "lump of ammonia." So anxious was he to make something stick against us that in this case as in the other just exposed he has the misfortune to put his sciolistic foot in it deeper than before. "Ammonia," he says, "is a *gas, and we cannot have a lump of it.*" Now let us give the ambitious young chemist a small "lump" of information of which he stands egregiously in need. Years ago in Volume III of the *Microcosm*, we laid down the law, then new to physical science, that the normal condition of all bodies is that of a *solid*, while both the liquid and gaseous conditions are abnormal, as the results of the addition of heat. Dr. Mott,

the distinguished chemist of this city, acknowledges this to be a new physical law and one of the most important generalizations of modern science; yet it had not reached the vacuum in our young critic's cranium. Ammonia is a gas only at a certain temperature; at a less temperature it is a liquid like water; at a still less temperature it becomes a solid like ice, having thus reached its normal condition. If one of the Professor's students should some day chance to bring from his laboratory a "lump" of this solid ammonia and hit the stupid critic between the eyes with it, he would be apt to receive a chemical and philosophical impression, as to the true nature of ammonia, which neither his education nor his reasoning powers will ever be likely to supply. It did not, however, occur to the critic that instead of *pure* ammonia we may have referred to a lump of ammonia as chemically combined with chlorine —sal ammoniac. He was after his big game with his "inexperienced pen," *and he caught it*, somewhat as the hunter had caught the bear—by means of his arms fast between her teeth!

Speaking thus incidentally of our newly discovered physical law—*that the absolutely normal condition of all material bodies is the solid*—reminds us of another of our critic's flippant charges, that Substantialism, unlike other scientific theories, had never pretended to announce a single new physical law. This, more graphically than anything else he has written, exposes either his mendacity or his stupidity. The truth is, Substantialism from beginning to end, is full of revolutionary laws and principles—necessarily new to science, because necessitated by the very basic departures it has made from the fundamental teachings of modern physics.

The great scientific law which wiped out the materialistic view that the universe consists only of matter and motion, was our first and chief physical discovery and philosophical triumph, namely, that besides *matter* and *motion* there was *immaterial physical substance*, including all the physical forces, in direct opposition to the prevailing doctrines of scholasticism that heat, light, sound &c., were modes of motion and nothing else. Was there ever a broader, more original, more radical, or more revolutionary physical law announced to the world than that *sound* instead of "atmospheric condensations and rarefactions" was an *immaterial substance*, and that the observed vibrations of the air were only an incidental effect, by which the whole world had previously been misled? Yet our experimental reviler says, in substance, that Substantialism has never pretended to the origination or proclamation of a new physical law.

The truth is the entire five volumes of the *Microcosm* and the two volumes of the *Scientific Arena* are full of new physical laws unavoidably growing out of the work of developing and formulating the Substantial Philosophy. We could, had we space, count off on our fingers one dozen of these laws the most radical and original ever recorded in scientific books. Take here, only one as a sample which dropped the theory of "Heat as a Mode of Motion" all into a heap at the feet of Prof. Tyndall, and left his ponderous volume by that name a shapeless mass of rubbish. It was this:—*that the heat observed in suddenly compressed air is not the conversion of the mechanical energy employed, as that theory teaches, but exists already in the air as an immaterial substance, though in a diffused condition, and that the reduction of the air in volume simply reduces the volume of the substantial heat contained therein, thus intensifying it.* (See *Microcosm*, Vol. V. Page 160.

We do not deny but that this new law on its discovery and announcement necessarily contravened our previous teaching on the cause of this observed heat in compressed air, which we had attributed formerly to the conversion of cohesive force into heat. It is the nature of a new law which sets forth any new truth in physical science to contradict previous teaching on the same subject whether by its author or by anyone else. Hence, it is not surprising, in our regular and progressive advancement in the discovery and application of new physical laws growing out of the fundamental truths of Substantialism, that some conflict should unavoidably occur with our earlier writings before these new laws had been discovered and worked out.

The Substantial Philosophy being of universal scope and application, will no doubt be a source of new and ever-recurring developments of truth for ages to come. It was not a freak of fancy, nor was it the spasmodic inspiration of an enthusiastic investigator. It grew out of the scientific necessities of the times, embracing for its foundation the fundamental axioms of universal being and involved at once the natural classification of all the substances in the universe into material and immaterial entities. As Substantialism consists in the progressive unfoldment of scientific and philosophical truth, its work in coming generations will still continue to be the development and classification of nature's laws in relation to her forces and observed phenomena to a final and complete apprehension of God as revealed in his word and works.

Now we wish to say, in emphasizing this reply to Prof. Thompson's attack, that either the wave-theory or the Substantial theory of sound must be false, since manifestly two diametrically opposite theories cannot both be true. We claim to be able to demonstrate the truth of the Substantial theory of sound, *first*, by the law of exclusion, as absolutely false and impossible, of the only other theory in existence, namely, that of the wave-motion of the air or of other conducting media; and *second*, by the inevitable analogies of the other natural forces such as electricity, magnetism, heat, &c., whose substantiality admits of no rational controversy. And we here assert that not one single difficulty has been presented by Prof. Thompson against the Substantial view or in favor of the wave-theory which we cannot easily answer and reconcile in harmony with the general principles of Substantialism as more recently formulated, while there are a score or more of considerations which bear absolutely against the wave-theory from its very foundation in the claimed "condensations and rarefactions of the air" up to its blowing out of a candle through a long tin tube by the clapping of two books together at one end, as set forth by Prof. Tyndall.

We do not say that every fact connected with even a true theory of science, should be or even can be fully explained or understood by man. We cannot, for example, tell how it is that substantial sound-force or substantial electric force can travel through a solid mass of iron, nor can we probably ever know how substantial magnetism can pass through solid glass and lift a bar of iron on the other side as if nothing intervened. But this limit to finite knowledge does not by any means conflict with the truth of the substantial theory of force or the doctrine that all force is *immaterial substance* rather than wave-motion.

But now a few words with regard to the arguments of the review, a matter which more than anything else interests us. We assert here again positively and conscientiously, after a careful examination of every criticism offered, that not the weight of a feather has been urged against our positions except in review of such inadvertant calculations and statements as we had distinctly ourself marked out for permanent revision.

For example: in attacking our now celebrated "locust arguments," his criticisms are confined to the mere stirring of the mobile atmosphere, which we admit and have long since admitted can be effected for a considerable distance by a very trifling body. But while harping upon this phase he is studiously careful not to touch the chief feature of that argument —one that is totally subversive of the Wave-theory—which involves the rapid alternate "*condensation* and *rarefaction*" of four cubic miles of air, to an extent of more than $\frac{1}{5}\frac{1}{5}$ of its normal density.

Prof. Thompson knows full well, though he lacks the scientific candor and courage to confess it, that if there is one grain of truth in the wave-theory of sound as formulated by Newton and Laplace and as everywhere taught in the colleges, the locust must by its physical strength alone, in the act of stridulating, produce the rapid alternate condensation, and rarefaction of that entire mass of air, thus exerting sufficient mechanical force to generate the heat required by that formula, namely, sufficient to change its density $\frac{1}{5}\frac{1}{5}$, thereby adding about one sixth or 174 feet a second to the velocity of its sound. He knows that this is in strict accordance with the current theory as everywhere taught, and as definitely worked out by Profs. Mayer, Tyndall, Helmholtz, and other physicists.

