

CONCEPTS OF THE
ELECTRICAL
PHENOMENA
OF PLANETARY SYSTEMS

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CONCEPTS
OF THE
Electrical Phenomena of Planetary Systems

BY
GEORGE ADAM, M. D.

1846-

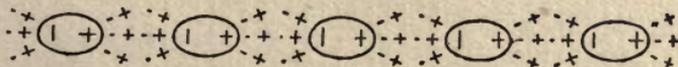
Author of "Electricity, the Chemistry of Ether"; "Radio-Activity"; "From Ether to the Physiologic Unit"; "The Physiologic Unit"; "Medicinal Vibration"; "Origin and Character of X-Rays"; "Nationalization of the Practice of Medicine", Etc.

A Monograph Applying a Fundamental Hypothesis
to Astronomical Facts.

(ILLUSTRATED)

Containing:

THE HYPOTHESIS.
THE SOLO-PLANETARY SPACE.
A CYCLE OF ENERGY.
A GREATER CYCLE.
A CYCLE OF LIFE.
DYNAMICS OF THE SOLAR SYSTEM.
COMETS.
THE MOON.
COSMIC REFLECTIONS.



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THE HYPOTHESIS.

The desire of the writer to generalize a Hypothesis, which he considers fundamental, prompted him to apply it to Astronomical Facts. In approaching the subject, it is imperative to build up from the central idea, although it necessitates traveling from the Infinitesimal to the Infinitely Great: and as the length of this article demands

ERRATA

Page 40, Caption, read: **Andromeda.**

Page 35, line 6, read: **photometer.**

Page 39, line 27, read: **than instead of that.**

or no they coincide with the accepted theories. The writer concludes that the ether molecule is composed of two fundamental units or atoms; that these atoms are equal in quantity, and possess inherently such opposite properties as to entirely neutralize each other—that they are quantitatively equal but qualitatively opposed; moreover, that ether atoms are identical with, or equivalent to the fundamental units of all matter. If we concede that the ether molecule is composed of two fundamental units (which may be termed positive and negative) having a contact surface of maximum extent, with almost if not complete immolecular neutralization, it is evident that we can formulate a con-

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THE HYPOTHESIS.

The desire of the writer to generalize a Hypothesis, which he considers fundamental, prompted him to apply it to Astronomical Facts. In approaching the subject, it is imperative to build up from the central idea, although it necessitates traveling from the Infinitesimal to the Infinitely Great; and as the length of this article demands conciseness in its parts, this quality must be adhered to even at the risk of being judged as arbitrarily stating the conclusions. However, no statement will be made but such as the writer is prepared to support by deductive reasoning and relative facts.

ETHER. Elsewhere the writer has formulated the hypothesis: "That Ether is the *simplest* form of matter, that it is *molecular*, and that it has a *chemistry*." Having adopted this hypothesis, as an *arbiter*, our effort will be to follow its inductive lead over the stepping stones of relevant facts, and to form our conclusions irrespectively of whether or no they coincide with the accepted theories. The writer concludes that the ether molecule is composed of two fundamental units or atoms; that these atoms are equal in quantity, and possess inherently such opposite properties as to entirely neutralize each other—that they are quantitatively equal but qualitatively opposed; moreover, that ether atoms are identical with, or equivalent to the fundamental units of all matter. If we concede that the ether molecule is composed of two fundamental units (which may be termed positive and negative) having a contact surface of maximum extent, with almost if not complete immolecular neutralization, it is evident that we can formulate a con-

ception of the character of the ether molecule, and concurrently gain a clear understanding of the properties, or absence of properties, of the substance ether itself.

Figure 1 indicates ether molecules, each composed of two units or atoms, the central nucleus inherently representing the principle attraction or concentrativeness, and the outer film inherently representing the principle repulsion or diffusibility. The central atom consists of purely positive matter, and the outer atom of purely negative matter, thus clearly differentiating ether atoms from those of ponderable matter, in as much as the latter are composed of mixed units. Ether atoms may be defined as the ultimate quantities of matter or force which no other force can split up. The size of the positive atom is determined by the resistance of its inherent concentrativeness to dissociation by external forces, and the size of the negative atom is determined by the size of the positive atom, or by the amount of negative matter which is neutralizable by the positive atom. The writer believes that the universe is constructed of such units.



FIG. I. Ether Molecules: The dark nuclei denote purely Positive Matter of concentrative character; and the surrounding gray films denote purely Negative Matter of diffusive character. When dissociated the atoms constitute Electric Matter. It is important to observe that no fields of induction surround ether molecules; although interspaces are shown. The relative position of the atoms as indicated corresponds to the differential distribution of matter in space, and to the inherent character of the units.

Now, suppose that the two atoms of an ether molecule, from their relative position and from the diminutive size of the molecule, have such surface contact as to allow complete

neutralization of each other according to the law that forces react inversely to the square of distance, then surely extrinsic forces, in general, must be excluded from the ether molecule, and accordingly it is imponderable and insensible. Again, suppose that molecules of other matter have not an equal number of positive and negative units within their construction, and the molecules being of larger size, their units cannot have maximum surface contact, then surely, according to the same law, these molecules are sensible and ponderable. Thus matter is in general differentiated into two great divisions: Ether, insensible and imponderable; Other matter, sensible and ponderable. An important consideration in the indicated (Fig. 1) structure of ether molecules is the apposition of negative molecular surfaces, which represent repulsion. It must be remembered that ether, being the medium of transmission of heat and light, is in this respect sensible matter.

The universal equilibrium demands the ether condition, and abnormally large ether molecules would immediately divide by polar attraction, and equilibrate as smaller molecular masses. Ether molecules above the normal size would form ponderable matter, and are impossibilities. They must be the most minute of all molecules. Let us see: In an electrified vacuum tube, with the greatest decrement of pressure consistent with electric conduction, there is found in the cathode rays a positive particle or "electron" estimated to be $1/2000$ the mass of the hydrogen molecule. This particle must be the ultimate of ponderable tenuity, and as it possesses a free potential, its constituents must be equal to three ether units or atoms (two positives and one negative). If constituted of a larger number it would be still reducible, and its free potential denotes that it cannot be constituted of a less number. As the ether molecule possesses two units its size must be $2/3$ of that

of the electron, or $1/3000$ the mass of the hydrogen molecule. When the cathode particle or electron is united with two negative ether atoms it is electrically negative, and of such charged particles the cathode rays must be constituted when under extreme decrement of pressure.

From these conceptions we must conclude that the substance ether is imponderable; that it possesses no frictional or cohesive properties; offers no (or a minimum) resistance to bodies passing through it; is extremely elastic; is a non-conductor of electricity; is incapable of being projected, not having weight; that it is compressible by the attractions and repulsions of its atomic units (polarization) (Fig. 2); that its units possess the property of impenetrability or extensibility; that owing to its molecular construction being of two units qualitatively opposed and quantitatively equal, it is capable of transmitting force without neutralization or modification of the force transmitted. However, radiating forces offer resistance to other radiations independently of the quality of the medium.

It must be conceded that all forces may be modified by the relation of matter to space. Thus positive and negative chemic elements which synthetically react under certain degrees of pressure may be even dissociated under greater decrement of pressure. We might allow that the forces of gravitation will act slightly on the substance ether, but that this force is neutralized by the spacial equilibrium, or the relation of the whole of matter to the whole of space, just as chemic affinity is neutralized in a partial vacuum. Whether we contend that gravitation is wholly excluded from the system of the ether molecule by the immolecular neutralization, or that it enters and is counteracted by the spacial equilibrium, we must inevitably conclude that the substance ether is imponderable. An

imponderable substance will occupy all space not occupied by other matter. This substance therefore fills the interstellar and intermolecular spaces, and is the medium of conveying force between the potentialized bodies which we call suns and planets.

ELECTRICITY. Although the ether molecule is generally insensible to extrinsic forces, yet under intense conditions it is split up, and although the substance ether is chemically at zero potential, when dissociated its atoms possess the greatest of all potentials—the potential of electricity. We must regard electricity as being related to ether as chemic action is to other matter. Moreover, there must be an interaction between electric matter and ponderable matter. We must regard ether atoms as chemic ultimates reacting with each other and with ponderable matter according to the law of affinities, and we must regard their dissociation and association as constituting electricity in its broadest sense. The important consideration is that in a positive electric charge we have a mass of purely positive matter, and that in a negative charge we have a mass of purely negative matter (Fig. 1), and that we have only to study the differential properties of these masses to determine the character of positive and negative chemic elements in all varieties of mixed or ponderable matter. Thus, ether atoms, as moving matter, associate and dissociate with other forms of matter according to chemic laws. When the fundamental units of matter are united, positive to negative, with maximum surface-contact, they have a minimum potential and form the substance Ether. When the ether atoms are separated they form Electric Matter, and at a minimum distance have a maximum potential. By following these lines of thought

further (impossible in an article of limited extent), it will be clear that Electric, Chemic and Physical actions are fundamentally identical, all being subject to the same great law of ultimate units reacting inversely to the square of distance.

