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GEOMETRY OF VITAL FORCES

F. VANDERBURGH, M. D.

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BY

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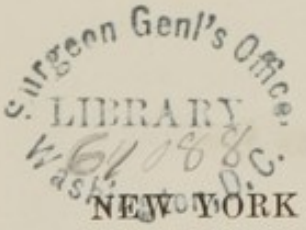

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PREFACE.

THERE are but four primary forces in nature: Oxygen, hydrogen, carbon, and nitrogen, and they unite with each other in three binary forms, which constitute the motive power of the universe.

Their combining proportions stand thus: $\frac{\text{OH}}{1\,6}, \frac{\text{ON}}{1\,6}, \frac{\text{OC}}{1\,6}$. Of these three binary forces the first only is elaborated in this essay, that the reader, freed from its complex relations, might gain a comprehensive view of the share which the primary force holds in the motive power that moves all bodies in nature. The central force $\frac{\text{ON}}{1\,6}$ is the standard force of organic life which generates and maintains its heat at 98° Fah. in every variation of climate, whether it be above or below its own stan-

dard, and in the third force $\overset{OC}{1_6^6}$ is found the decomposing or wasting force of organic life. The elaboration of these two latter forces will be more clearly defined in a subsequent essay.

But $\overset{OH}{1_1^6}$ is the primary force and starting point of every form of matter in the visible world, whether it be organic or inorganic. It gives the form of every cell—the homologies of the vegetable and animal cells are identical—the nucleus of the animal cell is the homologue of the utricle of the plant, and the primary cell of both is spheroidal, taking its primary form from the drop of water, and every succeeding modification in the shape of cells either in animal or vegetable life is simply a departure from this primitive type, and each new form in their infinite variations are guided and governed by the same rule, which makes no two snow-flakes alike.

Some, perhaps most of the readers of this essay, may be shocked at the rudeness of the first sentence. I wish to forestall this prejudice by a word or two of explanation. Forty years in the progress of my professional life has been barred by Sir Isaac Newton's theory of attraction, wherein my sympathies

for patients have been perpetually mingled with the conviction of an error that no one could solve in regard to motion, and now at the close of my pilgrimage with the materials always before me, to discover that any school-boy could have done, what the energies of a whole life had failed to do, put me off my guard.

It was no part of my work to speak exhaustively on any topic; much less was it my purpose to put Sir Isaac Newton in his proper relation to modern science. In the heat of writing, with a definite point in view, I designed to say only so much as would enforce the point. I wish to explain that any remark which seems to cast reproach upon the great Newton, must be understood rather of the science which has made his theory the limit of theorizing, the Ultima Thule of discovery. We speak of the man, meaning his place in science—but less the place he would and should have, than that other men compel him to take. Who was Newton? He was the greatest mathematician of his age, possessed of a powerfully systematizing intellect. What did he do? He conceived a great problem—*supposed* certain forces, and with a com

plete mathematics (which himself completed for the occasion) adjusted the laws and forces—to an accuracy astonishing and admirable to the last degree. A prime projectile force, and that of attraction, made his system complete and wanting nothing—a triumph of mathematics—a theory but merely of the machinery of moving worlds.

The most of students after him have been content to repeat his words, or to solve new problems by his rules. Some have broken away a little, and have accomplished much of far more worth than any piece of mathematics.

It is an injustice to the great Newton that his theory which relates only to astronomic systems, should be made to embrace the condition of atoms, and thus limit the achievements of science.

Nothing was farther from his thought than attempting in this manner the problems of heat and motion—he would have thrown up his instrument if he had tried it. Modern science, despite the proposition that attraction is the only force needed to explain the stability of the universe, is finding strange things among the atoms: perpetual motion —gigantic heavings of heat—tremendous crashings

of elemental (chemical) affinities—magnetic forces, mighty and active in the atom, but silent in the mass.

And these are the deep questions of the day: right study of which, will, not long hence, in the atom-motions grasp the systemic and universal.

Newton's theory of attraction was a grand achievement. It was a quantity which satisfied the conditions of the problem. Many will think his theory the noblest work of his time. Its place in science is perhaps greater than that of the Epicycles. The latter essayed the phenomena of stations and retrogradations, and held them for Copernicus to unfold.

Newton's attempted the phenomena of motion and stability among the planets, and held them questioned and answered, till ere long the deeper analysis of heat and motion shall verify the propositions. An atom is a world; all force is one; all motion is upon eccentric centres; and the questions of heat and motion involve the questions of physical life and the celestial revolutions. Life is the greatest phenomenon. In human life meet all forces of the universe. Man repeats or duplicates creation.

Science must study life, and not worlds. Meantime my great wish is, that medical practice shall henceforth govern itself by these deeper truths; and cease not to be governed by these principles, till the living body be as well understood as the far different thing—a dead body under the dissecting knife.

PHYSIOLOGY OF VITAL FORCES.

TO THE MEMBERS OF THE MEDICAL PROFESSION.

GENTS:—The knowledge of vital forces has been concealed from us for 150 years, by the great confidence reposed in Sir Isaac Newton's theory of the "attraction of gravitation."

On a close inspection of his theory, it does not stand the test of geometrical proofs. The primary forces which make matter impart to matter its specific gravity, and this specific gravity is lost in the rate of motion with which the moving body is charged. All bodies which move by their own momentum *carry no weight*, if their specific gravity is lost in their rate of motion.

The central sun, with all its satellites moving

in space around it, carry no weight. Man, at his standard of health, is unconscious of his weight. If he weighs 150 lbs., he can readily raise 150 lbs. to his shoulder and carry it with ease; his body and his limbs are the mere instruments of his force.

The specific gravity of organic life is proved to be $\frac{48}{100}$, its direct force is $\frac{84}{100}$, and its inverse force $\frac{21}{100}$. The specific gravity of inorganic matter is $\frac{25}{100}$, its direct force is $77\frac{27}{100}$, and its inverse force as the "square of the distance" is but $\frac{7}{100}$.

The resistance to the force of $77\frac{27}{100}$ in inorganic matter, being $\frac{7}{100}$, is two thirds less than that of organic life, which is $\frac{21}{100}$, and this difference of resisting force in the two problems equalizes the direct force in both, and we find but one force in nature, and but one law for its government. The relative forces in the two problems must be demonstrated to find the great dynamic force in nature; the one cannot be known without the other. The force in both problems is as their specific gravities. If the specific gravity in organic life is $\frac{48}{100}$, its direct force is $\frac{84}{100}$. If the specific gravity of inorganic matter be $\frac{25}{100}$, the rotary force of the atoms in the interior constitution of the globe, which drives it on its axis and on its plane, is $77\frac{27}{100}$ of force above its specific gravity.

Everything is veiled in this world, and we see nothing as it is in the form of matter—the matter is the *mask* of its forces. If we pick up an atom of sand on the sea-shore, it looks like a unit ; if we contemplate its relations, we are in the presence of God—they are Infinite. If we make, with the turn of our pencil, the graceful curves in the number 2, it appears like a unit in itself; if we contemplate its relations to 1 and 3, it represents not itself, but the invisible relations out of which it comes. It has no mathematical point, no beginning, no middle, no end, and its relations are infinite. Everything that is made is stamped with infinity in its invisible relations, and made visible to us in its singleness of form.

When our Saviour was in this world, the " world knew him not," and yet everything that was made by Him represents Infinity. The stamp of Infinity is on the seal of creation, and no part of that seal is defaced but the segment of man, and he is confused in the midst of phenomena. In contemplating phenomena, we feel that we are in pursuit of science ; the variety is endless and Infinite in newness of form, but of their *law* or *causation* we know nothing.

We call it science, but the science is His who

arranged their relations. In science, we have thus far come through the world sounding for anchorage, enlarging the circle of phenomena, and calling the last one science. The aim of this essay is to demonstrate the force which makes phenomena, and this may raise the veil which discloses Infinity behind it.

Every proposition which I shall offer you, is at variance with the science of the day, and by leading your minds out of the current of your daily thoughts, it cannot be expected that you will follow me understandingly, on a subject altogether new, and hitherto untraversed by the human mind. Whatever may be our obligations to Sir Isaac Newton for his various discoveries, the legacy which he has bequeathed to us in his "attraction of gravitation" has arrested the progress of science, and cast its shadow forward over the present generation. Before his time, there was confusion of mind. Since his time, there is confusion in science. In giving weight to all bodies by the "attraction of gravitation," his error is magnified by obscuring the cause of motion, and retarding the knowledge of heat. The force which makes matter endows it with motion, and this force averages nearly $\frac{80}{100}$ of force above its specific gravity.

This high rotary force within the atoms of matter lightens them in the ratio of the velocity, till their specific gravity is lost in the rate of motion. In man, at his standard of health, the velocity of his interior circulation renders him unconscious of his weight, but when the force of his circulation alters by disease, or otherwise, the weight of his body is a burden to himself. It would be so with the earth if its rate of motion failed. While it revolves on its axis at the rate of 25,000 miles an hour, its gravity is lost in its rate of motion ; but if the revolutions be reduced to 24,900 miles an hour, its gravity would sink it from its orbit, and bring with it the solar system with all its satellites, blotting them instantly and at once from the world's history.

The general plan of creation comprises within its range three problems for solution. The first is geometrical ; the second is purely mathematical, including the formation of atoms, and their aggregation into quantities and magnitudes ; while the changing relations with equivalents is an arithmetical calculation. Geometry excels mathematics in the art of discovering unknown truths, but it cannot advance a proposition and demonstrate it, by truths which are not already known. A thorough un-

derstanding of these three problems will make first class physicians of every member of our medical societies. If one half of our zeal in pursuit of the special properties of drugs, were devoted to the study of our vital forces, we should soon elevate our platform above that of our brethren, who, by the potentiality of their numbers, exclude us from our share in the public hospitals, and exile us from the army, where a large portion of the patrons of our science have sacrificed their lives under a system of practice which they would have rejected at home.

These old-school brethren maintain their standing in public opinion chiefly by their diagnosis, based on physiological discoveries, while we maintain ours by symptomatology, and the experimental discoveries of the specific property of drugs. They are dealing in matter, we are dealing in the primary forces which make matter. If they are brought to see and perceive the demonstration of the forces which make matter, and that we are practising on these forces, while they are practising on the matter which the forces make, they must change their relations or abandon the pursuit.

In their labor to maintain matter, regardless of its forces, they must soon become disgusted with a

profession which has hitherto so mysteriously misled them ; while on the other hand, if they embrace the knowledge which the forces give, they may direct the power which governs matter. The practice of medicine is one of the cardinal interests of humanity, springing out of the deepest necessities of our nature, and the science of medicine that is predicated upon either or both of these plans, can be nothing more than an enlightened empiricism while the science of life remains undisclosed. It is now the most enlightened empiricism which distinguishes the best physicians from the quack, and barring our experiments with drug action, there is no absolute rule to guide us in the cure of disease. Some are biased by their chemical or metaphysical partialities, derived from the schools in which they were taught. If an independent thinker happens to spring up, he originates his own theories from his personal experience and observation, and by interpreting symptoms and devising remedies in deviation from the schools in which he was taught, he may add something to the stock of medical knowledge, but still its end and aim is nothing more than an enlightened empiricism.

It is not exactly so with us ; we have made gigantic strides in the cure of diseases, by having a

rule in the choice of drugs, through the medium of *similia similibus*, discovered by the grasping and elaborating mind of the great Hahnemann; but thought ripens slowly; like the agricultural productions of a country, it has to be raised from the seed. His life was too short for the magnitude of his discoveries, and now his platform is too narrow for the broad field of our own.

We must all acknowledge that our similia similibus has an unknown basis in organic life, and there is no department of our science lying in deeper darkness than our vital forces, and we must establish some other point than the dead-house, and the remains on the dissecting table, to find this motive force.