He knows also from repeated calculations of ours based on this change of density, namely, "$\frac{1}{5}\frac{1}{5}$" of four cubic miles of air, that this insect by its music alone must produce a mechanical compressing effect on the mass of air permeated by the sound, equal to the compressing power of more than 1,000,000 locomotives under a full head of steam, or a mechanical squeezing force of more than 5,000,000,000 tons, while at the same time repeating this almost incalculable squeezing effect several hundred times a second.

Now Prof. Thompson is not ignorant of the facts here named, and is mathematician enough to work them out for himself. He simply knows if there is a shred of truth in what he teaches that the *heat* required by the formula of Newton and Laplace, in the condensations of the air, absolutely represents this mechanical condensing force of "$\frac{1}{5}\frac{1}{5}$" change of atmospheric density as worked out by Prof. Mayer in his elaborate article on sound, in Appleton's Encyclopedia. The whole question has also been worked out and reiterated in different volumes of the *Microcosm* which he

had right before his eyes, and yet, notwithstanding he thought it "a good subject on which a young man might exercise his inexperienced pen," he did not dare to let his pen touch the gist of our argument lest this terrific million-locomotive squeezing-power insect would put a period to his experimental writing. Without even trying to hide the fact that he did not dare to attack our main argument based on the locust, he quibbled all around its outskirts, sneered at "the so-called locust argument," ridiculed the stupidity of believers in Substantialism, framed shallow illustrations concerning the ease with which air can be displaced or water can be thrown into waves by a pebble, and yet all the time, with the effrontery of brass itself, he hoped to keep his readers in ignorance of the fact that if there is one syllable of truth in the wave-theory as formulated in every text-book and taught in every college, that same locust in permeating four cubic miles of air with its sound must exert a mechanical squeezing force equal to the power of all the horses in America.

No wonder he sought by a cuttle-fish trick, not to come within squeezing distance of this locust argument. But the little insect will follow him all the same into his hiding place in the prairies of Kansas, and will buzz around his "inexperienced pen" till his conscience, as we hope, will force him to heed its stridulating admonitions and confess to his deluded pupils that the wave-theory of sound is one of the baldest scientific fallacies of modern times.

We will only add here as confirmation of the correctness of our assertion that Prof. Thomp- was afraid to face this squeezing argument of the locust, let any bright student of his class put the argument squarely to him as here presented, and watch the expression of his face. Of course he cannot reply, as he will not dare to deny that according to the mathematical formula of Newton, sound travels 174 feet a second *too fast* for the wave-theory of sound. Every text-book on physics admits this. He will not dare to deny, that, in order to save the wave-theory, Laplace fabricated his hypothesis of heat supposed to be generated by the mechanical compression of the air caused by the vibration of the sounding body and by the mechanical atmospheric condensations thereby sent off. He will not dare to deny that the heat thus generated, sufficient, as claimed to add the 174 feet a second to the velocity of the insect's sound throughout the entire mass of air permeated, *must be the result alone of the physical energy of that insect exerted in the act of stridulating.* And, finally, as this theory of condensation and heat, as founded by Laplace, accepted by the scientific world, and as taught by Prof. Thompson himself, has been definitely worked out by Prof. Mayer, the highest acoustical authority in America, our critic will not dare to deny but that the locust produces the actual mechanical pressure attributed to it, equivalent to a change of density of $\frac{1}{174}$ throughout the mass of air permeated, thus absolutely involving the dynamic effort of 5,000,000,000 tons of mechanical pressure as urged. Again we say, let any bright student of the Garfield University make this argument his own and modestly present it point foremost at Prof. Thompson, and then watch the expression of his face.

We are only stating a trueism well-known to every professor of physics, when we say that this phase of the wave-theory—the condensation, rarefaction, and consequent generation of heat—lies at the very foundation of present acoustical science; and that if this squeezing and heat-generating argument based on the locust cannot be successfully met, the wave-theory absolutely breaks down. And this is true, it matters not how many circumstantial phenomena may seem to favor "that ancient theory," such, for example, as the action of the phonograph, the acoustical telephone, vibrating sound on distant diaphragms, &c., all of which we are now fully able to explain in harmony with the substantial theory, though formerly we were not so clear.

According to Prof. Huxley, as well as according to all recognized rules of logic, one single consideration positively opposed to a theory will break it down as effectually as will five hundred, it matters not how many appearances seem to favor it. As this rule laid down by Prof. Huxley is, of such vital importance here, we copy it entire as follows:

"Every hypothesis *is bound to explain* or at any rate *not to be inconsistent with the whole of the facts it professes to account for!* and if there is *a single one of these facts* which can be shown to be inconsistent with (I do not merely mean inexplicable by, but contrary to) the hypothesis *such hypothesis falls to the ground—it is worth nothing. One fact* with which it is *positively inconsistent* is worth as much and is as powerful in negativing the hypothesis *as five hundred.*"—HUXLEY, *Lectures on the Origin of Species*, p. 140.

Now while we positively assert that not one single fact has ever been pointed out or, as we believe, can be, which is not easily and entirely reconcilable with the truth of the substantial theory of force, we find all nature full of facts not only inexplicable by, but absolutely contrary to the mode-of-motion theories of the forces as now taught in the schools. This proposition will be overwhelmingly justified to the conviction of unbiased professors of physics as our future investigations progress.

We will add in conclusion that if the opposers of Substantialism wish to spread our cause among all unbiased, level-headed scientific thinkers, let them go on with their abuse and sarcastic sneers while cautiously avoiding such arguments as here presented, based on the American locust. And if the *Christian Standard* wishes to do its protegé real good instead of heaping upon him fulsome flattery, let it advise him to act the part of a true scientist and in a manly way grapple with a few of our leading and formidable arguments against the wave-theory, such as the foregoing, before turning his precocious pen into the shallow channels of ridicule. A recent number of that now narrow and bigoted sheet speaks of Prof. Thompson's book as follows:

"Prof. M. Thompson, of Garfield University, has taken occasion to review, in the *Disciple*, the deliverances of the editor of the *Arena* on the "Evolution of Sound." Though still quite young, the Professor has handled the worthy Doctor with a coolness, a clearness and a skill that would do credit to a veteran. With a consciousness of reserve power, he has simply made game of the apostle of Substantialism, who has been nothing but a puppet in his hands. It is clearly shown that the boastful doctrine of Substantialism is at best a discarded doctrine of earlier and more ignorant times, and that its substantial feature has been sublimated to the merest moonshine, to meet the objections that cannot but arise."

In another number of the *Standard* its editor says:

"We read "Wilford's" ridiculous pamphlet on the Wave Theory of Sound when it first came out several years ago. It was so absurd that we supposed no one of average intelligence would accept its teaching. To our surprise and humiliation, however, we found not a few of our own preaching brethren who accepted the thing as simon pure "science." We might have remembered, though, that there are many intelligent people whose scientific attainments will not protect them from such specious impositions."