Electric matter, however, must not be confounded with so-called "electrons" or "corpuscles," which are ponderable matter, and which may be electrified or non-electrified, as any other ponderable matter may be. A correct conception of electric matter—ether atoms—is essential to the comprehension of the questions to be considered.*

PONDERABLE MATTER. If it be shown that the laws of force can be generalized, then surely all forces must be fundamentally identical; and as force is the property of matter, then all matter must have identical units. Ponderable matter may be thus differentiated into two great divisions which accord with the divisions of electric matter or ether atoms: (1) Ponderable positive matter, in whose molecular construction positive or concentrative fundamental units predominate; (2) ponderable negative matter in whose molecular construction negative or diffusible fundamental units predominate. To illustrate: If a given number of fundamental negative units are combined

*In his work entitled "Electricity the Chemistry of Ether," the writer has followed the lead of his hypothesis through Electricity, Chemistry, Physics, and Physiology, and his researches have convinced him that upon the basis of this hypothesis, reiterated in this article, a generalization is possible. On the other hand it is clear that facts, even of Radioactivity or of Electrified Vacua, do not support the Electron Theory of Electricity. The writer is fully aware that only the most diligent and extensive inquiry (not confined to one scientific branch) will enable one to correctly value a hypothetical truth; while at a glance he seemingly determines the importance of a discovery of fact: Hence innumerable theories when there should be but one; and hence an incomprehensible labyrinth of laws when there should be but few.

with a larger number of fundamental positive units, in such relative position as to offer resistance to dissociating influences, according to the law that forces react inversely as the square of distance, then the combination is a molecule of positive character. Conversely a molecule of negative character may be constructed. The difference between the number of positive and negative units which enter into the construction of the molecule constitutes molecular potential. It will thus be seen that molecular potential and electric potential are identical in as much as they depend upon the unneutralized fundamental units; and that electric and ponderable matter have reciprocal action just as two forms of ponderable matter react on each other. It is conclusive that a molecular potential will possess a field of induction just as an electric potential possesses a field of induction, and that we have only to study the features of the latter to determine the character of the former; allowing for such modifications as are incident to molecular conditions. The writer is aware that these conceptions are not in accord with the kinetic theory of gases accepted by scientists; and that he contradicts the idea that atoms have movements independent of those of their molecules. That the molecule is the ultimate vibratory unit can be demonstrated physiologically if not physically. An atom can no more move independently of its molecule than a part of an electric charge can vibrate independently of the whole charge. Any part of an electric charge can become an independent charge, and an atom can become a molecule. The atomic and molecular conditions are mutually transformable, but the molecular condition is the motor unity; and the motion must be initiated by extrinsic stimulus.

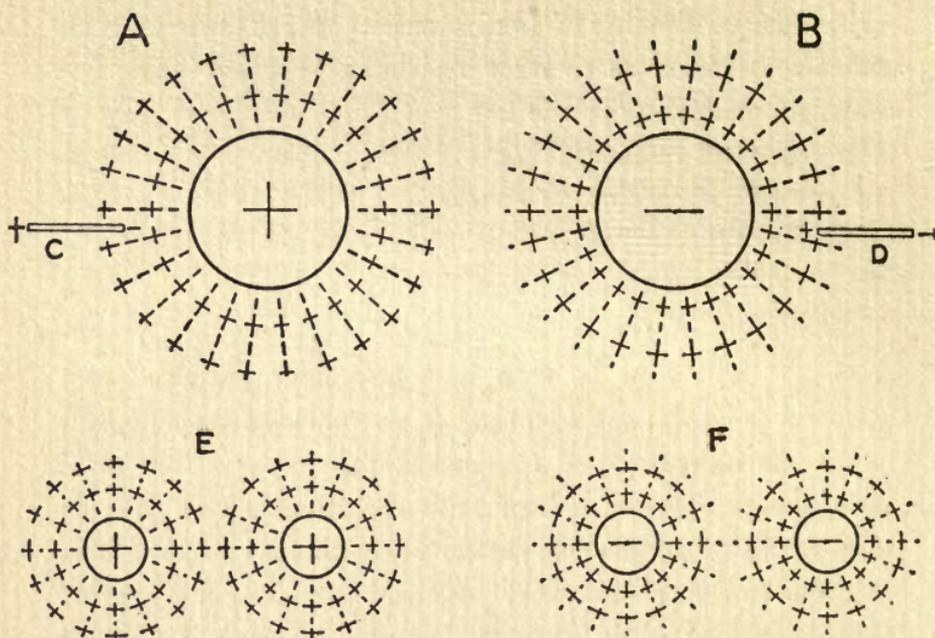


FIG. 2. Electric and Molecular Potentials: A and B, insulated and electrically charged bodies surrounded by induced fields, demonstrable by the polarization of the conductors C and D. The smaller figures E and F denote Ponderable Molecules; the inner circles denote the molecular masses; the plus and minus signs on which denote the quality of the molecular potentials. The molecular masses are surrounded by Fields of Induction in which ether or other matter is polarized as in electric fields. The chemic union of E and F neutralizes the molecular potentials thus setting free ether from the fields of induction. The ether is evolved as heat or light if it maintains its molecular character, or as electricity if it is split up into atoms.

It is obvious that ponderable matter may be formed of molecules of incalculable variety depending upon the relative numerical proportions, absolute numbers and relative placement of the fundamental units in the molecular construction. On the other hand, it is obvious that ether molecules never vary in their construction, although numerically they must be measured by the capacity and immensity of interstellar space.

TRANSMUTATION OF FORCE. In previous publications the author has expressed in the following formula the *modus* of the transmutation of force and its radiation: "That the transformation from chemic force to electricity, heat, or light, is accomplished through the setting free of ether from the induced fields of ponderable molecules, concurrent with the reciprocal rearrangement and further immolecular neutralization of their atoms; that the transformation from electricity to heat and light is by atomic ether becoming molecular; that heat and light are a disturbance of the equilibrium between ether and other matter, caused by freed or nascent molecular ether, and manifested as waves of readjustment." In illustration: Suppose that E (Fig. 2) represents two molecules of sodium with induced fields in which 128 molecules of ether are polarized; and that F represents two molecules of chlorine in the induced fields of which there are also 128 molecules of ether. Thus 256 molecules of ether are compressed within the interspaces of four ponderable molecules. By a chemical reaction four molecules of sodium chloride are formed, but with decreased molecular potentials, decreased induction in the molecular fields, diminished interspaces, and hence some part of the ether is set free. We will say that the four molecules of sodium chloride have within their fields 156 molecules of ether, then by the synthetic reaction 100 molecules of ether are liberated. If the freed molecules of ether maintain their molecular state, they will disturb the general equilibrium and manifest as heat or light; if the freed ether molecules are brought under the influence of differential potentials or polarities they will be split up, and their atoms will assume the electric state of matter (Fig. 4).

A hypothesis, to be elementary, must be upheld by all facts, however far removed by evolutionary processes. An

unexplained fact, though remote, impairs the value of a hypothesis, and a contradictory fact is destructive to its fundamentalitiy. These postulates have been kept in mind by the writer in applying the previous theory to the problems of astronomy; and he writes this article for the purpose of calling the stars as witnesses to the correctness of his conceptions. He believes that these conceptions furnish a basis from which to attack the problems of the universe; and he expects to present astronomical evidence that the density and tenuity of matter, and its differential distribution throughout space, are based on the inherent properties of fundamental units—concentrativeness on the part of positives and diffusibility on the part of negatives. (Fig. 13).



FIG. 2A. Indicating the Ultimate of Ponderable Tenuity—the Cathode or Beta Particle When Not Electrified.

THE SOLO-PLANETARY SPACE.

By this term we designate the domain of the sun and his tributary planets. We may regard this space as being occupied by a great wheel, the sun constituting its hub and the planets being placed along the spokes at different distances from the center. One of the important differences between the solo-planetary wheel and a common one is, that if we allot a spoke to each planet, we find that each spoke has a different length and a different rate of revolution from the others. The spoke on which the earth is located, when produced, is called the plane of the ecliptic. The plane of each spoke has a slight inclination to the plane of the ecliptic, just sufficient, as it were, to allow the spokes to pass each other in their revolutions. The rim of the wheel may be conceived as marking the boundary of the solo-planetary space in its equatorial extension. This space, however, may be considered as globular or elliptical in shape. We believe that we can show that the necessities of the solar system demand that the polar diameter of the space allotted to the system be about equal to its equatorial diameter; and that the space is occupied by two great streams of energy, the one imparting to the system the property of equatorial extension, the other the property of polar extension (Fig. 7). Clearly, such energies must be causal factors of a cosmic pressure.

On looking at the solar system as arranged on an astronomical map, it will be seen that the poles of the bodies are, in general, uniformly directed. Hence the solo-planetary space may be considered as having a north and south. But polarity has a different meaning than mere direction. It is conclusive from a study of the behavior of the compass

needle, and other phenomena, that the north and south poles of the earth are the seats of qualitatively differential potentials. Physicists have assumed that the earth is a magnet.

THE EARTH AN ELECTROLYTE, NOT A MAGNET. It is only necessary to critically examine the properties of a magnet to doubt the correctness of the assumption that the earth is a magnet. If a magnet is broken into pieces each piece retains the magnetic properties. If a chip, however small, is taken from it, the chip is a complete magnet. No such conditions obtain as regards the earth. It is true that there is the natural magnet, but quantitatively the polar differential properties of the earth cannot be ascribed to it. When a substance, subject to electrolytic action, is placed between the poles of a battery, the substance as a whole becomes polarized—the more negative part of the electrolyte is attracted towards the positive electrode and the more positive part is attracted toward the negative electrode. This polarization applies to gases, fluids and semi-fluids. That solids under these conditions do not manifest polarization is owing to the fact of the molecules being more firmly fixed, and not owing to any principle in the one that does not pertain to the other. It is consistent with facts to suppose the poles of the earth to be those of an electrolyte rather than those of a magnet—that the differential potentials are analogous to the potentials of the plates of a battery, or rather to the poles of a substance undergoing electrolytic action.

When the solid part of the earth is viewed as an electro-positive body, the fact of there being more land in the northern than in the southern hemisphere must be regarded as evidence of a relatively positive north to a relatively negative south. However, all solids are not positive in quality. A fair proportion of the sulphates, chlorates,

chlorides, iodides and other compounds having the negative principle well represented must be electro-negative. An accumulation of negative solids at the south pole will ren-



FIG. 3. An Electrolyte: The dark figures denote positive and the light figures negative elements. In exemplification: If the electrolyte be steam, and separated at its center, an excess of oxygen will be found at one pole, and an excess of hydrogen at the other.

der it potentially negative, not only relatively but specifically. Figure 3 indicates an electrolyte, say of steam, which is positive in potential as the earth is positive, with electrolytic differentiated poles.