The adjustment of this force is the primary aim of every good physician; and if the most distinguished be asked what he knows of it, his safest reply would be that he knew as much of it as those who taught him.

Man is a geometrical problem. It seems to be a far-reaching conception to suppose that a being so transitive, fleeting, and versatile as he is could have any geometrical proportions within him. Yet it is a conceded conception, to a being of undeviating progress, between infinity and nothingness, where

the balancing forces are maintained in equilibrium by primary elements which know no repose, and are resistlessly decomposing and reforming every substance in nature with new and fresh atoms.

Our general proposition embraces the whole ground of the three problems already stated.

SIT ATŎMUS, SIT HOMO, SIT ORBIS, SIT SYSTEMA SOLARE, OMNIA MATERIALIA IN NATURA MOVENTUR VI EADEM ÆQUABILI MOLI MOVENDÆ. "*All bodies in nature are moved by the same force proportioned to the mass to be moved, whether it be an atom, a man, a globe, or a solar system.*"

It may be well here to define two terms which are used on almost every page: *Power* and *Force*.

Power is used as force at rest, and force as power in action.

The motive power of the Universe will be found within the four invisible combining forces of Oxygen, Hydrogen, Carbon, and Nitrogen. These are all permanently elastic forces, none of which can ever be brought to a point of rest; where these forces are found wanting there reigns eternal death.

Separately they are more or less inert, but when condensed by the law of their combining proportions into three binary forms, they at once become

a power emanating directly from the hand of the Creator to intelligent beings, to work out the problem of existence, a study which is the highest prerogative of man, and one of the appointed means of cultivating his intellect and exalting his condition.

Problem of Organic Life.

Ox. to Hyd.	Ox. to Nit.	Ox. to Carbon.
$\frac{16}{1}$	$\frac{16}{14}$	$\frac{16}{6}$
$\frac{10\times14\times6}{1\times14\times6}$	$\frac{16\times1\times6}{1\times14\times6}$	$\frac{16\times1\times14}{1\times14\times6}$
$\frac{1344}{84}$	$\frac{96}{84}$	$\frac{220}{84}$

It is seen in the solution of this problem that $\frac{84}{100}$ of oxygen to $\frac{14}{100}$ of nitrogen determines the standard of heat in organic life to be 98° Fahrenheit instead of 96° Fahrenheit. The difference of two degrees in the demonstration from that found by experiment, is owing to the rare achievement in almost any constitution to maintain the highest standard of health. Nitrogen, the ally of oxygen in this demonstration, unlike its attendant gases, is limited in its sphere of action. It is not found in the solid crust of the earth. The great theatre of its presiding force is in the atmosphere, where it overrides the fiery element of oxygen in the propor-

tion of $\frac{4}{5}$ to $\frac{1}{5}$ of the latter, sharing with that element in the tempest and the storms, and by the instability of its nature generates those ever-changing relations in the thermal condition of the globe. But in organic life the relations are changed, where it becomes subordinate to oxygen in all warm-blooded animals. Albumen, casein, and fibrine, are nitrogenized compounds, which are also found in vegetable life. With these nutritive elements for the generation of heat, it unfolds the elements of motion in common with its attendant gases. It is a permanently elastic gas at its lowest temperature, and its specific gravity is as $\frac{14}{1000}$ to $\frac{7}{1000}$ of the gases of hydrogen and carbon combined. It is both combustible and explosive, and its great specific gravity adds a duplicate energy to its forces. Holding these highly vitalizing forces in solution with the instability of their combining proportions at the standard of heat, it is readily seen that if it were either in excess or wanting it would be instantly followed by a variation of heat from the standard, which would develop grades of fever in the ratio of its variations. If it should fall one, two, or three degrees below the standard, inanition or innutrition must follow, and we should have typhoid or typhus fevers measured by the degrees of deviation from the standard.

I may say here, by way of parenthesis, that I have sustained many patients in typhoid and typhus fevers, within the last four years, with an oxy-nitrogenous drink, made of the juice of half a good orange in a common-sized tumbler of water. If oxygen is beneath the standard, a tumbler of water will elevate it, and if it combines with the nitrogen of the orange, it becomes the staff of life in fever. Black tea, when homœopathically indicated, is a sovereign remedy and a sustaining force.

Returning from this digression and having gained the first point in the solution of the problem in the generation of heat, and the variations from its standard in fever, we are left on the threshold of darkness in regard to its development on motion.

Motion.

There is no less mystery in the undeviating order of its curvilinear lines, than obscurity in the cause of motion. If the rule of its action in centres of circumference be first understood, the cause of motion in all bodies will be more readily comprehended. There are no bodies in space known to move in straight lines, they are all more or less curvilinear in proportion to their magnitudes. This globe, on which we are revolving at the rate of 25,000 miles an hour, ever true to its orbit, has not

an inch of straight line in its circuit around its centre, or in its annual circuit around the sun, and what is true of the earth is true of all bodies which move in space, and is equally true of the forces in organic life, as well of those of inorganic matter. It was this discovery of curvilinear lines in all bodies that led Sir Isaac Newton to conceive attraction to be the presiding force which maintains them in their orbits around each other. It was on this conviction that he founded his world-renowned problem 150 years ago, that all bodies were attracted directly as the mass, and inversely as the squares of the distance. If this proposition were true, all bodies in motion would instantly stop, and all motion in matter would cease. The heart would stop its pulsations, and the pall of death would rest upon creation. If he had not awed public opinion into submission by the magnitude of his other discoveries, the validity of his proposition would long since have been questioned. But a genius so exalted above all others as to demonstrate motion on a problem of rest, could easily cast the veil of inertia over the minds of nations. If we reverse the proposition and state it thus : all bodies are repelled directly as the mass, and are inversely attracted as the squares of the distance, we start with creation on a motive power, and with this, when we reach

it, we can demonstrate the circulation of the blood. But there is a mystery to be first expunged from both these problems of motion. That of Sir Isaac Newton and the one now given you, *when analyzed*, are equal absurdities on the face of them, as the motion in *all* bodies is neither guided nor governed by the force of attraction. His centripetal force assumes a primary force from the circumference to the centre of bodies. It is obvious to the most casual observer, that a force thus constituted from the circumference to the centre of bodies, with no provisionary outlet for the force, would instantly explode ; and it is equally true that a centrifugal force must also explode every substance in nature, if it were not restrained by an attractive force of equal magnitude. But it is a well-known principle in physics, that two forces exactly equal repel each other, and that two forces that are unequal mutually attract each other, so that both problems fail to make curvilinear lines of motion.

The problem of motion in *organic* life shows the disproportion of these forces to each other to be so great, that the force of attraction, or any other force, is entirely excluded from all share in the formation of curvilinear lines of motion.

The true problem states that the centrifugal force directly as the mass is $\frac{8}{1}\frac{4}{0}\frac{5}{0}$, and the inverse,

or attractive force, as the square of the distance, is $\frac{2}{100}$, and that these forces apparently so disproportionate to each other, are reduced to an equation by the physical construction of the matter they move, and not by the nature of the force that moves them. Matter is so constructed that every atom in the physical world, whether it be solid, fluid, or gaseous, moves on an axis eccentric to its centre, *like the globe we occupy*, thus compelling the forces, if they move at all, to move centripetally without the aid of attraction.

A globule of blood is a spheroid similar to that of the earth, with a similar eccentric centre, and both revolve alike centripetally on their axes. I may remark, in passing, that the revolving force in the *blood globule* is $\frac{7}{100}$ above the driving force in the *heart and arteries*,* and this $\frac{7}{100}$ of force is expended in the venous circulation. Hence the blood atom revolving remotely from its centre accumulates a force from its own impulse. If the vital force in the blood globule was passive or reduced below the level of the driving forces of the heart and arteries, the friction would retard its velocity and exhaust the pulsations of organic life. Force is not massed (*as it is supposed to be*) against the

* This inverse force as the square of the distance is collected from hyd. 1, nit. 14, carb. 6=$\frac{21}{100}$.

resistance of bodies in magnitude, but impels the mass by rotating the atoms which compose the mass; the motion of the whole being the sum of all its parts. We have an example of this rotary force in the watch we carry, and in that larger clock of time which beats the seconds in our daily pilgrimage of life. But organic life, unlike inorganic forces, is a process of accumulation to its refinement in the dynamic force of the nervous system disclosed by electro agency. There is a series of experiments in electro-magnetism which proves positive electricity to possess a greater repelling force than negative electricity at the same tension, and that the positive pole holds the dynamic force, while the megnetic action returns to the point of departure at the same instant of time, leaving everything behind it adjusted as before. This process explains the inconceivable velocity of the dynamic force in its alternate motions, but gives no clue to its relative proportions.

Here we have the first glimpse of our dynamic force, and the question, How is it made? urges itself upon our attention. It is not by subdivision of its atoms, as we strengthen our drugs by dilution and trituration, but by a series of condensing forces, beginning with the four quarternary compounds of O., H., C. and N., condensed by their combining

proportions into tertiary forms, each assuming a binary form, the starting-point of dual relations in matter, $\frac{1}{1}^{6}$, $\frac{1}{1}\frac{6}{4}$, $\frac{1}{6}^{6}$. In the next step, we see them all condensed together into one dual force by electro agency, and working on a scale of antithetic relations (like heat and cold) as one and the same force of differing intensities in different directions.

If we could subdivide a second of time into a million of parts, and one of these into a billion, and one of these again into a trillion, and use them as we now use numbers, we could not calculate the velocity of the dynamic force in matter; and yet its products show it to be nothing more nor less than the refining forces of the four primary elements condensed into a dual force of antithetic relations. It is seen from the above, that the physical force in the general circulation is constantly condensing a dynamic force into the nervous system through the medium of the medulla spinalis, the electro-magnet of human life with its positive and negative poles.

The position and importance of this eccentric centre in the nervous system, has been sleeping for centuries, until its reflex action was discovered, but giving no hint as to its negative pole. The negative pole gives to the brain but $\frac{7}{1}\frac{2}{0}\frac{2}{6}$ of dynamic

force, while the positive pole gives to the spinal marrow $\frac{8}{100}$. The negative pole gives to the brain the slow calculations of logic ; the positive pole, the rapid combinations of the emotions and passions. There is a rule of action in organic life that in every mental process there must be an attendant organic process ; that the vivid senses must have their vivid centre, in the solar circle where the organic transitions are in exact correspondence with the rate of motion in the affections and passions, while the brain must have a table on which to write out the slow records of its evidence.

Velocity.

All bodies in nature lighten in the ratio of their velocity, until the specific gravity is lost in the rate of motion ; and it is the rotary force in our interior constitution at the highest standard of health, which renders us alike unconscious of the weight of our bodies. This is obvious in the rotary force of the nervous system, the simplest function of which is to excite the contraction of a muscle without producing sensation. The impression is sent to a ganglion, whose eccentric axis sends the impulse to the muscle and it contracts. The standard force of the muscular system is $\frac{85}{100}$, which is $\frac{5}{100}$ above the average standard of the solids of the body.

This head of water in the muscular tissues is the reservoir by which the electro-agency of the nervous system maintains the velocity of its action and reaction with the muscular tissues. Every muscle terminates at each end in a tendon, and these tendons at each end are inserted into bones, and the central part is the spring; when the centre contracts there is a strain upon the whole, and a direct force is exerted to tear the tendons from the bones.

There are, therefore, two strains upon the tendon at each end of the muscle, the centre part only being the spring, and when the action and reaction of the fibres begin to fail by overwork, the water in these tissues is reduced in proportion to the loss of strength by exercise, and they grow stiff and lame, and the spring is gone, and their weight is felt.