Now, all the older readers of the *Arena* know the animus of the *Standard* in this malignant thrust at Substantialism—a doctrine which every Christian editor should hail with gladness as the true scientific abettor and defender of the Christian religion. But on account of personal grudge, from having been worsted some years ago in a controversy with the *Microcosm* concerning the so-called fall of the moon from a tangent, the barbed arrow still clings in his vengeful vitals, and he takes every opportunity to vent his paroxysms of spite in the style here quoted. Before that controversy occurred, however, Brother Errett thought very differently of Substantialism and the "Problem of Human Life." He then spoke of the book as follows:

"The scientists who have dealt so flippantly with the solemn questions of spiritual and divine existence, and talked so vauntingly of their scientific demonstrations, will find that they have caught a Tartar. We cordially commend this work to our readers for earnest study."

The words here quoted effectually let the bottom out of the hypocritical statements copied above, "that the boastful doctrine of Substantialism is at best a discarded doctrine of earlier and more ignorant times." Shame on such mental perversity and depravity that will repudiate its own acknowledged and best convictions of truth and stultify itself out of personal pique when the editor knew, from our April reply in the *Arena*, that there was not one word of truth in the charge that Substantialism was "a discarded doctrine of earlier and more ignorant times."

It is lamentable, yes a disgrace to the cause of Christianity that its professed advocates out of personal animosity should revile and cast contumely upon Substantialism—the only doctrine of science or of human philosophy which pretends to meet the plausible and otherwise unanswerable materialistic claim that soul-force, life-force, mind-force and spirit-force are but the *motions* of brain and nerve particles which must necessarily cease to exist at death, as so triumphantly maintained by Prof. Haeckel. That great infidel naturalist proves this claim by the very motion-theories of modern science, insisting logically and irresistibly that if the forces of nature, such as sound, light, heat, &c., are but modes of motion of material molecules, then by every principle of natural analogy the motion-theory of soul, life, and mind must also be true, and consequently that *death ends all.*

Isaac Errett, the editor of the *Christian Standard* and the acknowledged leading thinker of the denomination it represents, knows that he could not answer that argument of Prof. Haeckel if he were to be drowned in the Ohio River as a penalty for his failure, except by calling to his aid the Substantial Philosophy, and thus, by demonstrating sound, light, heat and the other physical forces to be substantial entities, smash the claimed scientific analogy

which proves the soul, like sound, to be but a mode of motion. Yet he derisively, possibly without due thought, scoffs at this plank which has been kindly thrown to him and which is the only thing capable of keeping him and his entire religious plea from sinking out of sight. Was ever self-stultifying ingratitude more glaring and detestible?

When Prof. Haeckel's doctrine of the wave-theory of the soul was first announced in Germany, the clergy of the civilized world, educated in the motion-theories of the physical forces, stood appalled and helpless in the presence of that defiant scoffer of the University of Jena, until Substantialism arose in the power of its might and smote the beast between its two eyes by proclaiming the novel and revolutionary discovery that sound, the chief so-called mode of motion of modern science, was a substantial but immaterial force, thus wrenching the analogical sword from the hands of the atheists with which to slay materialism.

And what is the reward its discoverer has received for thus stepping into the breach and risking his all in defense of the doctrine of human immortality? Why, a young scientific vandal, professing to be a Christian, and now a professor in a Christian College, with his experimental pen dipped in the aloes of hate, tries to turn that Christian achievement into ridicule; while the editor of a professedly Christian journal, *par excellence*, either from stupidity or from malicious motives, abets this vandalism with a mendacity, which should bring shouts of approving triumph from the devil himself. Verily, an editor of a Christian paper who can mislead the public by speaking contemptuously and libelously of Substantialism, knowing what that philosophy teaches and how grandly it aids the cause of religion in its warfare against materialistic infidelity, is capable of becoming a Judas Iscariot armed with his thirty pieces of silver.

No, Bro. Errett, God and the religion you profess to love call upon you to repent of this cardinal error of your life, and to make amends to the readers of the *Christian Standard* before it is too late. You know better than you teach or permit to be taught in your paper, and every instinct of your intelligent nature assures you that it is criminality in the highest degree to contemn a scientific doctrine which has done so much to break the back of materialistic infidelity. We give you warning. You are an old man about of our own age, and time is short. Remember, you can no more mar Substantialism by such recreant self-stultification with all the professors of physics in the country to aid you, than you can scratch the surface of the polished diamond with a bar of soap. You may temporarily obscure its luster with the uninformed until such time as due replies shall follow, just as the bar of soap will temporarily mar the brilliancy of the purest diamond; but they will both easily wash off, and in either case the gem will be the clearer for the cleansing.

Better than printing such falsifications of facts, open up your columns to an equitable discussion of the merits of the wave-theory of sound between Prof. Thompson and ourself, which we are ready to begin at once and to reproduce in the columns of the *Arena*.

Bro. S. Richards, of Newton, Iowa, one of a number of readers of the *Christian Standard* who have sent us these clippings, says: "I'll give the *Standard* ten dollars if it will open its columns on equal terms to you and Prof. Thompson for a full discussion of the merits of the wave-theory of sound." We will double discount Bro. Richards' liberal offer and will pay the *Standard* $100 for such an opportunity. Will it accept the offer? We pause for a reply. And in the meantime we trust that the readers of that paper will raise such a storm around its editor's ears, as to compel him either to open up or shut up.

THE MEETING OF THE EVANGELICAL ALLIANCE.

BY THE ASSOCIATE EDITOR.

No more important gathering of the Christian forces of this country has ever been convened, than the Alliance Conference, at Washington, Dec. 7th, 8th and 9th. The most distinguished leaders and workers of all Evangelical Churches were present from all parts of the country. The one object was to confer upon the best methods of applying Christianity to the solution of the grave questions of society and government that seem to be shaping and molding the future of the country. The most courteous and cordial spirit of fraternity characterized every session, and the possibility of substantial unity was so clearly demonstrated that its importance was acknowledged as the prime necessity of the age. Bishop Harris, of Michigan, in a masterly address urging that one-ness of the Lord's prayer given in John XVII., uttered the key-note of the Convention in the sentence: "Co-operation must take the place of competition if the Church will respond to that prayer."

The perils that threaten the stability of our government were carefully considered. Dr. Dorchester, of Boston, read a paper on "The City as a Peril." It was shown that in 1800 one 30th of our population was gathered in cities of 10,000 and upward; in 1880, one-fourth, and at the rate of our present progress, 1900 will find one-half of our people massed in our cities. Again in 17 of our larger cities, more than one-half of the people are of foreign birth or parentage. New Orleans and Philadelphia have 51 per cent., Louisville, 53 per cent., Cincinnati, 60 per cent., Pittsburg, 61 per cent., Boston and Newark, 63 per cent., Brooklyn, 67 per cent., Jersey City, 70 per cent., Buffalo, 71 per cent., St. Louis and San Francisco, 78 per cent., Cleveland and New York, 80 per cent., Detroit and Milwaukee 84 per cent., and Chicago 87 per cent. of foreign birth or parentage.