Investigation of the causes of molecular and mass polarization makes it obvious that a mass or a molecule will not polarize by its own forces. A magnet of soft iron immediately depolarizes when the extrinsic force is withdrawn. A so-called permanent magnet inclines towards depolarization. An electrolyte only polarizes under the influence of two different forces. A muscle depolarizes on withdrawal of the stimulus; and nerves and all other physiologic units do likewise. Hence it is conclusive that external forces are engaged in the polarization of the earth. Also, it is obvious that if we find that all of the north poles of bodies within the solo-planetary space are positive in character, we may conclude that this space has not only north and south poles, but that these are positive and negative respectively, when polarizable matter is present, and that a force external to the solar system at least gives direction to this polarization.

Deductively, we must conclude that the common direction of polarities of the solo-planetary bodies is indicative of influence between planetary systems; and that the polar

direction points to a general direction in the polarities of the universe, and that planetary systems are interdependent. Nevertheless, the direction of the poles of the system, although caused by universal polarity, must be entirely consistent with, and supported by the forces within the solo-planetary space. In fact, we believe it can be shown that the intrinsic forces of the solar system are sufficient for the maintenance and even initiation of the polarities of the system, it being only the common polar direction that denotes extrinsic influence.

A CYCLE OF ENERGY.

It is agreed that energy as heat and light emanates from the sun and is absorbed by the earth. We will take up the course of energy at the point of its passing from the sun to the earth and attempt to follow the cyclic movement. In the first place: What is energy? We may say that it is a condition of matter not in equilibrium. We must then define equilibrium, and this we determine as: A balance of matter and force depending on the relationship of all matter and all force to all space. Thus, a molecule of oxygen in the air is in equilibrium, but when placed in a partial vacuum, it is entirely out of equilibrium, and immediately splits up until an equilibrated condition is attained. Here we must postulate that although ether is not energy all transformations of energy produce ether changes, and that transformative processes consist of reciprocal phenomena. Thus an ether molecule (Figs. 1, 2) set free by electric or chemic action on the sun's surface, disturbs the equilibrated relation of matter and force to space, radiates by displacement as a light or heat vibration, and is manifested by an equivalent but converse reaction, say, on the earth's surface. Then this energy that we have to consider as passing from the sun to the earth is molecular ether radiating by displacement or undulatory motion. If all space were not occupied by matter such radiation by displacement could not occur.

THE EARTH ABSORBS ENERGY AT THE EQUATOR AND EMITS IT AT THE POLES. Our globe is an inverted electrolyte. The sun's rays are incident to the earth's surface. We will not discuss here the side processes of storing energy as vegetable matter, but will consider only the more direct course of the cycle. We have elsewhere

formulated the following law: "When molecular ether not in equilibrium, as in heat or light, is brought under the influence of differential potentials, it splits into atoms, forming electric currents or charges." Heat or light radiations incident to the surface of the earth come under the differential potentials of the earth as a polarized body, and, molecular ether being dissociated, electric currents pass from the equator to the poles, the north or positive pole is negatively electrically charged, and the south or negative pole is positively electrically charged. The difference of electric potential however can never be sufficient to neutralize the primary difference of potential between the poles, and they must still maintain their differential character of the north being positive and the south being negative, the polar potentials of the earth as an electrolyte being always greater than the polar electric charges. That there are terrestrial electric currents admits of easy demonstration, but how they are generated, or where they go, have not been heretofore satisfactorily explained. As the earth is within the inductive field of the sun, there must be two causal factors in the production of terrestrial currents: (1) Inductive influence of solar forces; and (2) direct influence of the poles of the earth.

THE THERMO-ELECTRIC CELL presents an analogy to the equator of the earth in its relation to incident energy. In Figure 4 two metals are joined as indicated, the dark part being bismuth and the light part antimony. The junction A is heated and the junction B is kept cool. The ether as heat applied to junction A is split up by the difference of potentials between the metals, negative ether passes to the relatively positive bismuth, and positive ether to the relatively negative antimony, and are shown as electric currents passing through the metals. Now let the junc-

tion A represent the equator of the earth and the applied heat the sun's rays, and the analogy, so far, of the earth and the thermo-electric cell is complete. Numerous photo-

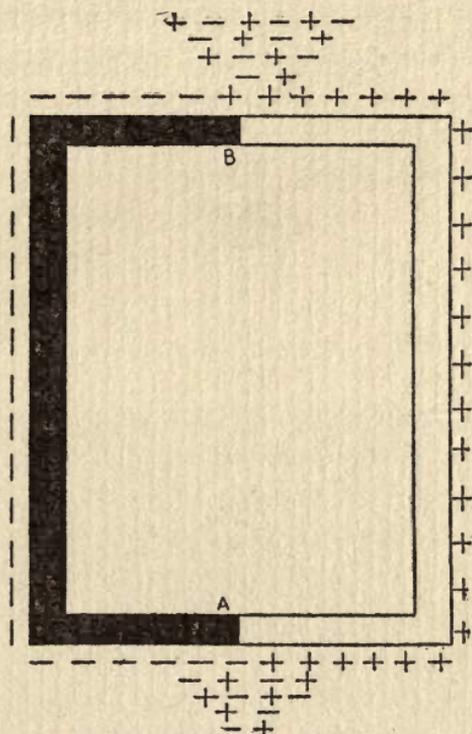


FIG. 4. Thermo-Electric Cell.

electric experiments might be quoted to show that light is transformed into electric charges when radiating under the influence of differential potentials. In the neighborhood of arc lights, of heated surfaces, or of glowing metals, such electrifications are manifested. Thus the transformation of light and heat radiations into electric currents by the polarity of the earth can be shown to have a multitude of analogies. The disposal of the electric polar charges will be further considered.

ELECTRIC DISCHARGE IN VACUO. Energy follows the course of least resistance. When electrodes having intense difference of potential are placed in a partial

vacuum tube with only slight decrement of pressure, the tube may not be electrified, that is, the electric resistance may be too great for the current to pass through the tube. By decreasing the pressure of the gas, it begins to glow—the particles of the gas are electrified and radiate within the tube. The electric resistance decreases, therefore,

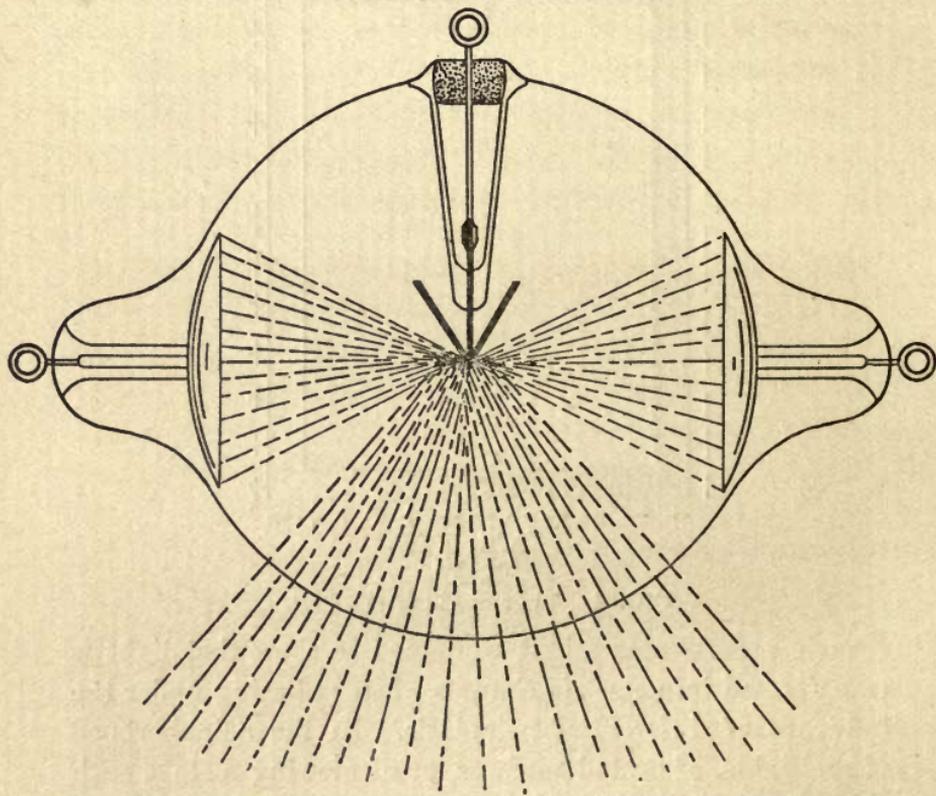


FIG. 5. Indicating Electric Discharge in Vacuo-cathode and X Rays.

in direct proportion to the decrease of pressure of the gas. There is a critical point, however, in the decrease of the resistance of the electric flow, and when the minimum is reached increase of resistance occurs. But mark this: The critical period is not determined by a change in the conditions that lessen resistance to the current, but by a

change in the number of electric chips which carry the convection-current. In other words if we could produce a complete vacuum and still be able to supply electric carriers the decrease of electric resistance would progress up to the vacuum point. Here we may say that a vacuum is a space from which ponderable matter is excluded, and occupied with no other substance except ether. Ether then offers no (or a minimum) resistance to the passage of ponderable matter.