When repose restores the adequate supply of water at the standard of $\frac{85}{100}$, the spring returns and the sense of weight is gone. Lassaine says that the percentage of water is greatest in infancy, less in childhood, adjusted in manhood, and dried up in age. This accounts for the perpetual motion and elastic spring of childhood, the steadiness of adult age, and the cane of the bent old man. If we apply the proposition to the rotary force among the heavenly bodies, we get a clear conception of

the whole phenomena of motion. All bodies in space lighten in the ratio of their velocity until their specific gravity is lost in their rates of motion. Then as each planet must revolve on its own centre, its orbit in space is defined by its own magnitude. This is exactly the rule of action among the atoms of matter in the invisible forces of human life.

Oxygen.

We have been dealing hitherto in forces. Oxygen is a power delegated from on high, and holds in solution the secrets of creation. It is the centre of all radiation, the source of all combustion, itself incombustible, for ever giving without loss, always supplying without exhaustion. It generates that standard of heat in which we all "live and move and have our being;" it presides unseen in the winter's storm, and its presence in the sunbeam restores life and animation to the vegetable world. The ships of commerce float in it, and the navies of the world ride on it, unconscious of its power. The steamship with artificial heat expands it into steam, the steam into vapor, and then it is condensed into water, and returns again to its labor. In its pure state it is a colorless and transparent gas, and no force or variation of temperature can change its

permanently aeriform condition. It not only guides and governs the thermal condition of the globe, but it enters largely into the composition of the crust of the earth, forming one-third of its substance. Its highest condensing force is found in water, eight-ninths of which is oxygen. It constitutes three-fourths of our bodies, four-fifths of every plant, and one-half of the solid rocks of the globe.

Cleave the rock of quartz, or granite, or marble, and the law of inertia of Sir Isaac Newton is transformed into a hail-storm of motion on their surfaces. Inorganic histology is as fruitful of motion as is that of organic life, and it is through the medium of the atom that the mystery of motion is unveiled. Inorganic, like organic bodies, take their forms from their cells, and this cell of inorganic matter bears the same relation to the granular matter of material bodies, that the cells of organic life bear to the tissues which spring from their walls.

There is a remarkable parallelism in the identity of cell material in all organized beings, and it is worthy of notice that the cell forming the simplest plants increases by subdivision according to a fixed rule of numbers—2, 4, 8, 16, &c., so that the rule of geometric progression regulates the subdivision of the primordial cells in all forms of organic as well as those of inorganic matter. The simplest

organism of vegetable life points by its structure up to man, and the organs of his body were sketched out in the inferior animals, in anticipation of his coming. It starts from the crystal to the plant, from the plant to the animal, and from the animal to man. The vitalized cells that begin the structure of organic life have no nerves traceable in their organization, and hence their power is passive, it is force at rest. Such, too, is the relation which the cells of inorganic bodies hold to the granular matter of their organization. The cell is known to be the germinating nucleus of all material bodies in nature, and if we now place the microscope which magnifies 4,000,000 of times on the face of these cleft rocks every atom on its surface will be seen to be rotating around its cell, as a necessary condition of its relation to its centre. In this rotary process of the atoms around their cells it is always found to be preceded by axial deflection among the atoms of matter in the return of these polarized atoms to their normal state. This deflection from a perfect circle results from the eccentric axes in every rotary atom ; and in the successive alternations of these polarized relations the rotary transmission is maintained with such inconceivable velocity that the eye beholds only a moving panorama in the dissolving views of motion.

It was the experiments of Berzelius that led him first to conceive that two opposite poles are given to every atom of matter, but it was M. De Lareive, following in his footsteps, who first observed that every rotary atom was armed with a directive axis, around which the motion was performed, but he made no examination of the axes, and the discovery rested *in pace* when it was made. It has since been shown by experiments as well as by the axial and equatorial arrangement of the molecules of matter by Prof. Faraday that the earth is physically arranged to move both on its axis and on its plane by a motive power, but he had absorbed so much of Sir Isaac Newton's law of attraction that the atom was beneath his notice.

Having shown the presiding force of oxygen in inorganic matter, the next step is to learn the means and method of its rotary forces. By introducing it into soap bubbles it is found to be magnetic, a property which belongs to no other gas. And in its highly concentrated state of chemical force it develops its alternate, ozone, giving the positive and negative force of electro agency. Here we rest the proof of the atomic or rotary force in nature, which is a dual force of repulsion and attraction, constituting the motive power of creation.

In the next place, we inquire, how does this force maintain itself in its mighty work?

In the active state of these alternate forces they develop electricity, and electricity, in its turn of changing relations with equivalents, disaggregates the molecules of these gases, and in the process insulates their constituent atoms with all their polarities set free, by which they acquire a concentrated tendency to combine their relations with *all other bodies* in nature, towards which they manifest no affinity in their normal state. Hence the universal and unlimited command of these forces over all the material bodies in nature. In the dual relations of the first elements of matter we see the working principle and sustaining power of its forces, viz., electro magnetism, in disaggregating the molecules of oxygen gas, reproduces itself in the process of disintegration, thus fully setting before us the phenomena of perpetual motion among the atoms of matter in the physical world.

Having shown oxygen to be a rotary force, its specific gravity will unfold the immensity of its power. Before other substances were made its relative proportion to its attendant gases was to hydrogen $\frac{16}{1}$, to nitrogen $\frac{16}{14}$, to carbon $\frac{16}{6}$, showing its proportion to be greater than that of all other substances in nature, and its specific gravity to exceed that of all other bodies in the proportion of 48 : 21. As these gases are the constituent elements or

bases of matter, they constitute the specific gravity of all substances which are made by their atomic combination, and hence they are the measure and sum of the specific gravity of all bodies in the universe. For example, when oxygen and hydrogen combine to form water, the specific gravity of the water, which is the standard of all adjustments, is the sum of the specific gravity of these gases condensed into its volume, and hence the specific gravity in the weight of the globe must stand as 48 : 21.

Its Elasticity or Mechanical Force.

With its density and its abounding weight it has the property of permanent elasticity—elasticity and permanent elasticity is the difference between oxygen and caoutchouc, the one is a finite force, the other an infinite power, the alternate forces of one are given in straight lines, the alternate forces of oxygen united to hydrogen unfold a spheroid, with its eccentric centre and rotary force, the starting-point of curvilinear lines in mechanico-vital atoms. The rule of motion in all elastic bodies is exactly equal in opposite directions, and they retain the motion which they receive from their elastic power. This affirmation is in direct accordance with the proposition of Sir Isaac Newton, that the quantity

of motion which is collected by taking the sum of the motions directed towards the same parts, and the difference of those directed towards the contrary parts, suffers no change from the action of bodies among themselves. Force thus constructed and thus adjusted acts in direct unison with the alternate motions among the molecules of matter, as disclosed by the microscope, and by proportioning its force to the matter it moves, it rotates an atom or commands a world. This property of permanent elasticity, and its acknowledged vital element, connects it with matter and makes it that mechanico-vital force, which fits it for creation, and yet so delicately equipoises the forces of human life.

Its Attractive Force.

The component parts of all matter are the gases of oxygen, hydrogen, carbon, and nitrogen, of which oxygen forms so distinguished a part. In order to explain the power of its attraction we must measure the force of its mutual relations with its attendant gases, and this will show which of them holds the sovereign power over matter. Oxygen to hydrogen, $\frac{16}{1}$, to nitrogen $\frac{16}{14}$, to carbon $\frac{16}{6}$, that is, oxygen is fifteen times heavier than hydrogen, and nearly three times heavier than carbon, and as 16 : 14 is

heavier than nitrogen, oxygen being the heaviest of the gases. To measure the power of their mutual attraction we must measure the velocity with which they approach each other. The velocity with which all bodies approach each other by mutual attraction is inversely as the masses of matter. Thus the velocity with which the lighter body moves toward the heavier is greater than that with which the heavier body moves toward the lighter. In the mutual attraction of the gases, then, oxygen stands as the greatest attracting force, and its alternate relation, ozone, since discovered, as its greatest repelling power.

Secondly : no natural force, electrical or otherwise, can take place or be maintained without the agency of water. There are six cubic feet of oxygen gas in every tumbler of water, the basis of the mechanico-vital force of organic life. The action of the dry Voltaic pile is due to the presence of water in the paper used for its construction, and frictional machines at a moderate rate of motion generate ozone by taking the water from the surrounding air.

The Voltaic piles and batteries used for telegraphic purposes derive their forces from the disintegration and recomposition of the water within the cells of the battery by electro agency. It is

known that a very small amount of chemical change sets free a very large electrical force.

Both Becquerel and Professor Faraday have shown that larvate electricity (ozone), chemically set free by the decomposition of a grain of water will charge a thunder cloud covering an area of thirty-five acres with a lightning flash of terrific intensity. But insular forces generated by the decomposition of water are shown on a broader scale in earthquakes. Months before the paroxysmal explosions of Vesuvius begin, the low murmurings of its ordinary discontent are heard rising from the ingathering forces generated by the conversion of water into ozone at the bottom of the crater. As the deep sounds like distant thunder multiply, the wells in the vicinity dry up, and the water around the base of the mountain disappears. The inhabitants in nearest proximity to the mountain confer with each other, and measure their danger by the area of country over which the waste of water extends. Pompeii is three miles from the base of the mountain, and streams and wells five miles outside of it are known to have been dried up, thus making a circumference of 48 miles within which the waters are taken up and converted into ozone in gradual preparation for the explosion which is to follow.

It is the scarcity of water that gives to voltaic mountains situated on dry land long intervals of repose. Stromboli, three thousand feet high, is surrounded by the waters of the Mediterranean, thirty miles from the shore, and its supply of water being constant, it is seen puffing night and day with undeviating uniformity. But it is shown by Professor Faraday that electricity in a continuous current, when set free by the decomposition of a grain of water, will maintain a platinum wire red hot 3½ minutes. Here we have the condensed force in a grain of water maintaining a rotary force at a red heat 3½ minutes. Compare this force with the decomposition of the $\frac{8.4}{1000}$ of water by its own agency in the electric current of organic life, and it will give us some faint conception of the electric current generated by the water of the globe, giving uniformity of impulse to the motive power of the universe by which it is enabled to work up to its time with undeviating certainty.

Resumé.

In this condensed view of our vital forces we have given you generalities instead of elaborating specialities, bearing on the science and practice of

medicine. A brief resumé of the prominent points may bring out some practical hints of importance.

It has been demonstrated in the problem of heat that $\frac{84}{100}$ of oxygen to $\frac{14}{100}$ of nitrogen established a central standard of health, and the deviation from this standard of health measures the fluctuating conditions of life. It is obvious that oxygen is the presiding and steadying force of the instability of nitrogen, at the standard of health, but when by our indulgences, which are of daily recurrence, nitrogen is in excess, its instability will generate abnormal sensations, in proportion to the excess, and thus by impairing or destroying the appetite for nitrogenized substances, sooner or later it must be reduced below its standard, and fevers of differing types may ensue until it is restored to its position.

Lastly: it is shown that the crude organic force in the general circulation averaging but $\frac{80}{100}$ is not the dynamic force recognized by the great founder of our science as a correlative force to his highest infinitesimal dilutions. The dynamic force which he clearly saw was undefined by him, and did not embrace the antecedent stage of its refining process in the nervous system and the brain, where the coexisting relations of the physico-mental processes develop the consensual and instinctive action of the mental process, with voluntary motion.

It was briefly stated how this force was generated, and that it was maintained by $\frac{5}{100}$ of force in the muscular tissues above the average standard of the body, and that its velocity surpassed our calculation. It was not stated, but left to inference, that here was a wide range for the strength of our drugs; that in the crude circulation where the motive force was $\frac{54}{100}$, low dilutions were admissible, but in the inconceivable velocity of the dynamic force in the nervous system, they were inadmissible.

The proximate cause of motion was omitted for the reason that its length might interfere with the object of this meeting. We were limited to the discussion of its rule of action among the atoms of matter, as being introductory to its production of curvilinear lines in motion.