Whatever diversity of sentiment this great number of foreign citizens may represent, ranging from mild socialism to wild anarchy, its proper and prosperous assimilation into American principles of government and citizenship is no slight undertaking. And if we add to the facility with which the untaught are graduated from alienism and granted the parchment of full citizenship, the alarming neglect of those who by birth and education should stand as the tutors, in all that pertains to efficient and intelligent citizenhood, to these liberty-loving and light-seeking multitudes, the problem increases in its gravity. One illustration will suffice. For the distance of 1½ miles on Fifth Av., above 14th St., N.Y. City, it is reported that only twenty-eight votes were cast in the last State election! And it is also asserted that in the squalid sections of the city, there were those who voted early and often. Why should the palatial Fifth Av. complain of the principles or persons that prevail in our government, so long as it shall continue to withhold its aristocratic self from the only possible correction of the evils that offend it?

"Immigration" was ably presented by Prof. Hjalmer H. Boyesen of Columbia College. We carefully quarantine against physical infection, while no safeguard is interposed against the worst phases of moral corruption, rushing like a mighty tidal wave from all parts of the world down upon our defenceless shores.

Pres. Gates, of Rutgers College, blistered the "Misuse of Wealth" in a manner calculated to restore a healthy circulation to any man, Church or community that shall come under his skillful treatment.

"Estrangement from the Church," by Bishop Hurst of New York, was an able statement of this increasing peril. The only amendment the writer would suggest would have been in the statement of the topic so as more accurately to state the fact, *i.e.* "Estrangement of the Church." The masses are always and freely accessible. The "Church" is not.

Bishop Coxe elucidated the peril of "Ultramontainism" in the terms and from the writings of its own friends. A skillful diagnosis of the true character of Jesuitism in all ages; a single abstract from a text-book approved by high Roman authority and in use in all the Catholic "parochial" schools in this country, being sufficient to show the Anti-American, as well as the Anti-Christian character of Ultramontainism.

"The Saloon." What gathering moral, political, or religious having at heart the high interests of mankind could fail to note the overshadowing menace offered to these interests by the saloon. Unequaled in moral turpitude. Undisturbed by moral instincts. Unapproachable in its diabolical organization, and devoted to the perfect and complete instincts of hell established upon earth, the saloon stands solitary and alone as the latest and greatest device of the arch-destroyer of body and soul. Dr. MacArthur of New York spoke valiantly words descriptive of its character, and then words of timidity and weakness characteristic of personal resentment and prejudice. In 1880 Boston had 1 saloon to each 329 inhabitants. Cleveland had 192, New York 179, Chicago 171, and Cincinnati 120 people to each saloon. In the Sixth Assembly District of New York there are 360,000 people, 31 Protestant Churches, and 3,018 saloons, or 100 saloons to each church. In the First Assembly District of the same city there are 44,000 people, 7 Protestant Churches and 1,072 saloons; or 153 saloons to each church! With such terrible facts uncontroverted, a great gathering of sturdy men bent upon relief is no place to elevate personal pride, made abnormally sensitive under public criticism.

"Perils to the Family," by Rev. S. W. Dike, of Mass., and the "Social Vice," by Col. J. L. Greene of Ct., were both admirable papers.

"Illiteracy," by Gen. Eaton, late U. S. Commissioner of Education, developed the fact that in 11 States the voters who can neither read nor write outnumber the taught; a condition of affairs that needs only the aid of class combination so popular in these days, to put 22 Senators in the United States Senate.

What was the conclusion compelled by such an array of Perils? That the panacea is the Gospel of Jesus Christ, and the method of its application must be the Evangelical churches. And thus it was with eminent fitness that the closing paper was upon "Individual Responsibility Growing Out of Perils and Opportunities," by Dr. A. J. Gordon, of Boston.

Altogether, the meeting was an historical gathering of notable men for a noble purpose. May the growing results be commensurate with the imperative needs!

In Sweden and Norway no intoxicant can be sold except at a place where good food, coffee, and other non-alcoholic drinks are also kept constantly on hand. The dealer is allowed to make a profit on these, but he is stringently prohibited from selling any liquor except at cost. The idea is that the dealer will thus endeavor to promote the sale of edibles and non-intoxicating drinks, upon which he does make a profit, and discourage buyers from drinking liquors upon which he makes none. It is called the "Gothenburg System," from the town in which it was first put in operation.

BOOKS AND PUBLICATIONS.

NYSTROM'S POCKET BOOK OF MECHANICAL ENGINEERING. Revised and corrected by Wm. Dennis Marks, Rh B., C.E. 19th ed., 1887, pp. 671. Publisher J. B. Lippincott Company, Philadelphia.

The engineer and student of science will gladly welcome this valuable Pocket Book, especially as it has been thoroughly corrected, revised and added to by Prof. Marks, of the University of Pennsylvania.

An elementary article on Dynamic electricity as also an article on the expansion of steam have been added by Prof. Marks. These greatly enhance the value of the Book. The fact that this Pocket Book has passed through eighteen editions is all that need be said in its favor. M.

ANATOMICAL TECHNOLOGY. By Burt G. Wilder, B. S., M. D., and Simon H. Gage, B. S. 2d ed. 575 pages. A. S. Barnes & Co., New York and Chicago, Publishers.

Students of Human, Veterinary and Comparative Anatomy will welcome the second edition of this valuable work, which furnishes explicit directions for dissection and for the preparation and preservation of anatomical specimens, as also a correct and clear account of the principal parts of an accessible and fairly representative mammal of convenient size.

The present edition contains much valuable information not contained in the former edition. Errors and oversights in the first edition have been corrected, and some changes have been made in the author's opinions owing to the progress in anatomical knowledge.

Figures representing the entire neurine in horizontal section have been introduced also, a figure representing the mesal aspect of a brain separated into its fine sucephomerts—and a figure representing the mesal aspect of a brain lacking the calloseum, also one representing a transection through the medicommissure.

Several tables have been revised and sixteen pages of new matter have been introduced. The book is printed in large type on good paper and is in every way for convenience of reference and study properly arranged.

We think highly of the work. M.

"WEALTH AND PROGRESS:" A Critical Examination of the Labor Problem, How to Increase Wages Without Reducing Profits, or Lowering Rents: The Economic Philosophy of the Eight Hour Movement. By Geo. Gunton, Price $1.00. D. Appleton & Co., pp. 382.

To that class of readers and students whose tendencies are conservatively progressive the above title will be acceptable; and it is to such that it makes an appeal.

The book is the joint labor of two workingmen. It originated in the mind of Ira Steward, a Boston machinist and reformer, and when, during the year 1883, he passed prematurely away he requested his friend, Mr. Gunton, the author, a mill operator of Fall River—to carry it forward to completion. In its latter stages it had the advantage of the sympathetic supervision of Parke Godwin, Esq.

Mr. Gunton had long been associated with Mr. Steward in reform, and there was perfect harmony between them. The book deals solely with natural forces in their economic relations. In some important respects it is intensely conservative. It accepts the wage system at present prevailing: or, looking upon its abolition as remote, it endeavors to make the most of its possibilities. It has no sympathy with Anarchism, and little or no hope from any reform in labor from ideal or spiritual sources. Its limitations come from the last direction.