AURORA POLARIS. The aurora occurs at both polar regions of the earth. According to Nordenskiöld the poles of the earth are continuously surrounded by a

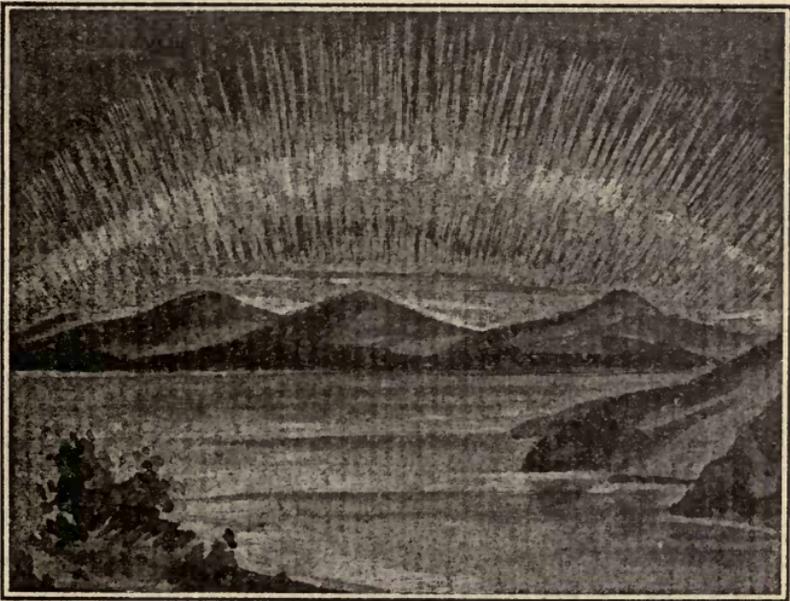


FIG. 6. Aurora Polarís. Manifestations of energy from a pole of the earth on its way to a pole of the sun.

ring or crown of light, the upper edge of which he estimated to be 120 miles above the earth's surface, and its diameter to be about 1250 miles. Other estimations have been made to the effect that aurorae extend 500 or 600

miles above the earth's surface. During "magnetic storms," and more especially during the occurrence of spots on the sun, auroral phenomena are so intensely manifested as to be observed all over the earth; and these intensities seem to have a period of $11\frac{1}{2}$ years, which corresponds to the length of the cycle of maximum magnetic storms and of sun-spots. Spectroscopic examinations of aurorae show the presence of gaseous matter, the exact character of which is not known. The spectra, however, consist of a few bright lines having a general resemblance to those of the electric discharge through rarified dry air.

Relative to auroral phenomena a remarkable fact may be noted: The position of the electric (so-called magnetic) pole of the earth, as determined by the vertical dip of the magnetic needle, was located by Sir James Ross (1831) at $70^{\circ} 5'$ north. The same navigator nearly attained the corresponding southern pole. (1839-43) and its position is probably about $73\frac{1}{2}^{\circ}$ south. The earth is supposed to have two magnetic north and two magnetic south poles. The notable fact is that the polar area embraced by the south circle of latitude of vertical dip is much more contracted than that embraced by the north latitudinal circle. In Fig. 7 these polar areas are indicated as positive and negative electrodes.

TERRESTRIAL POLAR CHARGES. In the cycle, we have traced energy to the poles of the earth which as stated are differentially electrified. As the sun's rays continue to act on the equatorial regions, and ether continues to be dissociated, the electric pressure at the poles increases, rupture of the medium must take place, and neutralization must occur in the direction of least resistance. The electric energy may follow one of two paths, and these we will consider in reference to their respective resistances: (1) The north and south polar

charges may select the nearest available terrestrial route towards each other and thus mutually neutralize. (2) The north and south polar electric charges may be attracted respectively towards the poles of the sun and neutralize within that body.

Now here is electric energy, as manifested in aurorae polares, that has been estimated by observers as 120 to 600 miles from the earth's surface, and evidently with no disposition to point toward the equator. The question is: From this point which is the direction of least resistance? If we consider that the space of 92,000,000 miles between the sun and the earth is occupied by ether, and that the space of about 8000 miles between the points of north and south aurorae as designated is occupied by the earth's atmosphere, we will at once see that distance is not the only factor of resistance. But more important than distance as an element in determining the course of this energy is the fact that the intervening terrestrial space is occupied by another stream of energy, as heat and light, from the sun, which would resist its crossing. The writer has to express a positive opinion that only when great magnetic storms occur and the area of emission of electric energy extends a great distance from the poles, and towards the equator, could neutralization of the electric charges take place by an intra-terrestrial route, either through or near the earth's atmosphere. When the slight resistance offered by partial vacua is considered, the conclusion is inevitable that convection currents starting from polar regions must travel through inter-planetary space to the poles of the sun. It must be admitted that distance is only an element of resistance to the travel of energy when ponderable matter is involved as a resisting agent. The electric currents of the earth are directed by its polar potentials, and are taken from the terrestrial poles

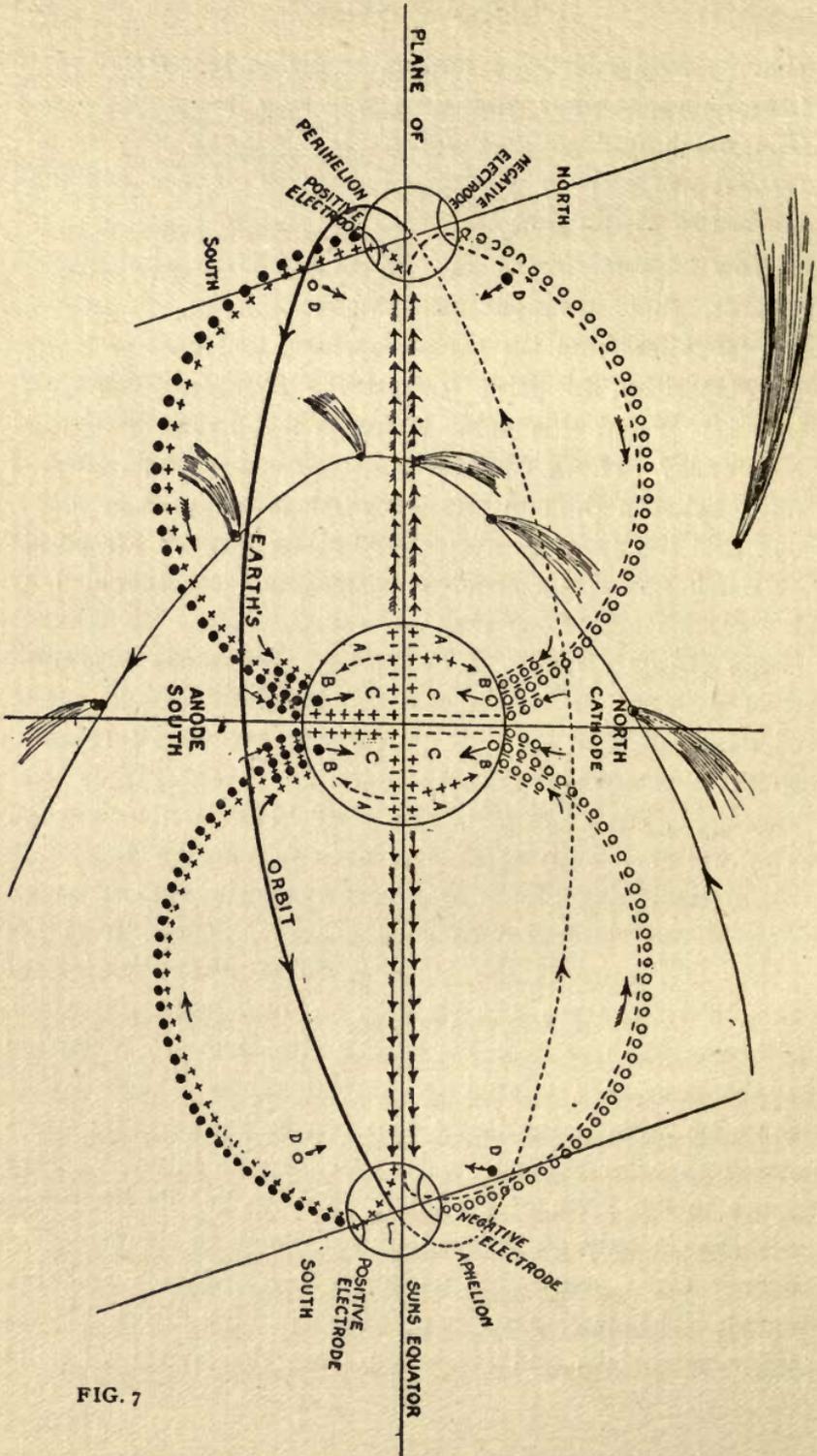


FIG. 7

by the stronger forces of the sun, just as oxygen is taken from hydrogen by a stronger chemic element, and just as a negative charge leaves a zinc plate to be neutralized within the circuit.

What is the form of the polar electric radiations? Undoubtedly ions or chips dissociated by the electric charges. It is possible that they may be identical with rays from radio-active matter—alpha rays from the south pole and beta rays from the north. However, there are many other instances of convection-currents carrying matter. In sparks evidence of metallic substances are found. Carbon is dissociated from the positive terminal of an arc-light and deposited on the negative terminal; and chips of molecules constitute the cathode rays in electrified partial vacua.

FIG. 7. Indicating a cycle of Energy between the Sun and Earth. Convection currents from the planets arrive at the poles of the sun, where ions are deposited; the currents pass, by conduction, through the central core, C C; and at the equator are transformed into heat and light. A A indicate reversed ionic currents in the photosphere. B B denote ions at the poles which ultimately neutralize within the photosphere. D D point to a certain decrement of pressure at which the electrified ions will dissociate as they leave the poles of the earth. Mark the different sizes of the north and south polar areas of the earth, and compare them with analogous areas as shown in Figs. 15 and 16. The figure represents a galvanic circuit with the earth as a thermo-electric cell.