These lines were demonstrated by Sir Isaac Newton one hundred and fifty years ago, to be determined in their deviations from straight lines by the force of attraction, and this demonstration is accepted by science at the present day. It is the misfortune of great men, in the propagation of great truths, to perpetuate great errors, and meeting in science on such unequal terms with an author who has awed public opinion into submission for a century and a half, I am led to invoke the aid of this Society to bear me out in this unequal contest. It was

well known to Sir Isaac Newton in his day that the earth revolved on an axis eccentric to its centre, and by whatever force it was moved, its *physical structure*, and not the nature of the force, compelled it to move around its centre, and in doing so it must define its own orbit by its own magnitude.

If this general proposition be true in regard to masses in magnitude, and they are made up of atoms which compose the mass and rotated by atoms which impel the mass, the motion of the whole being the sum of all its parts, then we can put the microscope into our vital forces and the mirror will reflect the real truths which the visions of the imagination have hitherto considered to be inaccessible to human thought.

FINIS THE ADDRESS.

$$\frac{16}{1}\ \frac{16}{14}\ \frac{16}{6}.$$

Seeing and not perceiving received its condemnation in centuries gone by. Sight is common to all, but the art of seeing is a perception given to but few. As we contemplate these six numbers, condensed into three binary forms, and resting on this slip of paper, we see nothing to interest or instruct us ; but when we perceive these numbers to include forces which represent the invisible forms of the visible world, giving to the planets their motive power, which revolves them on their axes

and drives them on their planes, defining their orbits, and giving them their homes in space, and after furnishing the heavens with its gorgeous scenery, it is said, "Let us make man," and these tertiary forces are condensed into the binary forms of organic life, and man comes forth in the image of his Maker, holding immediate relations to that tertiary power which represents the being of a God.

There have been many volumes written on the evidence of design in the beneficence of creation, but here seems to be the demonstration of the problem which unfolds a planetarium of the universe in the crystal deposits of his healthy urine.

In this little diagram, the shape of the largest comet resembles the form of the sun, and another has a striking resemblance to one of its wings, while the central sun with all its satellites and three significant crystals of the cross are riding in space on their eccentric axes.

CONFUSION IN SCIENCE.

Dalton's Definite Proportions.

If we are right in our judgment of the confusion in science, the proof is to be given in the statement of its errors, and this will contribute largely to the elaboration of the forces we have been condensing. We are under as great obligations to Dalton for his definite proportions, as we are to Sir Isaac Newton for his problem of motion, barring the idea of magnitude in the one, and the invisible atoms in the other, they are equal, each having had their share in the advancement of science. But Dalton's atoms were not rotary forces, and Sir Isaac Newton had no atoms to rotate, and they are thus reduced to a companionship on the ascending scale of science.

If either or both of their hypotheses were true, the clock of time would run down, and darkness would again be on the face of the deep—but when the dawn of the morning discloses a centrifugal force with its rotary atoms in endless duration, the mind expands as it pierces the darkness and dispels

the gloom which hangs over the brightness of creation. In every forward step in true science our souls are drawn nearer and nearer to that Being who knows all things, and yet knows no end.

Definite proportions are born of chemistry, and imply proportions that are fixed, and fixed proportions are defined by limitation of their atoms.

If this theory of definite proportions were true we should have exact sciences, and find squares, with all their angles equally adjusted, and circles with all their radii exactly equal. But the equality of all the radii of a circle is true of all circles, so far as it is true of any one, but it is not exactly true of any circle—it is only so nearly true that we correct our conclusions by combining with them a fresh set of propositions relating to the aberration. The definite proportions of Dalton are analytic distinctions which are lost in the coexisting relations of matter, and if these coexisting relations are substituted for his definite proportions, the endless chain of relations looses no link in its combining proportions, and perpetual motion, in its changing relations with equivalents, springs into being.

While chemistry is adding to the perplexity of simple bodies by multiplying instead of abridging their numbers; electricity, the most powerful, as well as the most delicate, instrument of analysis, is

gradually approaching the solution of the question —that there are no simple bodies in nature—but it seems idle for science to await the solution of a question so obviously untrue, as there are no simple forces in nature out of which a simple body can be made. A simple substance, of whatever form, isolated from all affinities, can enter into no combinations with other bodies, and with no germinating force it must ever remain an unacknowledged foundling, exiled from its share in the mechanism of the universe.

But electricity in its binary form acts upon all bodies, whatever they may be, whether solid, fluid or gaseous, and its primary current, which has been supposed to be simple, is found to be dual by developing two secondary currents, and each secondary current develops two tertiary currents, and each tertiary current determines two quaternary currents. It is obvious that the secondary current assumes a primary form as it develops the tertiary current, and the tertiary current in its turn takes on a primary form as it determines the quaternary current. These are all alike dual forces, which rotate the atoms of matter in the physicial world by coexisting relations instead of definite proportions.

Confusion in science follows Sir Isaac Newton's problem of motion.

The magnitude of this error has cast its shadow forward over the present generation, and involved all the great names which have lavished their powers in vain to carry forward the solution of this problem of motion. I quote from that great logician J. Stuart Mill, the brief sketch of these laborers: "Simple as the law of gravity appears to be, and beautifully in accordance with the observations of the past and present times, what an immense amount of intellectual labor has it cost. Copernicus, Galileo, Kepler, Lagrange, Laplace, all the great names which have exalted the character of man, by carrying out trains of reasoning unparalleled in every other science, each of whom might have been the Newton of another field, have all labored in vain to work out the consequences which resulted from the single discovery which he made. The brightest in genius, and the most persevering in application have lavished their powers on the details of the Law of Gravity. If such be the view we must take of the law of inanimate matter, of which the law of gravity discloses less than is yet concealed from us—laws into whose consequences it has cost

so much intellectual labor to penetrate, what language shall we hold when we consider that there are other and higher laws—laws which connect life with matter—that the law of gravity throws no light upon,—that we are now in ignorance of the smallest link in that chain which holds life in its mysterious relations with matter, or that still more miraculous one which connects mind with both."

If gravity be lost in its rate of motion the question is no longer debatable, but that a mind so clear, so comprehensive and with such mathematical precision, should demonstrate his problem on one half of its force, and that too on its inverse force, which led him farther and farther from causation, and the farther he went the farther from the truth, and yet achieve such gigantic discoveries, is the deepest, darkest paradox of all ; and that Kepler, Lagrange, together with all that bright galaxy of brilliant minds, should be so long searching with their fathom lines a bottomless abyss adds its testimony to the mystery. They have all gained what they have given us by drawing their deductions from the phenomena of motion with its curvilinear lines, in ignorance of their causation.

The Confusion of their Laws.

If there is but one force in nature there is but one law given for its government.

If what these great men have given us are deductions from phenomena, all their discoveries will not reach the dignity of a law. They were all geometricians with the highest order of intellect, and many minds as good go through life unpolished, but geometry being illustrative, and not investigating, led them to perceive the semblance of truth in the propagation of error.

Law is born of science, and its rule of action is the birth of its phenomena. The limited range of our observation leads us to confound law with its rule of action, and thus laws are multiplied without end. What are called the laws of nature are only isolated facts discovered by Copernicus, Galileo, Newton, Kepler, Lagrange and Laplace. The discoveries which they made were so far beyond the comprehension of the mass and so boundlees in their own minds, that they did not perceive they knew less than what was concealed from them, and they were thus led to the delusion that they had discovered laws.

A brief recapitulation of their discoveries will

show them to be rules of action springing out of one general law. Galileo's law,—the less force equals the greater, by moving through more space in a given time : it was on this rule that Newton based his great problem of attraction.

Then there follow in succession the experiments and discoveries of Archimedes, Galileo and Newton : first, that in a mass of liquid each particle presses equally in all directions.

Kepler,—the orbits of the planets are ellipses with the sun in one of their foci. The planets move over equal areas in equal times : the squares of the times of revolution of any two planets are to each other in the same proportion as the cubes of their mean distances from the sun. This was perhaps the most gigantic effort of the human mind, but it is seen that all these discoveries are isolated facts, and show no coexisting relations in combination of forces, resulting from one general law.

Law is a principle, holding in its element a scheme of government, and its rule of action proceeds from within itself by an inherent necessity. The special acts springing out of the necessity of a general law are in the direct ratio of the breadth and depth of its principle. If the law is to govern a kingdom its special acts will include every deviation from justice. If it is to govern a universe, its

special acts may be multiplied by the elements of the law, and this will comprehend all acts not at variance with its general principle.

The rule of action in the law of nature is a system of changing relations with equivalents, and the rule works up to its principle with undeviating certainty.

Confusion of Municipal Laws.

Sir Wm. Blackstone, the highest authority for English law, defines law to be a rule of action, and thus by confounding a principle with its rule of action he has obscured the science of law as thoroughly as Sir Isaac Newton obscured the science of motion, and so many laws have sprung from this undefined definition that a lawyer's library is like the fragments of a war-like nation, with no instrument fit for use, and the consequence follows that law runs out before it comes to equity, and chancery is set up to correct its aberrations, and like the rope of a windlass it never ends, yet the hope of every client is on the next turn of the wheel, confirming the common saying—"Nothing like the uncertainty of law."

Confusion of mind in two forms of belief.

This inquest may throw some light on that higher law spoken of by J. Stuart Mill when he says, "We are now in ignorance of the smallest link in that chain which holds life in its relation with matter, or that still more miraculous one which connects mind with both." The mind has two methods of coming to a conclusion, the one by contingency, where the materials are gathered from the feelings and passions, and where truth may be found by accident, the other by analysis, where belief is established by that process of reasoning upon facts which form the judgment. The feelings and passions where truth may be found by accident include sensation, association, memory, imagination, belief, and will.

These are the mental faculties which are held in common with the higher order of the animal creation. They are the vivid senses of man, and the vivid senses of the animal. These vivid senses obtain belief by the association of sensations in agreement.

If the first inference fails to make a conclusion, it makes a bias, if the second inference corresponds, the bias is increased, if the third inference is in agreement, it establishes a belief, and a conclusion

follows which is mistaken for a judgment. No inference nor any given number of inferences, however they may coincide, can of themselves form a judgment, as the decision by inference is come to before the judgment is reached.

Every human mind is more or less disturbed by two forms of belief, the animal and the intellectual. The animal is the solicitor, the intellectual the judge, and he who falls beneath them both, is sadly corrupted, or has had his mind perverted in childhood when the intellect was forming.

Here is a critical point in every man's character with two forms of belief; how important to know the axis on which it may turn; how important to see the danger, and feel our responsibility. "The wild deer and wolf to their coverts may flee," but we have no covert or refuge from danger, except it be in Him who gave us our bodies to gain wisdom by experience, and accepts our souls on the easy condition of confiding them to His care and keeping.

Here the physician stands as medical adviser between his patient and his God. They, in the instincts of their nature, flee from themselves, and confidingly commit their lives to our care and keeping, and why should not we in the instincts of our nature fly to Him who has no theories to perplex Him?

We are here bound by a duplicate obligation the one to our patients and the other to our God, and this vivid responsibility should be nursed and maintained in our daily intercourse with both.

The animal, with its small and passive brain, and its large solar circle, with its vivid senses, has but one form of belief—the animal, like the infant (till its brain becomes hardened), acts on belief. The animal's belief has degrees of deviation from its standard, but unlike that of the infant it never amounts to unbelief—unbelief, when traversing belief argues thought above instinct. The animal, unlike the infant, has but four perceptions to connect* its vivid senses with the outward world, sight, hearing, smell and taste. These are all vivid perceptions, which gain and give up their sensations to the passing moment.

The wild deer of the forest, that emblem of innocence and love, which sheds the tear of sorrow over the capture of its young, has no organs of combativeness, and it acts on the belief that its safety is in flight. With a telescopic vision which the sagacity of man can only avoid by concealment, an ear which vibrates on the turning of a leaf in the summer's sun, and a nose which scents its foe be-

* Touch in the animal is a sensation, and not a perception.

yond the reach of a Minie rifle, it is happy and contented in its belief.