The first chapter, on "The Relation of Labor to Production," fails to recognize the basic statement of Scripture, that all natural wealth belongs to its Creator, the Supreme Being, and more than this, it ignores the fact that whole groups of reformers have approximated the divine ideal in the statement that "natural wealth is not equitably verdible," in other words, that human labor, only, should be amenable to price.

In connection with the above, and in order to show how far an able and even gifted writer can darken counsel by inadequate conceptions and statements we quote the following remarkable paragraph. The italics are ours:

"*Distribution, as a distinct economic function, has no existence apart from production*—that is, there is no social factor whose normal function is to distribute wealth. It is true that wealth is produced by and distributed among the various members of the community; but the distinction between production and distribution is purely a metaphysical one; existing only as a mental concept, while as actual economic fact it has no existence. In a word, economic or industrial distribution is an inseparable and indispensable part of the necessary process of production, and cannot take place in any other way (except by charity or theft) which is uneconomic."

To the above it may be said that it is now fast becoming evident that there ought to be, even if there is not, "some social factor" to distribute wealth more equally than is done by wages. This conviction is taking form in profit sharing which is far from "charity"—it is justice. In another direction, Trade-Unionism has become an established fact, but the increased wages which it brings are not in any sense "theft."

We would not, however, deprecate the book in any other sense than the one already indicated. Read from its own premises, it is a contribution to economical literature of marked value; what those premises are will appear from the following paragraph taken from the preface.

"The central thought presented in this book, belongs to Ira Steward. By the central thought, I mean the idea that the standard of living is the basis of wages, and that social opportunity, or more leisure for the masses as expressed in less hours of labor is the natural means for increasing wages, and promoting progress."

Reasoning from the above base, Mr. Gunton demonstrates that there is no economic occasion or excuse for the present excessive toil. In doing this he criticises the wage-theories of Gen. F. A. Walker, Henry George, and Thorold Rogers. He then developes the subject historically, and topically, treating thus the question in various complex aspects as seen from its present exposures, making them all bear upon the reduction of the hours of labor.

The literary qualities of the book, and its general tone, may be inferred from the following extract:—

"Having through the more highly complex state of industry, lost the power to employ himself, the wage-laborer is compelled to work for others, whose sole object is to obtain from him the maximum amount of effort for the minimum reward. Consequently, when he is employed he is compelled, for the most part, through circumstances entirely in the hands of the employer except when limited by law or public opinion—to work as hard, and as long, as his physical and nervous energies will endure. This being the only condition upon which he can under the wage system obtain a livelihood; when idleness is forced upon him all his means of living are cut off."

"The *enforced* idleness of the modern laborer, unlike the *natural* idleness of the barbarian, and the aristocrat, does not consist of time, that is unemployed, merely because it is not necessary for the gratification of his wants but it consists of time, the use of which is indispensable to his very existence, except as he becomes a pauper or a criminal."

"Again the inability of the wage laborers to obtain a living according to the accepted social standard of their class is not only inimical to prosperity, and progress, but it is more dangerous to property and democratic institutions than is that of the barbarians."

First: "Because he is living in a more highly complex state of society he does not, like the barbarian, produce directly for his own consumption, but he produces what others consume, and consumes what others produce. Thus the consumption of the masses becomes the basis of the market for the wares of the whole community from whose transactions the income of all the other classes is derived, consequently the failure of the wage-receiving classes to consume—which enforced idleness implies—does not, as in the case of the barbarian, impoverish the laborer alone, but undermines the prosperity of the whole community—so frequently exemplified by industrial depressions."

Second: "The privations of the modern laborer are more dangerous to society than those of the barbarian This is because, having reached a higher state of social development, he is more sensitive to the needs and conscious of the rights of his industrial and social relations, and being more intelligent, he is naturally more powerful in producing a social and political tornado if the means of gratifying his established and recognized wants are cut off."

"The immediate and most important question, the answer to which is necessary to enable us to take the first correct step toward preventing enforced idleness, is, how to wisely and permanently increase the *leisure time* of the laboring classes. To this question, we are now in a position, on the basis of sound economic principles, to give a definite and emphatic answer, which is—*Reduce the hours of labor.*" E. H. R.

"UNFINISHED WORLDS" (A STUDY IN ASTRONOMY.) By S. H. Parkes, F.R.A.S., F. L. S.—$1.50. Pages 230. James Pott and Co., New York.

It is seldom one has the privilege of reading a work so full of interest and instruction from beginning to end as the present book. The author is master of his subject, and consequently able to express himself in a clear, readable, and comprehensive manner. We advise one and all to read this able production, knowing that all will be benefited as well as entertained.

The author is not a theorist, but prefers to deal with facts, cold and unaccomodating as they may be to some of the pet theories of the day. He refers to Professor Deschanel, who in his treatise on Natural Philosophy has thus defined Experimental Science: "It consists in observing facts instead of trying to divine them; in carefully examining *what really happens* and not in reasoning on what ought to happen." The discussion of the various theories advanced to explain the formation of the Universe are discussed from the basis of observed facts, and one theory after another is laid to rest as an illogical remnant of the imagination.

The author speaks of the difficulty of fixing upon a suitable title for a book, and that he felt this difficulty when he decided on "Unfinished Worlds," for he says "as a rule we have all a natural dislike to an unfinished thing." He however says, there are various senses in which this term may be used. "Indeed," he says "it would be difficult to say of any progressive thing or being, at what precise point or moment, absolute finish or perfection is attained . . . Change, ceaseless change, is one of the most evident conditions of material creations, whether organic or inorganic. Not only in one system, but in those distant star groups and scattered nebulæ which the telescope and the spectroscope have revealed, does the same law of change, growth, and decay exist. This, then, is the fact which the following pages are intended to elucidate."

The author commences with the consideration of nebulæ, and describes how Herschel with his large reflector swept the Heavens and determined what nebulæ could be resolved into distant star clusters and what remained in a more nebulous condition; and how Lord Rosse with his giant reflector showed that some of the nebulous conditions could be resolved into distinct points of light, and still some of the nebulæ remained unsolved; and this led astronomers to conclude that these were actually unformed luminous matter in various stages of condensation; which resulted in a general acceptance of what has been termed the "Nebular Theory." He tells how Dr. Higgins, with the spectroscope, examined an annular nebulæ in the constellation of Lyra and found that instead of giving out a continuous spectrum, as it would have done had the whole been a star cluster, exhibited only three bright lines, one due to Hydrogen and one to Nitrogen gas, thus proving the existence of luminous matter in its simplest, and apparently most diffused form; and luminous matter condensing in varying degrees, apparent toward the formation of a definite orb.

The author then discusses colored, variable, and temporary stars. He refers to Sirius, which has changed its color from red to white during the last 2,000 years and of the star "Argus," which not only changed its color from yellow to red, but its size from a fourth magnitude star to that of a second, and states that about 100 variable stars are recorded.