Fig. 7 indicates energy as heat or light striking the earth, passing as electric currents to the poles, where convection-currents are found, manifesting as aurorae. The convection-currents at first may consist of electrified molecules or ions of the common type—hydrogen negatively electrified from the north pole, and oxygen positively electrified from the south. As these charged molecules or ions pass upwards they will become further dissociated, as indicated in Fig. 7D, and as occur in a partial vacuum tube. At the north the hydrogen may be

dissociated into a minute particle as in beta rays, and this being negatively charged will continue its way to the sun's positive pole. The residual particle of hydrogen will diffuse through the earth's atmosphere. At the south pole the charged oxygen will dissociate at proper decrement into an ion the size of an alpha particle (helium), which being charged positively will seek the south (negative) pole of the sun. The residual particle of the dissociated oxygen will diffuse through the atmosphere and neutralize the residual particle of hydrogen. Radiant matter from the poles of the earth may, however, consist of various elements as may be analogously evidenced in electric sparks from electrodes of various materials.

THE SUN ABSORBS ENERGY AT THE POLES AND EMITS IT AT THE EQUATOR. The sun is not a self-luminous body, but an electric light. Electric energy emitted at the poles of the earth and other planetary bodies constitutes an immense stream of radiant matter which, according to the law of Ohm, spreads out in the direction of least resistance, fills the solo-planetary space to the north and south of the plane of the ecliptic, or rather the plane of the solar equator, and again converging at the poles of the sun enters that body with a concentrated force of inconceivable immensity, and only comparable to the equivalent energy of heat and light emitted at the solar equator. Thus electric currents of immeasurable intensity pass from the solar poles toward its equator, and neutralizing in the equatorial region are transformed into energy which illuminates and vitalizes the world. (Fig. 7.)

How does electricity travel through the central body of the sun? Undoubtedly by vibratory movements, as through a copper wire or other solid conductor. This is no doubt the method by which electricity travels through

the earth from its equator to its poles. The ions with their electric charges reach the poles of the sun, the ions are there deposited, and electric currents proceed toward the equator by vibratory movement. The spectroscope reveals the presence of metallic elements in the photosphere, carbon being the only non-metallic element for the presence of which there is any evidence. There is no evidence of electro-negative metalloids, such as oxygen, nitrogen, or other non-conductors; and even in the chromosphere hydrogen, an electro-positive element, according to spectroscopic evidence, is the prevailing constituent, although there is also evidence of helium being present. Thus we see, under solar conditions, evidence of positive concentrativeness, and also evidence, although of negative character, of negative diffusibility. Below the photosphere, and perhaps including the polar photospheric areas, matter must be more dense. The photospheric mass of electropositive concentrativeness must create an axial core of extreme density and of metallic character. That matter at the center of the earth is of great density is the opinion of Lord Kelvin, arrived at from certain experimental evidences. The axial metallic core of the solar body, possessing but slight electric resistance, must be the great conducting medium of electric currents passing from the poles to the equator. When the currents neutralize in the equatorial regions great quantities of molecular ether must be produced, and these must seek equilibrium by disturbing surrounding matter (Fig. 7c.). The conducting core, however, will not be disturbed any more than a copper wire is disturbed by the passage of a current. It is the heat and not the electricity which is the disturbing element. Molecular ether as heat will penetrate and seek equilibration by molecular disturbance in the photosphere, pro-

ducing the grains or nodules of Herschel; and by volatilization will carry some of its elements into the chromosphere. The photosphere then is a boiling surface, and the chromosphere is analogous to the steam arising from it. Further, at times, owing to the relative positions of planets the currents in the axial core become more intense; or owing to an excessive accumulation of ions at the poles ionic floods occur which, meeting at the equator, produce enormous chemical results; great masses of ether are thus set free, immense ebullitions perturb the photosphere, and volcano-like, great cavities are seen on its surface. These cavities or sun-spots, as seen from the earth, present a dark central portion of irregular form called the umbra, surrounded by a fringe, less dark and mostly made up of filaments directed radially inwards. Fig. 8 shows a typical sun-spot. The largest spot, observations of which are recorded, had a breadth of 143,000 miles, or nearly eighteen times the diameter of the earth.

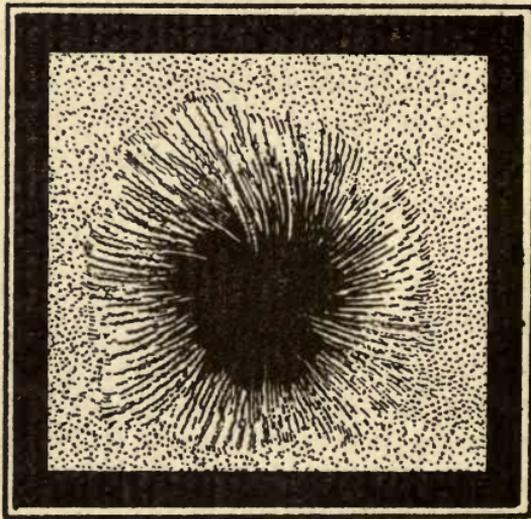


FIG. 8. A Sun Spot.



FIG. 9. A Miniature Sun Spot surrounding a heated glass rod.

To understand the results ensuing from the liberation of large masses of molecular ether, we must remember that ether, being matter, must possess impenetrability; and that owing to the property of cohesion it takes time for ponderable matter to mix and equilibrate with the ether. An experiment made by Frederick Hovenden illustrates this idea. Fig. 9 shows a cross section of a glass rod heated, and viewed, by means of an electric light lantern, through an atmosphere of motes created by means of tobacco smoke. The ether given off by the heated glass creates a dark ring surrounding the rod, and as it ascends it parts the mote-laden air. Ether set free beyond the capacity of ponderable molecules to work it up into light vibrations presents darkness, or heat movements; and this is what occurs in sun-spots, and round the heated rod.

Molecular ether freed by electric neutralization perturbs the immediate elements situated in the photosphere, and, radiating as from an electric lamp, furnishes light and energy to the tributary planets. This energy, emanating from the solar equatorial region, radiates along

the solar equatorial plane (approximately the plane of the ecliptic), and is returned to the sun as electric energy. The sun gathers electric energy and converts it into heat and light; the planets take up the heat and light and convert their energy into electricity. The sun is an electrolyte, the earth is an inverted electrolyte; the sun absorbs energy at its poles, and emits energy at its equator; the earth absorbs energy at its equator and emits it at its poles. The equatorial plane of the solo-planetary space is filled with a stream of energy of heat and light emanating from its solar center; the polar regions of the space are filled with electrified ions emanating from the poles of the planets, radiating sunward, and concentrating at the solar poles; and so the cycle is complete. But, mark, with the absorption of energy the sun gains ponderable matter, and this fact is indicative of a greater cycle.

A GREATER CYCLE.

The sun is a dilating body. The continuous accession of charged molecules to the poles of the solar mass, carried by convection-currents from the poles of the planets, gradually, although slowly, increases its dimensions. Probably it has already engulfed one or two planets by extending its equatorial circumference. Mercury already anticipates its coming doom and is preparing for its final absorption.

It must be remembered that matter in the sun has only one-fourth the density of the earth, and that the density of Mercury is seven-eighths that of our globe. Other planets vary in density. Hence matter lost by the planets and gained by the sun will increase the sun's mass much more than it will decrease the masses of the planets. Again, it is not necessary for the sun's circumference to reach Mercury in order to absorb it, as, long before that period arrives, the solar heat will have dissolved the planet. The intense radiations of molecular ether from the sun falling on the surface of Mercury are partly transformed into electric currents which carry particles from its poles to the sun. Mercury is being thermically and electrolytically dissolved, and truly the duration of its life as a planet is short.

Astronomers state that the sun is a small body in comparison to some of the fixed stars, which are great sun-centers of solo-planetary spaces. It is estimated that Algol has a diameter of 1,060,000 miles. It is probable that there are some suns of such dimensions that if one were placed in the center of the solo-planetary system it would dissolve Venus, and render conditions rather unpleasant for us. Yet, the solo-planetary spaces of such central bodies may not be any larger than ours; and the

only reason for suns being so large is that they are at a different period of a cyclic movement, which is perpetually modifying the conditions within the solo-planetary spaces. Our sun is growing. Mercury and Venus will be melted and absorbed. The solar circumferential area will embrace the orbit of Venus. Its diameter will then be 69,000,000 miles. Our earth may then be about the size of Mercury at the present time, and we may have lost our atmosphere. We may even have been robbed of our moon, which may be dragged off bodily at a tangent to its orbit. Our "Last Man" will have sung the last dirge long before the close of this cyclic phase. The life of our planet is escaping at its poles, shortly it will be absorbed into the constitution of the great Sun, and its constituents will part company, never more to combine as an individual planet. Our people, their experiences, their histories, their attachments, the results of their efforts to immortalize, will pass. The events of our planet may not even live in memory. But a planet will then have passed through one cycle, and surely a condition will be attained by evolution, which, in some form, must be capital to start the next.

A PLANETARY REBELLION. At this stage we have to retrovert somewhat in our story: Once upon a time there was a great rebellion in the solo-planetary space against the dominion of the Sun. It was headed by Jupiter, supported by Saturn, Uranus, and Neptune, and occurred during the formative stage of planets. It came about in this wise: The Sun was then a comparatively small body, and his chief advantage was the central position. He was receiving electric energy at the poles, and emitting heat and light at the equator, and the planets were revolving round him as their common center.

Jupiter conceived the idea of intercepting the electric radiations of Saturn, Uranus and Neptune, and thus becoming a sun himself. Certain periods in the revolution of the outer planets favored the scheme, and the outer planets poured their electric energy into Jupiter's poles. Jupiter increased in strength beyond all the other planets, and this fact made him ambitious to extend his sphere over the asteroids. Thus, the path of the asteroids being middle ground between the Sun and Jupiter, they were prevented from concentrating as one planet, and thus formed several. Further, being near to Jupiter, during the epoch of his greatness, they lost considerable matter as electrically charged ions radiating outward to Jupiter's poles. Mars also was stunted in his growth by the action of Jupiter. By and by the Sun, through his central advantage, becoming more massive, drove Jupiter from the asteroids, and, attacking the planet directly, broke his rebellious spirit by bombarding his surface with heat and light radiations, and seizing his supplies from the outer planets. The Sun thus established his supremacy over the solo-planetary space. Jupiter even now, at times, shows a refractory spirit, as mark his great "red spot" from about 1880 to 1885, which, sun-like, was probably formed by the absorption of electric energy derived from Saturn or Uranus, and transformed into heat at the planet's equator. A study of the position of the planets, and of Fig. 7, will show that the relative position of Jupiter is favorable to the interception of this energy.