But the infant, with the fifth perception in the sense of touch, needs no such guardianship in its vivid senses—it is born in the lap of care, surrounded by sympathy, watched by intelligence, and reared prospectively in slow development for time and eternity.

The domesticated dog, the highest in the scale of animal being, has a conscience. His belief stands before his will, and his conscience comes up after the act is committed. He steals from his home in the darkness of night, and kills a distant neighbor's sheep, and hides himself in glens and forests concealed from observation, till the vivid impression of his crime fades into another trial of his skill, and then he returns to his home with a sneaking smile and wags his tail about his master, as if nothing worth mentioning had happened, and when confidence is fairly restored, he steals away again and repeats the history of his crimes. It may shock some pious minds to hear that a dog has a conscience. The conscience is a sensational, and not an intellectual faculty, and its contingent development depends upon the commission of crime.

The sensation of a conscience could never be felt and could never have been known to man but

for a prior transgression; the conscience is not the guiding, but the adjusting faculty of the mind, and stands after the will has been impelled by the imagination to insult it.

But man's belief rests on a broader basis: with the addition of the perception of the sense of touch, and a large brain and a corresponding solar centre for the exercise of his vivid senses, he has an adjusting conscience, over which the reason and the judgment, with their analytic distinctions, may decide what the vivid senses may have misconceived, by drawing inferences from associations in agreement. Here the two forms of belief may be condensed into one if the mind could be impressed with a clear conception of the errors introduced by the imagination into the vivid senses. It is this indiscriminating faculty which introduces all sorts of material that deceives him.

Being the constructive as well as the furnishing faculty of the mind, and subject to sensations, it has no choice but those which sensations suggest. If the object it introduces is false, the accompanying sensation is as real as if the object itself were true, and the pleasurable emotion, if it be one, is sent forward among the social feelings, and entertained by them all. The delusion here arises from the reality of the emotion being produced by a false ob-

ject, so that the mind, instead of being capable of analyzing the object, is deceived by the sensation which the object itself produces. Here lies one of the roots of insanity.

Memory and imagination are duplicate forces, and constitute the radiating centre of the mind. The one brings the past up to the present moment, and the other meets it with the future, and they exchange centres that radiate both ways; sensation, association, and memory on the one hand, and imagination, belief, and will on the other, constitute the sensational mind, while the brain looks on to correct their errors.

The imagination is the only sleepless faculty of the mind, and we are apt to appeal to its seductive pictures to decide our trials, while the will passively listening, and feeling the sensations which the imagination introduces, sets up the pretensions of its prerogative right to execute a final judgment, before the consent of the judgment has been granted. In traversing the main channel of thought we have been passively arranging the logic table of its issues, that the imagination may rest safely beneath its mantle.

Will.

It is true of the will in its executive capacity, that it is always in command; but this trust is a power directly derived from the imagination itself, and both are subject to sensation, so that the antecedent circumstances determine its action, and the succeeding circumstances are but the continuation of the preceding circumstances which determined it. Hence the will, when acting in obedience to the imagination, is acting in its executive capacity, and not of its choice.

In the vivid period of childhood, before the brain has laid its floor for the analytic distinctions of logic, the imagination runs riot over the feelings and passions. When the future is introduced by the imagination to the child, with its prehensile visions, it persuades the memory to take them up, and the associations to weave them in, and, if the weft corresponds with the vision, it believes it, and sets up the will to wear it as the government of the mind.

Before the imagination has been soiled by contagious associations, it is a furnishing agent, with its beautiful imagery, in outlines of innocence and love ; but, when fallen, it is a scavenger, introducing all sorts of material, and deceiving the mind by the sensations which follow in the footsteps of its indiscriminate and distorted selections.

In this state, and without the controlling power of the intellect, belief and unbelief, ability and inability, depend upon the degrees of deviation in the imagination from its standard of adjustment with the sensational relations. If these degrees of deviation are restrained within its ordinary limits, the mind is swayed more or less by its delusions ; but when the estrangement of the imagination from the memory of its past sensations takes place, it is cut off from its anchorage in the natural feelings and emotions, and insanity is its home.

Mind.

The mind perceives the error first.

Here is a dark point in our mental processes that must ever attend our pilgrimage below. In the new-born infant the eye sees all bodies reversed, or wrong end up, and it corrects the error by the sense of touch, as we correct our reasonings through the medium of errors.

The panoply of truth is a myth to the finite mind, as it cannot reach it directly. But to Him who made all things it is a blaze of light. In us it is *induco*, to be searched for, and drawn out through the medium of errors; and it is the error which cheers us onward, with its semblance of truth, in the never-failing hope of reaching it *directly*.

But directly has two meanings, the one in straight lines and the other immediately; and thus we always feel to be on the threshold of truth, unconscious that we must reach it through the medium of errors.

In the arrangement of the primary forces of organic life, oxygen unites with its inverse relations directly $\overset{OH}{-}\frac{1}{1}\frac{6}{}$, $\overset{ON}{}\frac{1}{1}\frac{6}{4}$, $\overset{OC}{-}\frac{1}{6}\frac{6}{}$, and thereafter all their polarities are set free to combine their relations with all other bodies in nature, toward which they manifest no

relation in their normal state, and inverse relations are then established and are permanently maintained with the primary forces.

In this process they are thrown off of their primary bases into the broad field of changing relations with equivalents, and still the inverse forces are subject to the primary power of oxygen.

Here that invisible force of nitrogen, so distinguished for its energy and instability, is among these inverse forces. In the refining process of its nutrition it is the supporting and sustaining force of our mental processes, and, as it unites with all other forces inversely, the relation of truth to error is reversed, and we perceive the error first.

How far this state of mind may be modified by phosphoric combinations is left for future investigations to determine. Nitrogen is not an element of inorganic matter, but holds its prerogative right in the heavens, where its greater specific gravity and motive force, energizes the winds, storms, and tempests, and commands their repose. Here it shares its force in the proportion of $\frac{4}{5}$ to $\frac{1}{5}$ of oxygen, (uncombined,) both in the winter's storm and summer's sun. Its most remarkable office, however, is shown in organic life, by leasing its energy and instability to the transient, versatile, and fleeting pilgrimage of human life, and withholding its presence from

our future state, as no nutrition is needed there. Here we have found what we were not in search of —a well defined distinction between life and soul. It seems evident that the nitrogen in vegetable life gives energy, activity and instability to the physical forces of organic life, and when the mind leaves its nitrogenized body it leaves with it its nitrogenized force, and the mind, released from its inverse relations, sees things directly in their rectified position.

Nervous System.

Every scientific work which treats of human life demonstrates the nervous system centripetally, and every work thus written must be read backward to be understood by the reader.

The nervous, medullary, and cerebral systems are three differing systems of relation, and the physiologist identifies them all into one relation, and testifies the brain to be their common centre.

The order of succession in the development of organic life ignores this statement, by reversing the problem. It is a well-known fact that the nerves themselves are fully developed and are performing their functions before the spinal column appears on the theatre of its action, and that the spinal column is organized and performing its functions before the

floor of the skull is laid for the construction of the brain. The vertebral column and base of the skull are the first parts of bone that are developed in embryo. These vertebræ form centres of circumference whose centres are in each other, and they unite in the form of a ring in their circumference, to form a channel in their centres for the passage of the spinal marrow, and each of the vertebræ is formed from three primary centres of ossification.

The medulla spinalis, the electro-magnet of human life, is laid at the top of the column, at its junction with the brain, and the prolongation of its crura is sent forward into the two hemispheres of the brain to complete their relations.

The starting point of this force in the solar centre is centrifugal, radiating from this nervous centre through the spinal marrow to the medulla, from which it is reflected backward centrifugally to its starting point, where its alternate forces, by their action and reaction, maintain this nucleated sphere of organic life till the negative pole of the medulla sends forward its negative force for the construction of the brain. The starting point of the nervous system is found in the cœliac axes, in the centre of the solar plexus, with its two semilunar ganglions, one on each side of it, both of which are the largest ganglia of the body, and give birth to the greater

and lesser splanchnic nerves. If the greater splanchnic nerve be traced centrifugally through the medium of the great sympathetic, and the lesser through the medium of the great pneumogastric nerve, they will represent a physico-mental nerve, one branch of which produces sensation, and the other motion. One makes the mind, and the other matter. These branches, rising from one base, are joined to each other on the inner side by branches from the solar plexus itself, the lesser, the mental, joining the cœliac axis at its root. Thus armed, these nerves, with eccentric axes in their ganglia on which all bodies move, become the matrix of the nervous system, with its action and reflex action, from its centre in the solar plexus to the circumference of its relations in organic life.*

* If my anatomy is at fault I may be pardoned for its errors, as its study was abandoned fifty-six years ago, under the tuition of the late John Augustin Smith, M.D., who was then a young Virginian of twenty-four years old, and just returned from Europe, and made Professor of Anatomy and Surgery in the College of Physicians and Surgeons of the city of New York. It was my privilege to enjoy two full courses of his lectures, for two years in succession. We called him concrete. His mind was a condensing engine, and fitted in all respects to demonstrate Sir Isaac Newton's problem of motion centripetally. He carried us with him in all his clear and lucid analytic distinctions to the terminus of his extreme doctrines; but when I reduced them to practice on my patients I at once found that my emetico-cathartic disclosed an eccentric axis in the stomach, and was

Having reversed the problem in the nervous system by demonstrating it centrifugally, we may next state the functions of its ganglionic system.

In the distribution of the nerves, with their radiating branches, from the centre of the solar circle to the circumference of their relations to the spinal marrow and the brain are found ganglionic centres, with eccentric axes, and no two axes alike.

In the ascending scale of organic life it is found to maintain the general rule of inorganic matter, where every snow-flake has an eccentric axis, and every two are similar and no two alike, and every drop of water in a rain storm, from which snow-flakes are made, has eccentric axes, and every two are similar, and no two alike, and they all fall rotating on each other's track to the ground. These rotary forces in the ganglia of the nervous system may give us a lamp to light our pathway into that dark centre from which our passions and emotions spring, and it may light us into that darker chamber where the calm thought of reason and judgment presides in its seclusion over the disturbing feelings of the soul.

The digital nerve, that constitutes the sense of

decidedly centrifugal, ignoring all my teachings, and gradually reversing the problems of the school into centrifugal forces operating both ways.

touch, which distinguishes the properties in bodies, ascends from the fingers, is lost in the median, and from thence pursues its direct course to the brachial plexus, where it is rotated into the four anterior branches of the lower cervical and first dorsal nerves, which unite to form the fifth pair, where the great ganglion of Gasser is traced deep between the tranverse fibres of the pons-varioli into the lateral track of the medulla spinalis, where the sense of touch was found by Muller's experiments, and from which the medulla, the great central ganglion of organic life, rotates from its negative pole the ingathering forces of the sense of touch which form the layers of logic in the centre of the brain. The ganglion of the eye rotates the vision and retains the memory of sight ; the ganglion of the nose rotates the sense of smell and retains the memory of odors ; the ganglion of the tongue rotates the sense of taste, and retains the memory of its many flavors ; the ganglion of the ear rotates the waves of sound, and retains the memory of every tone, whatever may be its velocity ; and the ganglion of the solar centre rotates the passions and emotions, retaining the memory of their sensations in the ratio of the vividness of their impressions. It is not to be forgotten that all these senses are duplicate forces, and that the ganglia of the two eyes are similar and not

alike. If they were exactly alike, one eye would be equal to two, but the difference in the two axes in these ganglia gives a dual sight to perceive dual relations in their contrasts and resemblances for the mind to contemplate.

As the atoms make the mass, and rotate, the mass, the body itself, is a dual relation—one side may be palsied and the other not. The tongue has two halves, with their unequal tastes, to bring unequal flavors to a standard of adjustment.