The sun is next considered, and the author states that one of the first definite facts which sun spots revealed was the rotation of the sun on his own axis, once in about 25½ of our days. Describing a sun-spot, he says: "A sun-spot is not a fixed depression in a hard substance, like the opening of a lunar crater, but a restless, changing, angry-looking thing. A great yawning gulf, suddenly opening in the middle of an ocean, would more appropriately represent it, supposing its waves were liquid flame." He states that a close connection exists between the appearances of sun-spots (the average life of which are about three months) and many of our well-marked magnetic disturbances, has

been fully shown. He says, "occasionally these so called 'magnetic storms' have occured, during which the compass has been wild with excitement; oscillating from 5 to 10 degrees within an hour or two." Speaking of the light and heat emitted by the sun he says, "if all the planets in our system were put together, the total sum of light and heat they receive would only amount to a 227 millionth part of the total quantity thrown out by the sun." He discusses the theories relative to the fuel of the sun and quotes from Young—who says "the total life of the solar system from its birth to its death is included in some such space of time as thirty million years."

The Planets are next considered, and the probability of their supporting life. "Mercury" is dismissed, as unsuitable, as its aqueous atmosphere would so retain the enormous heat it receives from the sun, that no kind of life that we have any conception of could be possible. "Venus" is likewise dismissed on account of excessive heat and cold. "Neptune" having a specific gravity slightly greater than water proves that it must be in a fluid or semi-fluid condition and therefore in only an elementary stage of world-formation. "Uranus" is also called by the author "another unfinished world." He speaks of the fact that the moons of Uranus revolve from east to west and not in the opposite direction as do all other satellites, and says "these moons present an astronomical puzzle of which, at present, no explanation has been given." "Saturn" is next considered, and the author states that the hypothesis now generally adopted to explain the nature of the rings around this planet, is that they are composed of myriads of small satellites each revolving in its own orbit, but so thickly aggregated together as to produce the appearance of a continuous surface. Langly, speaking of this planet, says "He is the lightest for his size of all the planets. In fact, he would float in water." In answer to the question, "What is the meaning of the light satellites which are circulating around Saturn at such immense distances," the author says, "WAIT." "Jupiter" is next considered, and the author says the satellites of this planet were nearly the first telescope discovery made by Galileo, and that the discovery met the same incredulity as befell Galileo's other announcements. One astronomer refused to put his eye to the telescope, lest he should be convinced. He soon after died; and when Galileo was informed of the fact, he sarcastically remarked, "I hope that he saw them when on his way to heaven."

Comets are next considered; and the author states that it has been proved without doubt that on the 30th of June, 1861, our earth actually passed through a considerable portion of the tail of the great comet which appeared at that time. And the only effect noticeable was what Dr. Hind described as "a peculiar phosphorescence, or illumination of the sky." The author says the splendid phenomenon which occured on the night of November the 27th, 1872, has been attributed to the nucleus of a comet coming into collision with the earth; the multitudes of shooting stars which then fell, like a shower of fiery rain, being the supposed fragments of this wrecked comet. The author says that comets "are not worlds, nor is it probable that they ever will be. But that they serve a purpose in the great economy of the universe we may rest assured."

"The planet "Mars" is next considered, which he says is more like the world in which we live, in its physical characteristics, than any we have yet surveyed." The author says the atmosphere of Mars is rarer than our own, and gravity would possess less than half its force here, and he quotes from Prof. Ledger, who in a jocular sketch says the inhabitants of Mars would probably be fifteen feet in height and could stand a higher temperature than we could, and on account of their larger eyes would need less light.

The author points out the fact than one of the satellites of Mars, "Phobos," is the only known instance of a satellite circulating faster than its primary rotates.

The *Moon* is next considered, and the author claims that if it should suddenly drop out of existence, human life upon this planet would very speedily come to an end. He states, that "exactly as the sun preserves, through the agency of winds, a healthy circulation in the atmosphere, so the moon performs a similar service to the waters of the sea, and the great tidal rivers which flow into it. But for this work as a mighty scavenger, our shores where rivers terminate, would become stagnant deltas of corruption. Various *theories* are next considered. In a criticism upon the evolution theory, we find the following: "For many years the author, like many other microscopists, sought diligently for a specimen of the wide-spread hypothetic protoplasm; but the only place he ever found it was inside of a book!" He further says: "The real transmutation of species has been no whit more successful, than were the alchemistic attempts to transmute the baser metals into gold."

Speaking again of our Sun and his retinue of planets, the author says that he is journeying on through space at the rate of about four miles per second. The author states that each star, planet, comet, or satellite appears to have received its own individual and specific momentum, which defines its speed, and determines its orbit. And no two of these are known to be absolutely alike!—"Thus, everywhere we see the CREATOR'S great facts confounding and crushing out man's little theories."

The appendix contains a brief description of Dr. Dollinger's Experiments on Monads, and the author states that the lesson which these experiments clearly teach is certainly not "the evolution of new species," but rather the *extraordinary persistency of specific forms*, and their power of gradual adaptation to the very extreme conditions to which their long line of ancestors had been subjected. In closing this lengthy review, which this book clearly merits, we can advise but one thing—and that is secure a copy. MOTT.

[RECEIVED.]

EVOLUTION OF SOUND EVOLVED: *A Review of the article entitled The Nature of Sound;* by M. J. Thompson, A. M., Professor of Science in Garfield University, Wichita, Kansas. Standard Publishing Co. Cincinnati, Ohio 1887.

MAGAZINES.

[Any subscriber to the ARENA may order either of these publications, through us, at prices named.]

The Christmas Number of "Scribner's Magazine" deserves unlimited praise. All that well-directed expenditure of money could secure from authorship and artistic skill, are combined. We cannot give space to details. We advise our readers to buy Scribners, January, 1888, issue, beginning Vol. 3, contains excellent articles and is well illustrated. "The Great Pyramid," by Edward L. Wilson, is replete with valuable information. The low price for subscription for "Scribner's" make it accessible to all. ($3.00 per year.)

December "Century" has as its frontispiece "A. Lincoln, 1861." It is a "speaking likeness." The Article "Abraham Lincoln: A History," treating of Lincoln's Inauguration, with incidents of the trip of the Presidential Party from Springfield, Ill., to Washington, D. C., written by J. G. Nicolay and John Hay, is an authoritative statement in detail of one of the most important events preceding the Civil War. "The Sea of Galilee," by Edward L. Wilson, cannot be otherwise than interesting, considering the subject and the authorship. "After the War" will be read as a pleasing contrast to the controversial features and dry statistics of the "Memoranda of the Civil War." Brander Matthews gives "Notes on Parisian Newspapers." This writer gives much interesting detail. But he speaks, too, of the contents of one leading journal (illustrated) as characterized "often by a vigorous and vitriolic brutality unmatched in the history of caricature." "Too frequently are they absolutely unfit for publication," &c. Every copy of the "Century" is a library of valuable reading matter. For the January, 1888, issue, the publishers announce a list comprising topics of great interest. ($4.00 per year.)

The "Popular Science Monthly" for December has a full page picture of John Jacob Bayer, as frontispiece. The first article is devoted to "Inventions at Panama," written by Stuart F. Weld. "The Metals of Ancient Chaldea," by M. P. E. Berthelot, and "The Rise of the Granger Movement," by Charles W. Pierson, are interesting papers. The issue for January, 1888, will offer among its table of contents, contributions upon "Governmental Interference with Production and Distribution," by Hon. David A. Wells; Evolution and Religious Thought," by Prof. Le Conte; "Glimpses of Life Along a Coral Reef" (illustrated); "Railroads and Trade-Centers," and others upon important topics. ($5.00 per year.)