THE CYCLE CONTINUED. Returning to the cyclic movement we find the sun's circumference becoming equal to the orbit of our late earth. Great tongues of matter and flame project millions of miles further. In this connection it must be understood that the density of

the sun is comparatively small, and that each planet at the sun's surface density is capable of occupying a spacial band on each side of its orbit extending half way to the next planet's position. Hence, as the sun grows in mass and absorbs other planets, and in addition receives electrified matter from those remaining, its circumference must be well over the orbit of the last-absorbed planet. The solar body gets progressively less dense, as it increases its dimensions, according to the disposition of positive and negative matter within the solo-planetary space. (Fig. 10.)

Jupiter has declined, and the histories of his civilizations, of his giant strifes, and still more giant accomplishments, have been written. Saturn long since has lost his rings and is now the seat of great "human" activity, denoting such a high civilization inconceivable to a mind in our present status. Uranus is just arriving at those conditions of density, and of the relative consistencies in the states of its matter, essential to vital processes. A polar view of the conditions of this period is undoubtedly shown in the great nebula Lyra. (Fig. 21.)

SPACIAL BOUNDARIES. Here we must more particularly define the solo-planetary space. We will divide the space allotted to our system into: (1) The True or Primary solo-planetary space, consisting of that portion which is more or less occupied by ponderable matter; and (2) the Secondary or Greater solo-planetary space, a vast area surrounding the primary, bearing a similar relation to it as a field of induction does to its primary potential, and into which probably no ponderable substance ever enters. If we travel to a point many millions of miles beyond Neptune, keeping on the plane of the

GREATER CYCLE.



sun's equator, and passing through the region of negative and tenuous ponderable matter (Fig. 10), we will find the sun's rays, as manifesting under present conditions, diminished, but the rays of the numerous suns beyond, in the aggregate correspondingly increased. If we adjust our photimeter we will find that at some such point in space (perhaps ten millions of millions of miles from ponderable matter) the outgoing and incoming radiations will be exactly equal. Here we may plant our boundary post as marking the limits of the greater solo-planetary space. Our post is on a line with the great solo-planetary wheel which turns on the plane of the sun's equator, and the hub of which is the sun's mass; but we have left ponderable matter behind and we are in the midst of interstellar space. On looking telescopically towards the wheel we are struck with our changing scenes. We see Uranus, now appearing as the largest of the planets, taking on all the phases of the moon, but fading in the distance at its full phase to the merest point. We will see a partial eclipse of the sun by Saturn, and the glorious sight will be enhanced by rays of light passing between Saturn's ring and the central body. Our earth is the merest speck in the heavens. We are in the midst of the celestial desert, where even the mental eye fails to distinguish landmarks; but our delicate instrument detects the billows in the ocean of ether as they pass and re-pass the gulf separating borderland from borderland of solar systems—infinitestimal waves of force traveling through boundless space. The intensity of the loneliness terrorizes the soul, and the zero pressure threatens its integrity. The most minute particle of ponderable matter would appear as a friend. We are surrounded by a medium that transmits vibrations without modification, and without resistance. We place our

vibrator and send a message through infinite space, which will roll through the aeons; and the message reads. ALONE WITH GOD.

Let us further define our boundary lines. Keeping on the line as already defined (where radiant energies equalize) we will travel towards a point directly opposite the south pole of the sun and on a plane of the sun's axis. We find that our line of travel describes a curve indicating that we are bounding a space of globular or elliptical form. From a view-point on a plane of the solar axis, and at the south pole of the greater solo-planetary space, we place our telescope so that we can examine the sun's pole. Our first glance gives a delightful surprise, and we look at the telescope to see if it has been converted into a spintharoscope. The splendid sight presents a field of scintillations similar to that of a platinum surface bombarded by alpha rays. On consideration we see at once that this is a matter of fact and that alpha energy from the poles of the planets is beating against the south pole of the sun, and is partly reflected with magnificent brilliancy. We now adjust the telescope, at low power, so as to have a general polar view of the solar system. It manifests as one glimmer of light, more intense than, but similar in character to the glow of an electrified Crookes tube. We raise the telescopic power so as to examine each planet's pole separately, and we view the glories of aurorae polares. A stream of energy is emanating from each pole, spreading out fan-like, and again concentrating, enters the sun's mass at its pole. Without the telescope this light has a faintish yellow tint like the light of an electrified vacuum. We conclude that all space is filled with energy, and that radiant glory everywhere prevails.

A CRITICAL POINT. Again we return to the greater cycle, the course of which we take up at a critical point. The sun has extended his boundaries until they are co-equal with the boundaries of the solo-planetary space. There is no sun, and there are no planets. The density is almost uniform, only a relative positive condensation, showing the axis of the space, which is a production of the former sun's axis; and a relative negative diffusion towards the rim. Matter still revolves around the axis. The matter of the space also shows some polarity, that is, at the north pole of the space there are more positive ions than there are negative, and at the south pole of the space there are more negative ions than positive; a condition similar to that of an electrolyte (Fig. 3). It would be chaotic but for this electrolytic arrangement, and for the relative placement of positive and negative matter throughout. There is no electric manifestation, there is no light, and there is no heat. Matter is in equilibrium at the highest point of general diffusibility. In this respect it must be remembered that heat and light must result from relative motion. Viewed from a "fixed star," the solo-planetary space presents darkness.

The Nebular Theories of Kant, Laplace and Herschel, formulated by different processes of reasoning, assumed the creation of gaseous matter in rotary motion, with conditions somewhat similar to those of this phase of the cycle. They reasoned that rings of matter were left behind through a contraction-process, and that the outer planets were formed first.

A RETROACTION. At this stage of the cyclic movement all the elements and conditions for chemic action exist. As long as there were two or more bodies within the solo-planetary space their mutual action caused inductively synthetic reactions, or the separation of positive

and negative elements with larger molecular potentials and increased induced fields, which ended in diffusing matter. When the last planet was absorbed by the sun, and the sun himself by this action lost his identity, chemic action changed in character. Electric action had disappeared, and with it the power of matter to diffuse. Positive and negative elements then had a tendency to come together and to assume denser conditions. Matter at this stage had only one form of potential, which was chemic or molecular in character. Probably all matter was ionic in character, the ions being separated by large intermolecular spaces filled with ether, and the ether being dominated by the molecular potentials of the ions.

Let us draw a mental picture of the true solo-planetary space with the almost uniform density of its matter during this period, as indicated in Fig. 10 from B to E. If

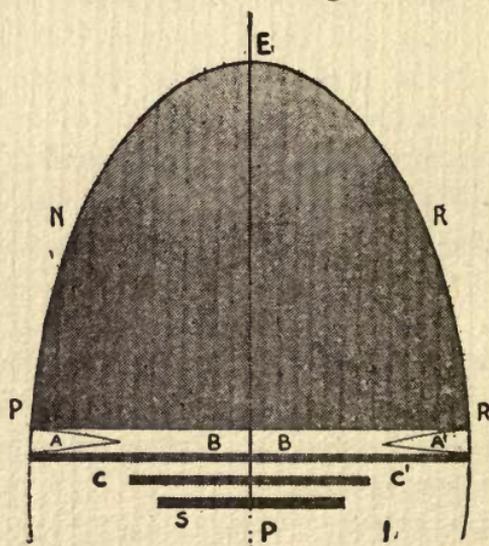


FIG. 10. A semi-cross-section of the true Solo-Planetary Space, showing its equatorial plane, P E. The lighter portion, above N R, indicates the region of Negatives. The darker central portion, P R, indicates the region of Positives. As matter contracts Ether Spaces are formed from the Sun, S, outwards.

we note the tendency of elements to react on each other, thus setting free molecular ether, as heat, we will have no difficulty in seeing that at different intervals within the solo-planetary space large bodies of ether will be segregated, and thus the contracting ponderable matter will be confined to limited areas. Fig. 10 shows such ether spaces in process of formation. It is evident that as the ponderable masses continue to contract that ether spaces will continue to grow. Space A will extend across the equator through BB and unite with space A1. A and A1 will extend along the circumference until uniting respectively with C and C1. The other ether spaces will extend also until they are all united into one great interspace. Then, it will be seen, that there is a central rod of ponderable matter, S, along the axis; and great bands, probably about twelve in number, encircling the rod at different distances. Each of these bands has for its center the orbit of a future planet. The central rod, S, is the future sun. During this phase of the retro-active period there have been three modes of action within the solo-planetary space: (1) A circular mass movement of the rod and the bands on an axial center—the momentum of former rotation. (2) Contraction of ponderable masses as a result of chemic action. (3) Contraction from gravitation. However, it must be recognized that contraction takes place at a greater rate in matter placed towards the center than in that placed towards the circumference of the space; and that matter is less dense and more negative in direct proportion to the distance from the axis of the space. The conditions of this period, and of that which follow, may be observed in the great nebula of Andromeda. The outer ether spaces and bands of ponderable matter are distinctly shown, but the inner

spaces are too small, and too obliquely presented to be observed. (Fig. 11.) The three active forces will now be modified by an event of importance.



FIG. 11. A Polar View of a Solo-Planetary System during the contracting period. The nebula of Andromeda. From Mr. Roberts' Photograph.