Objects of vision have differing relations, which the two eyes adjust to a standard of observation. Odors and sounds are governed by the same rule, as well as the expression of the face—the two sides of which being unequal gives the high standard of expression by its symmetry, and the nearer from symmetry they approximate to equality the less striking the face ; as the degrees of deviation lessen and lessen, the nearer it approaches to vacuity.

Sight and Touch.

Touch distinguishes man from all other beings. In animals it is a sensation, in man a perception, and its importance is only known when measured by the perception of sight. Of the five senses, only two, touch and sight, spread their sensations over

extension, and the most constant relation subsists between the two, and their relation is so uniform that whatever the one feels the other knows. The vast field over which the faculty of vision presides, with the precision and permanence of its perceptions, leads us to believe that, notwithstanding the wrong adjustment of the eye, nothing material can escape it. But the presumption that the eye sees whatever is material fails on testing it. If a substance be placed at a given distance from the eye, and it should bear no analogy or resemblance to any substance which has hitherto been embraced by its focal powers, what impression could the eye gain of its material properties? Clearly little or nothing. Apart from its color and contour, nothing. Submit it to the sense of touch, with closed eyes, and all its essential properties are at once known and appreciated. We forget, from habit, that our vision is corrected by the sense of touch, and that our desire to feel what we see is the impulse of a detecting power to learn what a weaker power cannot give.

The sense of touch is designed for deliberate action. The fact it examines, and the evidence it bears, is deliberately taken, weighing its testimony in arithmetical progression, and in equal quantities, and when its proportions are taken to the two hemispheres of the brain, they form the basis of the calculations of logic.

INSANITY.

A SENSATIONAL, AND NOT AN INTELLECTUAL DELUSION.

Dr. Parigott says, under the head of insanity in America, "it is a curious fact in human economy that the weakest person, even among women, may raise the moral and muscular powers to such a degree as to produce incredible strength and effort; and it is nothing but an indomitable will in the mind of the insane which appears to give them superhuman strength;" and he adds, "that it is nothing but an indomitable will roused to its highest tenacity, that prevents our soldiers from knowing or believing they can be beaten."

To comprehend the condensed nervous power in human life, we are not to measure it by the will of the soldier in the full development of his muscular force and in the spring resulting from victory, but it must be measured in that unfortunate class of our patients who are deranged, and whose muscles

are attenuated to threads by their sensational delusions. Here the will of the insane, unlike the will of the soldier, presides over physical emaciation, and yet unlike the soldier, without physical exhaustion. It is apparent in all mental aberrations ; if their mental agonies were not delusions they would soon die. No natural sensations could bear their anxieties and sorrows for twenty-four hours without physical exhaustion ; and yet we find the tension of their nervous system capable at any time and at any moment of condensing its force into wasted muscles, giving them more power to resist all control by physical means than they ever enjoyed at the full standard of health, and the tenseness of their nervous systems may last unimpaired through weary days and sleepless nights, for months and years without exhaustion.

The experience of our most distinguished physicians at the head of the charitable institutions, are led to regard this physical endurance of the insane mind under their protracted sufferings, to be the result of an " indomitable will."

Here arises a grave question for medical practice. If the antecedent circumstances determine the will, instead of the will determining the circumstances, the practice must differ. If the will determines the circumstances it is a subject of mental

discipline ; if the circumstances determine the will it resolves itself into a question of medical skill.

If the wrong sensations produced by physical disease be righted, the will falls passively into its own channel.

The will is often mistaken for a motive power, when it should be regarded only as the rudder of the ship of life.

Every mind has its own method of analysis, the analytic distinctions of the insane are as precise and clear when reasoning from false premises, as they were before, when reasoning upon sound ones ; their sensations are all wrong ; when we lose our points of compass we are for ever travelling in a circle ; it is so with them, they are always traversing one idea.

When the intellect loses the guiding power of the will, it is incapable of analyzing the delusion, the sensation produced by a false object being as real to them as if the object itself were true. But when the executive force of the will is guided by antecedent sensations in the vigor of health, the inferences drawn from the associations of sensations in agreement are true. On the contrary, when the executive force of the will is guided by antecedent sensations which are false, the intellect may be likened to a ship in a storm with no rudder to guide it.

There is a passive as well as an active insanity, both of which depend on the conditions of the organs in the variation of their morbid sensibilities from the standard of health. The reasoning power of the insane loses none of its analytical distinctions when reasoning from false premises.

The stock which the memory of touch has laid by is there, but its present faculty finds no properties in bodies to correct its aberrations. If the present sensations of the moment are forgotten in the memory of sensations that are passed, the intellect has the guiding power of the will, and the mind for the time being is adjusted to its normal standard, and the history of past events are often related with the precision and clearness of the written record of a daily journal, but when absorbed in these diseased sensations despair renders them stolidly indifferent to every sympathy. The eye sees in the tender emotions of a mother, the expression of design ; best friends are regarded as enemies ; poverty stalks abroad in the footsteps of wealth and plenty ; and ruin casts its dark mantle upon every possession. The rich carpet looks like a soiled blanket, and every footstep on it is the approach of a bandit. The morning air smells of sulphur, the spring breezes are poisonous, the new-laid egg tastes of decay, the sweetest butter rancid, the tender steak

foul, best bread disgusting, and the richest cream putrid. Estranged from the Creator, and life prolonged for the purpose of perpetuating suffering and avenging crimes which a diseased imagination has engendered.

The Constructing power of Atoms.

The invisible angles within a drop of water become visible *in their constructing forces* when thrown on a plate of glass at zero, where they first crystallize in the form of a little star. This stellar figure first throws out rays of crystals from its centre, and branches of rays, all making angles of 60 with each other, and as one, two or three separate crystals start up within the sphere of the stellar centre, in the act of crystallizing, they are free to move, and the outer poles are seen to be attracted inward (inverse force) toward the sphere of the stellar centre of repulsion, and all will then be found in the same plane at the angular points of an equilateral triangle, since each must be at the same distance from each of the others. As a fourth crystal approaches in the same manner, it will arrange itself at an equal distance from each of the other three, at the apex of a triangular pyramid of equal and exact forces. In this order of crystallization geometrical

forms are the necessary results of the electro-magnetic force acting on a drop of water, and its invisible angles are rendered visible by simply altering its temperature in the process of refrigeration.

As water changes from its fluid state into crystals, by congelation, the forms are determined by angles of 60, but as no two spheroids of water, like two leaves on the same tree, are exactly alike, every spheroid crystalizes into new forms, until every variety of known forms pass into the unknown.

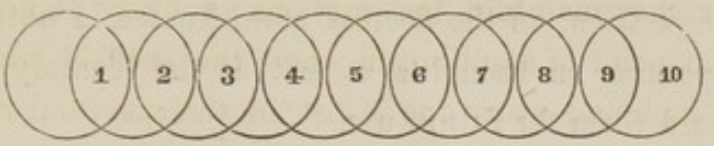
This rule of action in the formation of snow flakes by congelation and of crystals in differing temperatures, is the guiding rule of action for the formation of every atom of matter in the physical world, whether it be organic or inorganic, as they are both organized by the same binary power, $^{O\ H}_{1\ 6}_{1}$.

In this pre-arranged form of the invisible angles of oxygen, it comes to be the archetype of matter and the moulding element of life and motion in all things ; and while it remains itself an unchanging power by uniting with the disaggregating forces of carbon and the recombining forces of hydrogen, it imparts changing relations to these positive forces in organic life, and in regulating the velocity of revolutions in the rotary atoms of inorganic mat-

ter they maintain the motions in every planet at that point of equilibrium where the specific gravity in each and every one is lost in their several rates of motion.

Atoms unite with Atoms by changing centres.

Having established the compound nature of forces and the binary forms in matter, we are introduced to the interchange of relations among the atoms of matter in themselves, or in other words, we are reduced to the question, by what means do atoms unite with atoms? If Sir Isaac Newton's theory of attraction was true, all atoms would be reduced to simple bodies; the force being in the wrong direction for its affinities, no reproduction could ensue. If the force in all atoms be centrifugal and unite by mutual affinities, it does not explain the process of the interchange of relations; if we say by an exchange of equivalents, it does not disclose the method of adjustment. But as the combining proportions in all atoms of matter which unite with each other are represented by numbers, the following diagram may explain the process by showing the binary combination of numbers in their own relations?



2 is a binary compound of 1 and 3, and 2 is the centre of the circumference of its relations ; 3 is a binary compound of 2 and 4, and 3 is the centre of the circumference of its relations ; 4 is a binary compound of 3 and 5, and 4 is the centre of the circumference of its relations, and so onward to infinity. Every figure, whatever may be its number, is a binary compound of two other numbers, and the central number is always the centre of the circumference of its changing relations.

Any number may represent an atom of matter which is always a compound of two other atoms, and this atom is the centre of the circumference of its relations. The atom thus complete in itself is linked into the relations with the next atom to the limit of its combinations by an undeviating rule, while its centre is always changing with its change of relations, and hence it cannot stop to make a duplicate by reason of the constant change in its centre, and every new centre is a new base for new combinations in matter. The velocity of thought has to be measured by this process ; two thoughts unite with each other by changing centres, and the

imagination, on the fleetest steed known in nature, is pouring in thoughts as fast as the memory can record them for future use.

Thus numbers stand in the same relation to each other as the combining proportions and equivalents of the substances they represent, and the problem of any one number ; take for example the number 2 ; simple as it first appears to be, presents combinations so general as to be co-extensive with all nature. At first it is difficult to conceive the illimitable range of any single number, or that parts of the number 2 form the aggregate of the remotest calculations in algebra, just as the first atom of creation forms a part of the pen with which I am writing.

Whatever is made up of parts is made up of parts of those parts. In tracing the relations of the number 2 with 1 and 3, they obey the same rule as is observed in the combining proportions in matter ; no beginning, no middle, no end, has ever been known in atoms or numbers ; mark the numbers 1, 2, and 3 in their order of relations, and the number 2 is the centre of the circumference of its relations, and proves to be a radiate of 1 and 3, decreasing in its deviations toward No. 1, and increasing in its degrees toward No. 2, so that its radiating range is illimitable in both directions, as the subdivision of

No. 1 cannot be reached, and the accumulations of No. 3 never exhausted.

Radiates.

It has been shown in organic life that the direct force is $\frac{84}{100}$ to $\frac{21}{100}$, and the primary force is centrifugal. This foundation being established, it follows by an inherent necessity that every atom of matter in the physical world is a radiate.

Pythagoras was right when he held that numbers were the essences of things. As they represent the combinations in the atoms of matter, they are all radiates. 2 is a radiate of 1 and 3, and 3 is a radiate of 2 and 4, and 4 is a radiate of 3 and 5, and 5 is a radiate of 4 and 6, and so onward to infinity. There is a distinguished Professor lecturing in this country on natural science, whose alphabet on radiates is a short lesson limited to the first four primary developments of infusorial life ; from this terminus the order of radiates is reversed, and each classification terminates with itself, and new series are introduced until his telescopic vision foresees the different origins of the human race, and he then sows the germinating seed broadcast over the land. When he learns that every atom of matter in the physical world works on a centrifugal centre, he will

perceive that every atom is a radiate ; and as the atoms multiply and combine into living structures, limited only in the initial elements of their organizations to orders and classes, he will find them all radiates from the polyp up to man.

It is the primary proportions of the forces in matter which define the orders, genera, and species, and classify all the relations of organic life and those of inorganic matter. His four orders and four classes transcend the primary limits of adjustment in creation. There are but four elements out of which matter is made, and they combine into three orders and unite with each other in binary forms. The moment we lose sight of these geometrical proportions, the mind loses its anchorage, and the imagination, when left to itself, turns scavenger and introduces all sorts of material, unassorted, into the mind, deceiving it by the sensations they produce. Man, the monarch of matter, is the monarch of radiates on the ascending scale of being : the *proportions* of the primary elements in his initial structure are only peculiar to his race. No man lectures more learnedly than this Professor. With his enthusiasm, clearness of thought, and precision of style, he throws a halo of truth over his errors which excites the same emotions in his audience that it does in himself. His denial of spontaneous repro-

duction in infusorial life is obviously taken to rid himself of the introduction of the human race on the theatre of life by a single pair.