"The Atlantic Monthly" is a welcome addition to our list. The publishers of the Atlantic assert that since the first number appeared in 1857 "there has not been a single issue which has not realized the wish of its first publisher that the magazine should represent what is best in American thought and letters." We see no good reason to controvert this claim. Its table of contents furnishes much of merit in the department of "Fiction." Its "Essays and Sketches" include material for many volumes of rare interest. While in the several other departments may also be found names of some of the best writers of the day. We shall refer to the "Atlantic" more particularly in future. ($4.00 per year.)

"The Magazine of American History" maintains its high standard of excellence. This Magazine should be more widely known; and where ever known is appreciated. ($5.00 per year.)

"Christian Thought" (December) contains among other papers, "The Religion of Humanity," by Lyman Abbott, D. D., "A Study of Trichotomy," by S. G. Van Dyke D.D.; and "An Introduction to the Study of Comparative Religion," by Frank F. Ellingwood D.D; the last being particularly noteworthy. Under "Views and Reviews," the reader will find three articles,—"A Great Blunder of Science," "Influence of Philosophy on Politics," and "To the Third and Fourth Generation," to which attention should be directed. There is much of great value in the pages of "Christian Thought." ($2.00 a year Bi-Monthly.)

"The Missionary Review of the World" is now published by the Messrs. Funk & Wagnalls, of New York. With the January issue, the publication begins its New Series, Vol. 1, No. 1., with J. M. Sherwood and Arthur T. Pierson as editors. The number contains a sketch (with portrait) *in memoriam*, of its late editor, Rev. Royal Gould Wilder, also summary of interesting information from various missionary fields in different parts of the world.

"Words and Weapons," Rev. Geo. S. Pentecost, D. D., Editor, H. T. Richards, 251 Broadway publisher, is published at $1.00 a year. The magazine is of earnest religious character, and cannot fail of usefulness in its chosen field. We wish for its publisher great success.

There is yet before us a list of valuable magazine publications, but we are limited in space and must defer reference to them.

In the Department of Juvenile Literature, we feel a real pleasure in naming for special preference, "The Youths Companion," of Boston, "Our Youth," of New York, and the "Wide Awake," of Boston.

The Youth's Companion is a peer among kindred publications. Not only is it chaste in tone, but its literary excellence is of the highest order. And in mechanical execution also, it is first-class. We commend this publication to every family. Its low price—$1.75 per year weekly, places it within the reach of almost all. Address Perry Mason & Co. Boston, Mass.

D. Lothrop & Co., of Boston, publish the "Wide Awake." It is a sprightly, sparkling magazine (illustrated) with very much of excellent value in its contributions. The December number has a large list. "The Wonder Ball;" "Warwick Brookes and his Pencil-Pictures;" "The Drummer Boy of Kent;" and "The Last Christmas Tree," cannot be read without benefit by any class of readers youthful or adult. ($2.40 a year.)

"Our Youth," issued weekly by the Methodist Book Concern as "a Paper for Young

People and their Teachers," is edited by John H. Vincent, D.D., ($1.50 a year.) It is not trammeled by any mere denominational claims. Its editor though a Methodist is from his relations with the Chautauqua enterprise necessarily liberal, and free from partizan or improper sectarian ideas. "Our Youth" is a model paper. It is devoted "to Young People and their Teachers." The announcements of the Publishers for the year 1888, gives names of many of the best writers of the day among its corps of contributors.

"The National Normal Exponent." (Monthly) R. Heber Holbrook editor. Published by the National Normal School Company, Cincinnati, O. A sprightly journal in its Twelfth Volume. The current number is, however, marred by an undignified assault upon Dr. A. W. Hall and his work.

"The National Builder" of Chicago, maintains its leading position and is worthy of patronage.

Literary "Molecules."

—o—

There is one thing almost as strong as truth itself, and that is persecuted error.

Much learning shows how little mortals know; much wealth how little worldings enjoy.

Clothes and manners do not make the man, but when he is made, they greatly improve his appearance.

To overcome our own passions, and meekly to bear the passions of others, is the effect of victorious grace.

The nerve that never relaxes, the eye that never blanches, the thought that never wanders—these are the masters of victory.

Mrs. Mary A. Livermore says there are 127 occupations now open to women. By-and-by the men won't have to work at all.—*Tid Bits.*

Type made from paper is one of the latest novelties. A process has been patented by which large type used for printing placards can be made from pulp. Such letters are at present cut on wood.

All is evil under the sun; there is no beauty or virtue, nothing worth striving for in this life, unless one can look by faith to the better country and "endure as seeing Him who is invisible."—*Wm. Durant.*

A new use for electricity has been found in the coal mines, where the mine cars, instead of being hauled by mules, are now propelled by electricity carried along a wire.

One of the richest veins of natural gas anywhere in the country has been struck at a depth of only 400 feet at a point on the Indiana side of the Ohio River, 25 miles below Louisville, Ky. It is said that the flow of gas exceeds 200 cubic feet per second.

The highest mountain in the western hemisphere is Aconcagua, which rises 22,415 feet above the sea, and is in plain view from both Valparaiso and Santiago when the weather is clear. Chimborazo was until recently supposed to be the king of the Andes, and in geographies published thirty years ago was described as the highest mountain in the world. No one has ever reached the summit of either monster, but by triangulation Aconcagua has been determined to have an advantage of 2,000 feet over old "Chimbo" in stature.

Since the discovery of petroleum 53,000 wells have been drilled in Pennsylvania and the adjacent oil territory. It cost $200,000,000 to sink these wells. The oil they produced sold at the wells for $500,000,000, therefore the profits of the producers have been $300,000,000.

The perfect character is not attained in a day. It is "first the blade, and then the ear." It is evil passions resisted, and overcome. It is the harsh word unspoken, the unkind thought suppressed, and at last the life adorned and beautified by gentle, helpful words and deeds.

A true motherhood is a dowry for a daughter, and a portion for a son, more priceless than a legacy of millions. To have a good mother is to go full-armed to life's sternest battle, and to stand well equipped before its harshest brunt. To have a bad mother is to stand unsheltered under the black sky, unscreened beneath the pelting hail.

Strive everywhere and in all things to be at peace. If trouble comes from within or without, treat it peacefully. If joy comes, receive it peacefully, without excitement. If we must needs flee from evil, let us do it calmy, without agitation, or we may stumble and fall in our haste. Let us do good peacefully, or our hurry will lead us into endless faults. Even repentance is work which should be carried on peacefully.

The tide in the St. John's river at Palatka, flows up the bottom of the river—that is, the water at the bottom of the stream is the saltiest of sea water, while at the surface the water is fresh and sweet. It is a curious thing to see the fishermen hauling fresh water bass out of the stream at one depth, while salt sea crabs are brought up from the bottom in the shad nets. Palatka is eighty miles above Jacksonville at that.