THE BIRTH OF ELECTRICITY. Up to this time matter has not, to any great extent, been physically differentiated, but now along the centers of the rod and bands small nuclei of solid matter might be observed. Those in the rod quickly develop into a solid core, while those in the more central bands develop more quickly than those eccentrically placed. During this period the radiations from the surfaces of each band are neutralized by the radiations from the opposing surfaces of adjoining bands. These radiations are caused by the contraction of matter as a result of chemic action, and are in the

nature of heat and light waves. But now the radiations from the rod strike the solid nuclei of the first band, and these becoming polarized dissociate the radiating ether and electricity is for the first time manifested. From the poles of the nuclei electrified chips fly off, which, seeking the poles of the rod, electrify its core, and the first electric circuit is made.

We conclude that matter within the solo-planetary space is in some degree polarized by external forces, and that polarization is universal and uniform. Independently of external force we find that the forces within the space are sufficient for the production of all relative phenomena, but for this uniform direction. Thus a solid nucleus of matter when exposed to the sun's rays would immediately polarize, but the fact of the direction of the polarization being universally uniform indicates a directing force beyond the solo-planetary space. When a nerve is exposed to a stimulus, such as the optic to light, the initiatory nerve unit polarizes, and the polarization is always in the same direction, and is independent of the character of the stimulus. So it is with the direction of polarization of the nuclei of planetary bodies.

Under the influence of electric currents flowing in opposite directions the rod and the nuclei revolve with greater velocity. The first band rapidly contracts laterally, and the rays of the rod begin to fall on the second band. The nuclei of this band become polarized, the ether radiations are dissociated, and convection-currents are established between the second band and the central rod. The nuclei in this band begin to revolve on their axes, and they acquire greater speed than other matter in the same band, thus aggregation takes place around these as centers. Some of the nuclei, being more favorably situated and nearer the central rod, move with a greater

velocity than others. Thus, as they cross each other's spheres they unite, until only one nucleus remains in the band of matter, which becomes a planet. Other planets follow from the same processes of condensation, and in order from the sun outwards.

In the meantime the central rod, by the chemic reactions of its elements, and from its increased revolutionary speed, assumes the globular form, and thus is gradually transformed into the sun of the present time. The sun speedily develops from the accession of radiant matter from the poles of the planetary nuclei, and he gradually assumes control over the planetary space. The radiations of heat from his equator striking against the first band retard the further formation of its nuclei, and as these radiations become more intense the nuclei of the first band dissolve, the material of the band reassuming a more uniform consistency; and as the dimensions of the sun continue to increase this band becomes his great medium for transmitting light to the planets—the photosphere.

As the sun increases his dimensions successive bands are brought under his sway, and the order of the solar system of to-day is established. The only departure from this systematic procedure was the rebellion of Jupiter, which we have already recorded. However, when the sun's circumference corresponds to the orbit of Neptune, there will be still a vast sphere tributary to him, where matter may be conceived as available for the formation of new planets; always bearing in mind that as the sun's circumference approaches the rim of the solo-planetary wheel his influence is over matter, which is progressively more negative and more diffusible. Thus the solo-planetary system, on the line of its equator, may be surrounded by an atmosphere of negative matter (Fig. 10)

which is never condensed; just as each planet is surrounded by an atmosphere. This circumferential band of negative matter must exercise a repelling influence on similar surfaces of proximate systems, hence, large interspaces filled with ether exist between the stars; and this repulsion must be a factor in determining, subject to cosmic pressure, the dimensions of greater or secondary solo-planetary spaces. A molecule, a nucleolus, a cell-nucleus, an electrically charged body, a planet, a sun, are each surrounded by a space such as surrounds the solo-planetary system. According to the distribution of energy emanating from the solo-planetary system our nearest neighbors should be the celestial north and celestial south of us, and, as will be afterwards shown, should present a nebulous appearance.

A CYCLE OF LIFE.

The history of one planet is, in the main, the history of all. The rule must obtain that the nearer to the sun the shorter the history of the planet, the shorter the period that vegetable and animal life is possible on its surface, and perhaps the shorter the life of its individual plants and animals. Inside of Neptune there were probably about twelve planetary bands in the embryo of the solar system. Others may be developing beyond Neptune. The sun never develops physical conditions suitable for plant or animal life. Its function is to convert electric energy into heat and light, and as a central body to regulate the conditions of its tributary planets. It is the great diffusive agent of matter as the transformation of energy at this seat is accompanied by ionization. Two great processes go on in the universe, alternately predominating: (1) One embracing chemical action accompanied by the concentration of matter; (2) the other embracing electric action accompanied by the diffusion or ionization of matter. The sun is the great and principal organ of ionization.

Probably Mercury was the fourth planet from the center. The third was Vulcan, which may have been absorbed by the sun a few years ago. The orbit of the first planet was less than 1,000,000 miles in diameter and it still maintains its revolutions, and embryonic band form, as the photosphere. The life of the second planet must have been of short duration, and probably was electrically torn to pieces, its constituent ions being deposited on the poles of the sun, or dissolved into vapor, according to the degree of positivity or negativity in their molecular potentials. The duration of the life of a planet must be influenced by the intensity of incident radia-

tions and the dimensions of its mass. Obviously life on the more immediate inner planets must have been short and intense. However, we must not altogether judge past conditions by the present. For instance, during the life period of Mercury the sun was comparatively small, and Jupiter may have partially assumed the properties of a sun, thus depriving the central body of its intensity. At that time Jupiter may have been a number of scattered planets, which at all times during the periods of their revolutions may have intercepted electric rays from the Saturn and Uranus regions. Again the extreme outer planets may not have been sufficiently condensed at this period to promote electric energy. Thus the conditions favorable to life moved from Mercury to Venus and increased in duration in the latter; thence to the earth and again increased in duration. The law of progressive increase, however, will have a break in the case of Mars, but this is fully explainable by considering the influence of Jupiter on that planet. Conversely Jupiter will have a corresponding excess of increase of the period during which life can be supported. So life scenes shift from one planet to another, from within outward, from the proximity of the sun to the outermost possible planetary condensation, from being short and intense to being long and calm, until one turn in a perpetual cycle has been accomplished. Incomprehensible as to its magnitude, simple in its plan, uniform in its principles, great and glorious in its results, in its contemplation the infinite system of cycles, from the evolution of planets to the mitosis of cells, calls forth a venerable worship for the Inherent Force that directs all.

DYNAMICS OF THE SOLAR SYSTEM.

As factors in the production of dynamic phenomena the following laws are noted:

1. Newton's first law of motion: "A body once set in motion and acted upon by no force will move forward in a straight line, and with a uniform velocity, forever." We do not question the correctness of this law, but the extent of its application in explaining phenomena is certainly unwarrantable. It assumes an initiatory force which it does not name, and is not satisfactory as to changing conditions. If we could place our hands on the earth and stop its revolutionary movement, the planet would immediately resume that movement on removal of the force which stopped it. Let us see: Fig. 12 shows a wire through which is flowing an electric current. Within the electric field is placed a north-seeking pole of a magnet bent and pivoted in such a way as to be free to

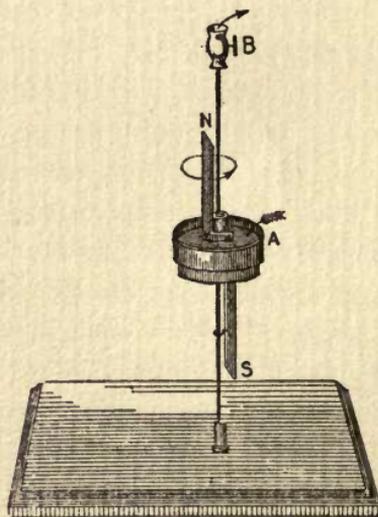


FIG. 12. Rotation of an Electric Field. The north-seeking pole N revolves from left to right when the positive current passes from A to B.

rotate. The positive current enters at A and escapes at B. When the current is present the pole rotates in the direction indicated, from left to right; when the current is absent the rotary movement stops. Newton's law is just as applicable to such a movement as it is to that of the earth. This law finds expression in the term momentum.

2. The electric or magnetic law is rendered thus: "Unlike forces mutually attract; like forces mutually repel." Newton's gravitational law is formulated as follows: "Every particle of matter in the universe attracts every other particle with a force inversely proportional to the square of the distance." Obviously these two laws are not in harmony, and hence are not basic to a generalization. Newton's law is defective in that it eliminates repulsion as an inherent property of matter; the electric or magnetic law is not cognizant of the concentrativeness of positives relative to the diffusibility of negatives. The writer submits the following as a general law: Unlike forces mutually attract; like forces if negative mutually repel; like forces if positive mutually repel to the extent of their fields of induction, and attract by an inherent principle of concentrativeness. It will be observed that it is only in reference to positives that the electric or magnetic law is modified. Figure 13 illustrates the writer's conception of the primary forces. The arrows indicate the direction of the reactions. Between positives the inner arrows denote the impenetrability of the fields of induction, while the outer arrows denote inherent attraction. It must always be borne in mind that positive potentials will separate by means of attraction between the positive forces and proximate negative forces. As Newton framed his law as applying to the action of planets, and as these bodies are positive, we will define Newtonian attraction as that form which occurs between positive masses, as indicated by the outer

arrows (Fig. 13). Thus it will be identical with the cohesion of positive molecules. For convenience we will tabulate the reactions as follows (Fig. 13): (1) Newtonian attraction, or positive mass attraction, taking place between positive masses; (2) polar mass attraction following the approximation of unlike poles; (3) mass attraction occurring