He shies all development and lends his ear to metamorphosis, and his imagination, fired by this casuist, sees in every new order of being, from the polyp up to man, the special intervention of the Creator to start a new career of existence in every new division of animal life.

As the Professor's mind is now adjusted, he cannot alter the direction given to human thought by previous inquirers—so true is it that the greatest minds cannot escape from the atmosphere in which they live.

The faith of mankind has been led doubtingly, yet believingly, for centuries through the medium of the imagination.

It was the imagination which shook the creeds of primeval date ; and, when philosophy arose, it was the legitimate function of the imagination to explore the secrets of the human mind and lay the foundation of Psychology.

In all the physical theories of the ancient philosophers, imagination exceeded its first limits and took the place of rigid observation.

Plato embellished his philosophical system by the popular creations of his imagination, and the

Professor has been reaping the harvest of his delusions.

If his imagination was restrained within the just limits of rigid investigation, the unruffled dignity and repose of such a mind, when adjusted to its logical relations, would command the respect and homage of his hearers on the one hand, and enable him to sow the seeds of his science broadcast over the face of society, which he now only delights.

His imagination has painted on his mind four classes of radiates, beginning with the lowest, and naming them on the ascending scale of their organizations into polyps, acaleps, echinoderms, and sea-urchins. In the polyps the plan is executed in the simplest manner by a sac (cell), the sides of which are folded inward, at regular intervals, from top to bottom, so as to divide it by vertical radiating partitions converging from the periphery toward the centre. "What faculty of the mind, except it be the imagination, could conceive a radiate, the sides of which are folded inward at regular intervals, and all converging from the periphery toward the centre?" This polyp must have been an unacknowledged foundling, to radiate in the wrong direction from its circumference to its centre.

A radiate, to maintain its character as a radiate, should have its starting-point from its centre, with

radiating partitions from a central cell, the sides of which are folded inward, and then converging from the periphery toward its centre, and the atomic forces would then be repelled directly as the mass, and inversely attracted as the square of the distance, and it would make a regular polyp under the guidance of law.

"In adding infusoria to radiates," the Professor says, "Cuvier was false to his own principle of founding all classification on plan." While the Professor's plan is merely a hypothetical conception founded in his imagination, that of Cuvier is founded on a judgment ripened by experience and common sense. He says that Cuvier was influenced in joining infusoria to radiates by the seeming simplicity of structure, and to place them in the lowest division of the animal kingdom on that account.

What else had Cuvier, or what else has the Professor, to guide him than simplicity of structure?

What new revelations of the atomic constitution of the material world have since been made, on which the Professor can found a plan that was anything but gratuitous? He says even the simplicity was only apparent, and at certain seasons of the year myriads of these animalculæ may be seen in every brook and roadside pool. They are like transparent little globes without any special organization appar-

ently, and were it not that they are in constant rotation, thus exhibiting a motion of their own, one would hardly expect that they were endowed with life. To the superficial observer they all look alike, and it is not strange that, before they have been more carefully investigated, they should have been associated together as the lowest division of the animal kingdom, representing, as it were, a border-land between animal and vegetable life. But since the modern improvements in the microscope, Ehrenbergh, the great master in microscopic investigation, has shown that many of these globules have an extraordinary complication of structure. Subsequent investigations have proved that they include a great variety of beings, some of them belonging to the type of mollusks, others to the type of articulates, while many others are the locomotive germs of plants, and, so far from forming a class by themselves as a distinct group of the animal kingdom, they seem to comprise representatives of all types except vertebrates, and to belong in part to the vegetable kingdom.

This quotation proves too much for the Professor's plan of distinct groups in the animal kingdom from the polyp up to man.

Acknowledging the unity of elements, and affirming that they represent all types except verte-

brates, while some of them belong in part to the vegetable kingdom, proves Cuvier to have been right when he placed them in the lowest order of animal life. All physical organizations born of the same elements exhibit these differences in the ratio of their primary proportions, and are distinguishable from each other by the fractional shares of these elements which enter into their initial structures. Granting the elements to be one in essence, every degree of divergence in organic life makes a difference in the form, and is measured by every degree of deviation in the relative proportions of the elements that enter into the masses.

Whatever of debasement or degradation may take place in these changing relations with equivalents, it is to be remembered that equivalents are similar, *but not alike,* and if the likeness is not preserved, it may appear as a deformity when its specific value is the same.

Taylor says, "If among the races of the human family we were to take the most extreme cases of intellectual and moral dissimilarity, such as that of the modern European and the Papuan or the Bosjesman, it would not be necessary to travel a mile from our firesides to find individual contrasts fully as great. Nay, is it not so that, sitting around the same table, the types intellectual and moral of the

Greek and of the Barbarian, of the Scythian and of the African may be pointed to ? Certainly it is so in any place wherein are assembled as many as a hundred persons who are cousins and townsmen." Whether we take our examples from continents or from cities, or from near neighborhoods, we shall find it difficult, or we may find it impracticable to substitute any hypothesis of classification ; that is to say, we shall not be able to circumscribe any number of individuals with constant lines, so as to distribute them into any classes or species whatever. Every such conjectural classification will be always breaking down under our hands and melting away, until every aggregate has resolved itself into the individuals which compose it.

Hence there is no rule of reproduction and no law to guide it without a special intervention. The primary elements of aquatic life are chiefly derived from water, where oxygen, whose primary element is life itself, plays its most conspicuous part in rotating myriads of spheroids around their common centres, both within and without a drop of water. In sharing its bounty with one sixteenth of hydrogen, it embraces all cold-blooded animals, that abide in waters, each and all of which are radiates.

A SANE MIND WORKING ON ITS OWN CENTRE.

In summing up the forces of organic life, the end proves its beginning.

It started with these three vital forces, $\frac{16}{1}$, $\frac{16}{14}$, $\frac{16}{4}$, and they were condensed by means of electro-agency into one current, rotating organic forces on eccentric centres, until they finally reproduced three focal centres in human life: the reproductive organs, the stomach, and the brain, each of which has different rates of motion.

If the vital forces of the reproductive organs be elevated to their standard relations with the stomach and the brain, we have in these three focal centres the animus of the whole system.

The stomach, with its eccentric axis and centrifugal force in both directions, is a radiating centre to these two vital organs, receiving their reflex actions in return, and at the point of equilibrium the primary force is receiving as many sensations from its own satellites as it sends off from its own centre, and thus these three focal centres of organic life adjust each other's relations, when guarded by the influence of abstemious and temperate habits. But here is the grand crisis in every one's character.

In these three relations there are two suggestive organs, the one for the appetite and the other for

the passions,* over which the logic of the brain must preside, or debauching forces will ensue. The central force, $\frac{16}{14}$, by habitual indulgence, renders the central organ a slave to the appetite, and, by directly disturbing the passions, throws the mind off its centre. In this country more than in any other, nitrogenized forces prevail. Energy and instability are the most remarkable traits in the American character, and in the superabundance of animal food we are the most nitrogenized nation on the face of the earth. The nitrogen condensed in four ounces of animal food, would charge twelve ounces of vegetable food above its standard.

It is the difference of the juice of the grape to the wine it makes. The poorest man who earns his

* We have purposely refrained from introducing secondary relations until the primary forces were all clearly established, but this ultimate development, if unexplained, would be received as a foundling without parentage.

It is well known to chemists that phosphorus is a powerful stimulant, and exists alone both in the brain and ganglionic system, in the form of an oleo-phosphoric acid, in a free state; that it exalts the power of the brain and the forces of the ganglionic centres, and that the reproductive organs in man are highly exalted by the condensation of two per cent. of this phosphuretted oil in the composition of his semen.

When the phosphoric acid is separated from its compound in the general system, the ganglionic centres, having lost their normal stimulus, rotate feebly.

bread by daily labor, may have his three meals of animal food three times a day in its most condensed form ; and the crumbs of it which fall from the rich man's table, energizes the rebellion in the kitchen below ; and when this picture, painted with his coarse materials, is reflected into his dining-room above, where are turtle soup and tender sirloins, with mutton chops and veal cutlets with gravies, exhaling odors which excite an appetite already surfeited, he may see how the sensations in the muscles of the pugilist, by living exclusively on animal food, trains his passions for blood, and that these same sensations may become disturbing forces within his own domestic circle, generating, with his own means, passions which he himself may be striving to subdue. If the refining process of so much condensed nitrogenized food disturbs the mind, how is he to control the moral sense ?

The higher the wages of his cook, the more he demoralizes his family, and the evil extends to his dogs and horses. An excess of nitrogenized food makes the one surly and bite, and the other dangerous beneath the saddle or in harness.

Nitrogen, when in excess, remains uncombined, and is followed by physical, moral, and mental instability, and throws the mind off its centre.

Unseen in its dark channel, it differs from rum

in its permanent work, the one commits crime by impulse, the other deliberately.

The Southern rebellion was nurtured on hog and hominy, pork and bacon, the most condensed form of animal food. To maintain physical, moral, and mental health, nitrogen must be graduated to the scale of physical exercise, then the stomach will be light, the head clear and the passions cool. Students and men of business, with active states of brain, use up their nitrogen as regularly as it is reduced by manual labor, while an active brain with *anxiety* reduces the nitrogen more rapidly by an active state of kidneys, with frequent nicturition. No matter how hard the brain works, if unattended with anxiety it never kills. If all the teachings of all the divines in the country were condensed into one sermon, and the proof sheets given to every individual in it, it would be casting pearls before swine, if it cannot be made to be the interest of every individual to take care of their daily habits of indulgence. The task properly belongs to the medical profession to take it up and with clear heads and determined hearts become missionaries to every family they prescribe for.

It seems to me to be impossible for this Republic to remain so, with its present resources, without the establishment of abstemious habits.

No monarchy in Europe could withstand the nitrogenized forces generated by the wealth of the United States. Small centres of circumference will begin to resist municipal laws, and these small centres will amalgamate, and the centre of the circumference be enlarged until it begets another rebellion.

A kind Providence has given us an enormous national debt to restrain our passions for the time being, and in this interim, if the medical profession will take it up and enlighten the minds of this nation by showing them the dangers of indulgence, and teach every family they prescribe for the value of abstemious habits for the regular maintenance of their physical enjoyments, the task of self-government would be comparatively easy.

But we must clear out our own Augean stables first, before we can invite our guests within them, and then begin by showing them how their diseases are generated, and how they can be avoided ; how their minds are disturbed by physical sensations, growing out of their physical indulgences, and how fleeting, transitive, and unstable are all their enjoyments, when compared with one day of happiness resulting from self-denial. Teach them to eschew tobacco, which first lessens the action of the heart and prepares the way for rum, and rum for habitual

indulgence. But the waste of life, great and demoralizing as it is by indulgence in these poisons, do not compare with the unseen ravages by the excess of nitrogen uncombined in our daily food. It only combines when its standard relation is as 16 is to 14.

If my voice was not feeble on the "Grampian hills," I would shout its perturbations to the centre of the earth.

PROBLEM OF THE SOLAR SYSTEM.

INORGANIC FORCES,

Or rather insensate forces, are measured by $77\frac{27}{100}$ of direct force to $\frac{7}{100}$ of inverse relations.

In surveying our position, it is obvious that we have been demonstrating forces backward, and in our retrograde pilgrimage have reached that grand crisis in the world's history where the central force in man was first introduced, and the antecedent problem of creation stood in the binary forms of $\frac{\text{O. H.}}{16}\frac{\text{O. C.}}{1}$ to $\frac{16}{6}$.