About twenty-eight miles of new streets are laid out each year in London, England, about 9,000 houses are erected yearly; about 500,000 houses are already erected; about 10,000 strangers enter the city each day; about 125 persons are added daily to the population; about 120,000 foreigners live in the city; about 129,000 paupers and beggars infest the city; about 10,000 police keep order; about 2,000 clergymen hold forth every Sunday; about 3,000 horses die every week; and, it is said, about 700,000 cats enliven the moonlight nights.—Public Opinion.

Domestic Hop Beer.—A healthful summer drink, a tonic, is domestic hop beer. Boil a good handful of pressed hops for an hour in three gallons of water, pour it, after straining it, over three pints of molasses. When cold stir in one-half cake of compressed yeast, dissolved, and one large spoonful of essence of spruce. In the morning it will be ready to bottle. Tie down the corks. It is highly recommended by physicians and has the merit of being inexpensive. It is good especially for nervous people.—*The Independent.*

The great glacier of Alaska is moving at the rate of a quarter of a mile per annum towards the sea. The front presents a wall of ice some 500 feet thick, its breadth varies from three to ten miles, and it is about 150 miles long. Almost every quarter of an hour hundreds of tons of ice in large blocks fall into the sea, which they agitate in the most violent manner The ice is extremely pure and has tints of the lightest blue as well as the deepest indigo. The top is very broken, forming small hills, and even chains of mountains in miniature.

Some curious earthquake phenomena have just been discovered in an isolated section between Summerville and Charleston, which bears terrible evidences of being one of three foci of the great shock of August, 1886. The ground for miles is literally overturned. In consequence, there are to be seen many deep pits, on the margin of which have been thrown up pure white sand, as is seen only on the sea shore. On the white sand thus upheaved has sprung up a dense growth of sea plants, such as is found on the tops of the white sandhills created by the wind currents on the islands of this coast.

DR. WILFORD HALL'S SCIENTIFIC LIBRARY.

THE principles of the Substantial Philosophy, with their collateral bearings, which are unfolded in Dr. Hall's writings, have cost him more than ten years of unremitting labor, such as few men besides himself have ever performed. The results of this tireless scientific and philosophical research, as therein elaborated and set forth, can be found in no other library of books on earth; and those who fail of the present opportunity to secure these unique works, at the trifling cost proposed by his publishers, will realize a missing link in their chain of knowledge, which they may always regret and may never be able to supply.

EIGHT VOLUMES THAT WILL LIVE.

THIS library consists of the "Problem of Human Life" ($2), the five volumes of THE MICROCOSM, bound in cloth ($7.50, or $1.50 each); the first volume of THE SCIENTIFIC ARENA, bound in cloth ($1), and the "Text-Book on Sound" (50c.), amounting in all to $11.

By special request of Dr. Hall this entire library will be sent to any person by express on receipt of $5, if ordered soon, or before the plates shall pass into other hands—an event probably not far distant. If sent by mail the postage, $1.25, must be added. Should the person sending $5 on this special offer already have either of the above eight volumes, some other book may be substituted, if in our list of publications found elsewhere on this page.

No person who has tasted the fruits of this comforting and elevating system of doctrine, as set forth in those volumes, should allow this opportunity to go by for leaving to his children an heirloom which may prove an almost priceless memento in coming generations. Bear in mind that this library can only be obtained by addressing Hall & Co., publishers, 23 Park Row, New York.

BORDERING UPON IDOLATRY.

THE philosophy of Substantialism, which advanced thinkers now agree is destined to revolutionize the present science of our schools, possibly before this generation shall pass away, took its rise less than a decade of years ago, in the "Problem of Human Life," a work which has been hailed with commendations from the press of the civilized world, such as no book has ever before received. The publishers of this work have filed away hundreds of such notices, many of which are too laudatory and too nearly bordering on idolatry to be printed. Indeed, the publishers of THE ARENA are constantly receiving contributions from enthusiastic admirers, well written, but so full of flattering praise of the editor's work, that he feels obliged not to allow them to be printed. The following, however, is a mere specimen of such press-notices of the "Problem," a book of 524 octavo pages, and of which between 60,000 and 70,000 copies have already been sold without a dollar's worth of advertising:

A SAMPLE OUT OF 240 NOTICES.

[*From the Christian News, Glasgow, Scotland.*]

"One of the most trenchant and masterly opponents of this theory (Darwinism) is Dr. Wilford Hall, of New York. Some time ago he wrote a book entitled 'The Problem of Human Life,' in which he subjects to a searching and critical analysis the strongest arguments in favor of evolution advanced by Darwin, Haeckel, Huxley and Spencer, the acknowledged ablest exponents and advocates of the system. Never, we venture to say, in the annals of polemics has there been a more scathing, withering, and masterly refutation read or printed. Dr. Hall moves like a giant among a race of pigmies, and his crushing exposures of Haeckel, Darwin & Co. are the most sweeping and triumphant we have ever read within the domain of controversy. If our thoughtful and critical readers have not yet read the book, we venture to prophesy that they have a treat before them."

[*From the Methodist Protestant, Baltimore, Md.*]

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

[*From the Illustrated Christian Weekly, N. Y.*]

"A very remarkable book has come under our notice, 'The Problem of Human Life,' which we have examined with some care, in which the author reviews most successfully the works of Darwin, Huxley, Tyndall, Haeckel, Helmholtz and Mayer, demonstrating, as we think, the utter fallacy of scientific materialism."

[*From the Brethren at Work, Mt. Morris, Ill.*]

"It is unquestionably the most startling and revolutionary book published in a century. There is no escape from the massive accumulation of facts, and the overpowering application of principles in which the work abounds from lid to lid. It marks an epoch in the centuries. It is a work of Providence and will not accomplish its mission in a generation. It unfolds truths that will stay as long as Christ is preached. Although strictly scientific, its one aim is the demonstration of a personal God, and a hereafter for humanity. We never tire reading it. It is an exhaustless mine of Christian truth. It is the literary *chef d'œuvre* of the age. It is worth its weight in diamonds."

[*From the Presbyterian Weekly, Baltimore, Md.*]

"The trenchant criticism, logical force, scientific attainments, and the clear, popular style of the author, have combined in producing in 'The Problem of Human Life' a volume that meets a pressing want, and one that will be warmly welcomed."

[*From the Dominion Churchman, Toronto.*]

"We most cordially concede to 'The Problem of Human Life' the well-earned title—*the book of the age.* Doubtless the God of Providence has raised up the author to meet the wants of the Church in this time of need."

[*From the New Covenant, Chicago.*]

"We can truly say that we are amazed at the originality, thoroughness, and marvelous ability of the author of this work."

[*From the Amer. Christian Review, Cin., O.*]

"The author, a man of acknowledged genius, and confessedly the brightest scientific star of modern times, has startled the religious world into transports of joy and praise. No religio-scientific work has received both from the secular and religious press such willing and unqualified praise as the 'Problem of Human Life.' It is the death-blow of atheisitc science."

[*From the Journal and Messenger, Cincinnati, O.*]

"'The Problem of Human Life' is a very unexpected contribution to scientific polemics, which, if its reasonings shall be justified, on thorough investigation, will prove to be one of the loftiest achievements of this age, and effect one of the mightiest scientific revolutions ever seen."

[*From the Christian Standard, Cincinnati, O.*]

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