The problem of organic life embraced three primary forces, $\frac{\text{O. H.}}{16}\frac{\text{O. N.}}{1}$, $\frac{16}{14}$, $\frac{\text{O. C.}}{16}\frac{}{6}$, and the specific gravity was $\frac{48}{100}$ to $\frac{21}{100}$, and the direct force $\frac{84}{100}$. The problem of inorganic forces embraces but two binary forms $\frac{\text{O. H.}}{16}\frac{\text{O. C.}}{1}$, $\frac{16}{6}$, and the specific gravity is $\frac{32}{100}$ to $\frac{7}{100}$. If the specific gravity of oxygen be $\frac{48}{100}$ to $\frac{21}{100}$ in organic life, and gives for oxygen a force of $\frac{84}{100}$ when the specific gravity of oxygen in inorganic

matter gives $\frac{32}{100}$ to $\frac{7}{100}$, what will be the force of oxygen here ?

In organic life the specific gravity of $\frac{48}{100}$ to $\frac{21}{100}$, is $\frac{27}{100}$ direct weight in inorganic forces, $\frac{32}{100}$ to $\frac{7}{100}$ gives direct weight of $\frac{25}{100}$, hence the proportions as $\frac{27}{100} : \frac{84}{100} :: \frac{25}{100}$ $77\frac{27}{100}$. The specific gravity $\frac{27}{100}$ gives direct force $\frac{84}{100}$ specific gravity, $\frac{25}{100}$ gives direct force $77\frac{27}{100}$.

The fraction $\frac{97}{100}$ may give the disturbing force discovered by Sir Isaac Newton, which he called perturbations, a deduction which he drew from the supposed attraction of gravitation among the remote bodies in space ; but this term would be inapplicable to the variations of a centrifugal force in the interior constitution of the globe, where oscillations may accrue by the agency of an additional force of $\frac{27}{100}$ of centrifugal power not otherwise accounted for.

In organic life the resistance to the direct force was $\frac{21}{100}$; in inorganic matter the resistance to the direct force is only $\frac{7}{100}$: the resisting force being just two-thirds less than that in organic life, brings the direct force in both problems to an equal and exact adjustment, and the great dynamic force in nature stands forth in all its magnitude and power.

The more oxygen is studied the more it appears to be a self-sustaining power delegated from on

high to teach the geometry of physical forces to man. If it was translated into its generic term, oxygon, which is a triangle with three acute angles, and three concentric centres, it would enlarge the dimensions of oxygen gas from the narrow field of its operation, where it is now only generating oxides and acids, into the dominions of science, where it controls the changing relations of the universe by the steadiness of its power.

It is the great mechanico-vital power in nature, whose permanent elasticity gives a force which is exactly equal in opposite directions with its positive and negative force included within its own invisible relations.

The source of all combustion, and yet incombustible, with three affinities, it supplies the whole physical, moral, and mental world with combustion, enabling them to maintain changing relations with equivalents in perpetual motion, accommodating itself to every change of relations, sometimes putting itself beneath its affinities, yet always controlling their forces without diminution or exhaustion. In the beginning it made hydrogen its lineal descendant, bestowing upon it the "waters of life freely," of which it gave to man $\frac{80}{100}$ for his organic enterprises, and, by uniting with hydrogen equal in bulk to its own specific

gravity, has made hydrogen a positive force in matter.

Thus, by degrees, the weakest power in nature has grown from small dimensions which are sublime in their vastness, and now it controls in its own right four-fifths of the physical power of the globe.

In their duplicate relations they made water a spheroid, the mould and starting point of every form of matter known to man, and the direct cause of curvilinear lines in motion ; oxygen makes the angles, and with hydrogen the curvilinear lines, and within these invisible relations lie concealed electricity, the refractor and reflector of light, and the base and balancing power of all the forces in nature. Here we have the primary force which reflects the light in darkness.

Thus it is seen that the spheroid, which is made by the union of oxygen and hydrogen, is the archetype of every form of matter, from the crystal to the plant, from the plant to the animal, from the animal to man. Every atom in his composition is spheroid, and it is this which gives him the art of making spheroids in every variety and form of arches and crescents, and every deviation from straight lines with his fingers ; but it is beyond his skill to make a perfect circle without an instrument

to guide it ; there is no such form within him, and he cannot give what he does not possess, without the aid of art.

When he loses his points of compass his spheroidal form defines his own orbit by his own magnitude, like that of a planet, and he traverses his spheroid until some fixed point changes his centre and guides him into a straight line. The same dynamic force which made him a spheroid, made the globe spheroidal before him, and the matter in both is geometrically arranged in similar spheroidal forms. Water was the first binary compound which announced the beginning of the world, when "darkness was on the face of the deep," and all the waters of the globe are found, by analysis, to hold in solution some or all of the mineral bodies which constitute the structure of the globe. Dalton found one part of common salt in rain-water, at Manchester, in England, and Brand found in rain-water, in the interior of Germany, common salt, salt of ammonia, chlorate of potash, sulphate of magnesia, carbonate of magnesia, sulphate of lime, oxide of iron ; the chief of these being the constituent elements of sea-water, brings incredulity to a stand on the subject of the formation of the globe. The sea is a laboratory, with its electro-magnetic engine disaggregating the molecules of sea-water and ren-

dering their tributary elements to the formation of dry land. The first process was the formation of crystals in the form of rock-salt and amorphous crystals for sea-shells, and shell-fish, and calcareous deposits, that the dry land may appear. All bodies passing from a fluid to a solid state tend toward a regular geometrical arrangement of their atoms into crystals by a given rule. If the fluid be at rest, the axis of the crystal will be at right angles to the surface of condensation, forming radii with their bases in the circumference, and thus the deposit and growth of matter in the centre of the earth is a solid masonry of rocks and crystals geometrically arranged, both axially and equatorially, in the form of brace-work for the construction of the globe. The physical discoveries of Professor Faraday led him to distribute all material substances in nature into two great classes, one of which is repelled by the poles of the magnet, so that they are placed by this force equatorially in the line of the poles, while the remaining class, being attracted by the poles of the magnet, arrange themselves axially or centrifugally in the line of the poles.

From this physical arrangement of the electromagnetic force, the one axial and the other equatorial, the earth is driven by one and the same force on its eccentric axis in a twofold (rifle)

motion, and the direct force of $77\frac{27}{100}$ impels the mass by rotating the atoms within the mass, the motion of the whole being the sum of all its parts.

The reader has not traversed the massing of matter thus far without gathering impressions hinted at by all things and assumed by none, that the construction of matter from a primary spheroid is in centres of circumference, with angles of definite relations in the forms of brace-work.

The little star of hoar-frost on a pane of glass, which hastens to cover up its footsteps with a polished glade of ice, stands in the angles of definite relations as the prototype of the brace-work of creation. The axial and equatorial arrangements in the interior constitution of this globe, is a system of brace-work in this type of hoar-frost.

It is the rule of formation in every atom of inorganic matter, that the centre of its circumference is in angles of definite relations in the form of brace-work, and this rule of action is carried forward in the ascending scale of being up to man. Every angle, in whatever form it may be drawn, is a brace ; every deviation from a straight line must be met with a corresponding deviation in the shape of a brace ; and every angle in science is exhausted in (cos-micros) the little world of human life.

All forces are invisible till they unite to form

matter, and the invisible angles of these forces are the moulds of the visible forms of matter of which the globe is made. The dry land now on the surface of the continents, was once submerged within the ocean, and the mountains now visible are examples of the brace-work of the globe within it.

The ocean, at its birth, was not the ocean it is now ; its dimensions were less, from its compactness of form. As the lower and interior strata of earth and rocks and crystals were laying axially and equatorially the foundation brace-work of the globe, the spaces among the atoms of matter were correspondingly enlarged till they came to where we are now searching for the geological periods of its ancient history. The ocean and the earth have since grown up together, burying the stone effigies of their dead march as they came along, until they have reached their present form and magnitude by feeding on the air.

The air is the earth's foster-mother, from which it derives its chief support.

Its rich clothing of vegetable life, and the material substances of all decomposing trees and forests, with the exception of the ashes which remain after they are burned, are derived from the atmosphere, and all these changing relations in the growth of matter are derived from the seas and

oceans, whose dimensions lessen as the dry land appears, and the spaces among the coarser materials than those of water, with the elevation of mountain lines, may make the difference in the diameter of the globe without altering its specific gravity. In exchange for this wealth of vegetable life, the payment is made in the elements of death. The carbonic acid which is exhaled, is taken up by the air, and wings its way east and west, north and south, making the tour of the globe. The date trees which grow round the fountains of the Nile drink it in by their leaves ; the cedars of Lebanon take it up to add to their stature ; the cocoanuts of Tahiti ripen upon it, and the palms and bananas of Japan change it into flowers ; and these perpetually dying and decomposing bodies add their annual deposit to the growth of the earth ; and when countless ages have been given to the lease of its activity, gathering to itself new circles of matter from year to year, centuries multiplied by centuries will be the sum of its growth.

Its Motion.

The force which made the earth endowed it with motion, and defining its own orbit by its own magnitude, it was instantly on its track with every other satellite which formed the circumference of

the sun's centre at the same instant of time. All things, both in and on it, are in process of change, except its motion.

The electro-magnetic force generates no more matter than it can maintain in motion, and the changes in the masses of matter by growth cannot accelerate or retard the rate of motion. The atoms on the surface increase in velocity in the ratio of the increased diameter of the mass, while the revolution on its axis is the same as it was in the beginning.

Spontaneous Generation

Is the rule of action under the general law of changing relations with equivalents, where atoms unite with atoms by changing centres. Inorganic forces have no organs of reproduction, yet by changing relations with equivalents, they gain new centres, and reproduce new forms of matter, making no two things alike.

In the process of congelation electro-magnetism changes the angles of the molecules of water into snow-flakes and crystals, with new centres, and turning out no two forms alike, it is nothing more than the spontaneous generation of new forms of matter, with no organs of reproduction.

Nitrogen, so nearly allied to oxygen in specific gravity, stands next to it in vital economy, in the physical construction of organic life of the *highest order*. Where is the link in the chain of relations missing, which disables these two vital forces from generating the lowest forms of infusorial life without organs of reproduction ? The first two forces of oxygen and hydrogen complete their record of reproduction under the rule of inorganic matter, and the other fulfils the law under the rule of organic life. If the law holds good with oxygen and hydrogen in the development of snow-flakes and crystals, where no organs of reproduction are needed, none can be required with oxygen and nitrogen in the development of infusorial life, as the primary force in organic life lies back of reproduction, in like manner as vegetable life lies back of the reproduction of its seed.

Summary of Inorganic Forces.

In this significant little globe of ours are found the elements of all the forces in $\frac{1}{1}^{6}_{\text{O. H.}}$ and $\frac{1}{6}^{6}_{\text{O. C.}}$ that are needed to make up the matter of the solar system. This little planet shares with every other satellite the privilege of its own orbit, and in it is found

the motive force which makes and maintains its curvilinear lines of motion, and the rule by which atoms unite with atoms by changing centres—properties which are common to all the satellites of the solar system, and the sun itself could hold no binding relation to its satellites unless its affinities were common to them all.

How many series of centuries the sun was shedding its rays upon the silent faces of its own satellites before the disturbing forces of man were introduced, with the element of nitrogen added to his primitive relations, their own geological histories must determine.

If the bounties shed upon our planet are common to all, the assumption may be indulged in, that nitrogen was a component element in the atmosphere of every planet at the beginning, and that a like organic intelligence was enjoying the fruits of it, at a subsequent period, on a scale of magnitude proportioned to the larger sphere of their orbits.

In this essay I have aimed more at condensation than continuity of thought, as I have had but eight weeks to devote to it. In demonstrating

forces backward, it is impossible to group them in the order of their relations ; and a summary of the mass, by reversing the demonstrations, beginning with one law and one force, which makes eccentric atoms, under the rule of changing centres, and so onward, will simplify the whole and make it intelligible.