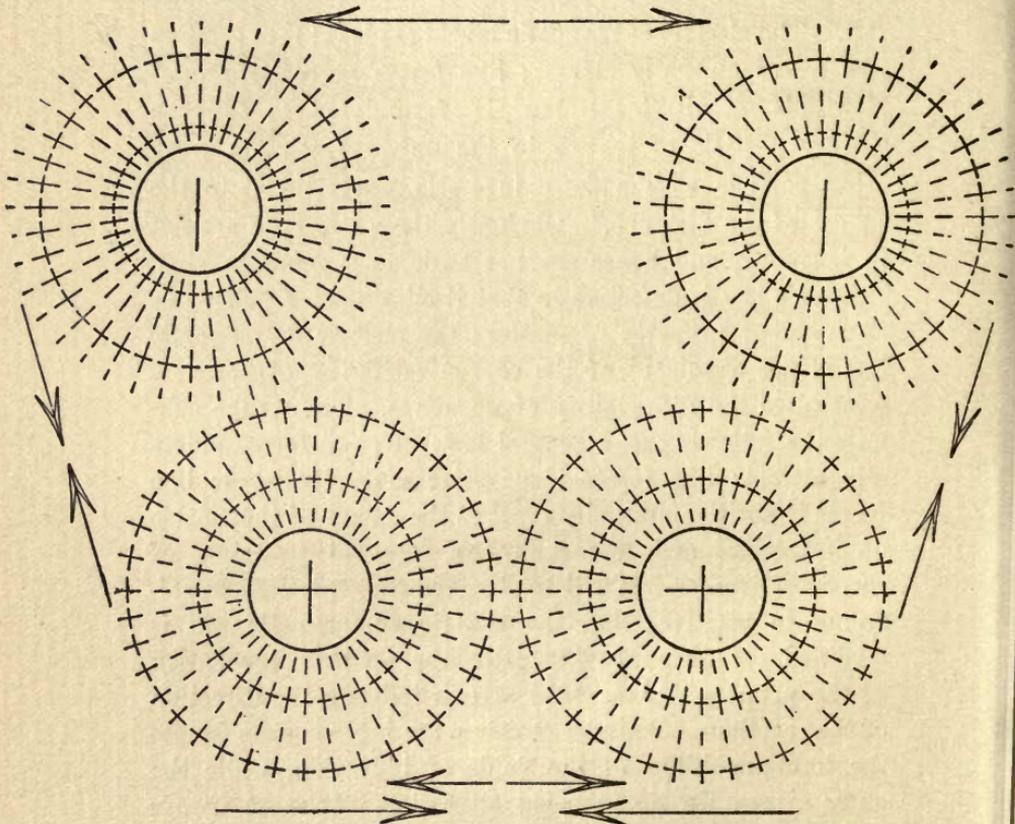


FIG. 13. Indicating Differential Manifestations of Elementary Forces: The centers represent insulated potentials, whether Electric, Molecular, or Mass; the primary potentials being surrounded by fields of induction.

between positive and negative masses. (1) Positive mass repulsion limited to the impenetrability of fields of induction, as in the interspaces of positive molecules (inner

arrows, Fig. 13); (2) polar mass repulsion following the approximation of similar poles, also limited to fields of induction when positive; (3) mass repulsion occurring between negative masses, and acting inversely as square of distance (applying also to proximate negative poles). A relative movement of poles may occur, without mass translation.

3. Relative Direction. Around an electric current there is a magnetic whirl. Clerk Maxwell formulated the following rule as to its direction. "The direction of the current and that of the resulting magnetic force are related to one another as are the rotation and forward travel of an ordinary (right-handed) corkscrew." (Fig. 14.)

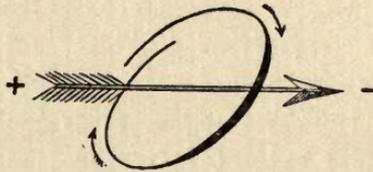


FIG. 14. The arrows denote the direction of positive currents, and induced whirl of positive ions.

This rule applies to the positive electric current, and to the north-seeking magnetic pole. The writer formulates the following general law: Facing a receding positive, or approaching negative, primary current, a positive potential—positive magnetic pole, positive ion, or positive body—within the field of induction, rotates from left to right, in the upper segment of its cycle.

Scientists are not entirely agreed as to the quality of the north-seeking pole of a magnet. It is the opinion of the writer that it is positive, and similar to the terrestrial north: The compass does not behave as if it were directed by a fixed potential such as the pole of a magnet, or even by the polarized potential of an electrolyte; but it does behave as if directed by current potentials. We have shown

(Fig. 7) that from the earth's equator a negative current flows northward, and a positive current southward, each of which escapes at its respective pole. Now mark the difference between the area embraced within a circumferential line passing through the north electric, or so-called magnetic, pole of the earth, and the similar electric area of the south. It is apparent that the positive and negative electrodes of the earth bear a wonderful analogy to the electrodes of a static machine selected as to size so as to give a maximum spark with a constant electro-motive force (Fig. 15); and to the different dimensions of blood-clotting at positive and negative electrodes, as shown in Fig. 16. Truly, these are evidence of the concentrativeness of positivities, and the diffusibility of negativities; and they are also evidence that the construction of Fig. 7 accords with terrestrial electrical facts.

The writer concludes that the positive pole of the magnetic needle points northwards, and that its actions are the result of a couple—the electric currents of the sun as expressed by the earth's rotation on its axis, and the electric currents of the earth. The magnetic dip belongs to the influence of the earth's currents and is similar to the attraction of a current for iron filings. The dip gets larger as the rotation velocity of the earth decreases towards the poles, and as the earth's electric currents condense and approach nearer the surface. If the earth's currents entirely controlled the needle it would point east and west, or at right angles to the currents. The needle being acted upon by two currents of opposite direction, its positive pole takes the electrolytic direction of a positive ion going in an opposite direction to a negative current, or, seeking the cathode of the sun. The north-seeking pole is certainly positive, and obeys the rotary law (Fig. 12) as formulated, as do also the sun and planets. The poles of the earth, of

the compass-needle, and of the elements of the photosphere (Fig. 7, AA) have a uniform general direction, and the primary currents of the sun (Fig. 7, CC) must be a common directive cause. The currents of the earth being directed by its polar potentials point differently.

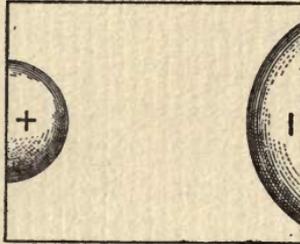


FIG. 15. Electrodes of such relative size as to give a maximum spark.

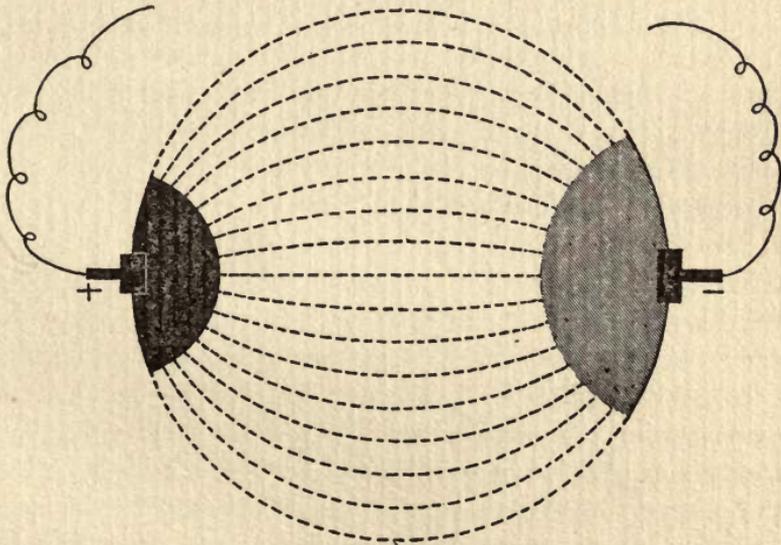


FIG. 16. Differential clotting of blood at Positive and Negative Electrodes. Compare these with the polar electric areas of the Earth. (Fig. 7).

4. Ampere's laws: (1) "Parallel electric currents of opposite direction mutually repel; those of the same direction mutually attract." Fig. 17 indicates the manifestations of this law. When the currents are of the same direc-

tion the induced lines of force tend to embrace the two currents; when they are opposite in direction, the lines of force tend to pass between and repel them. (2) A series of laws may be summed up: "Currents obliquely directed induce stresses in the surrounding media tending to straighten their paths, as nearly as possible, in parallel direction." (3) The force exerted between two parallel

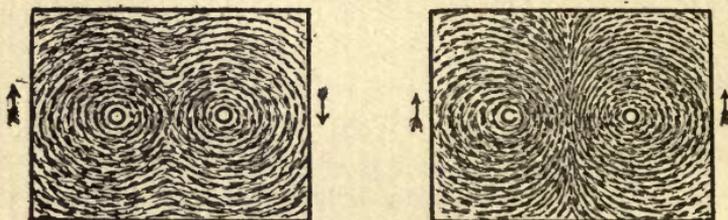


FIG. 17. Attraction of currents of the same, and repulsion of those of opposite direction. The arrows denote the direction of the whirl.

portions of circuits is proportional to the product of the two currents, to the length of the portions, and inversely proportional to the simple distance between them." This law of Ampere's is fundamental to Kepler's second law: "The radius-vector of a planet describes equal areas in equal times." The distinctive quality of Ampere's laws is their fundamentality, being as applicable to solar systems as to simple electric circuits. His was one of the greatest minds.

SOLAR MOTIONS. We have described the sun's mass as possessing a central nucleus or rod of extreme density, metallic or positive in quality, and having in a high degree the property of electric conduction. Surrounding the central nucleus the masses are less dense, and according to spectroscopic evidence are made up of positive matter in which hydrogen largely figures. The following are types of chemic elements proved by means of spectroscopic observation to exist in the photosphere: Hydrogen, carbon, iron, nickel, copper. Electronegative elements have not been spectroscopically observed in the sun..

We may assume that the central nucleus extending from pole to pole is constituted of the more dense of the electropositive elements. We have concluded that electrified matter emanating from the poles of the planets is being perpetually deposited at the poles of the sun, and that electric currents pass from the poles to the equator. The question arises: What effect do these current forces produce on the photosphere? The answer must be *rotation*.

It is evident that the photosphere must be the induction field of currents passing through the central sun. Now, if we apply the corkscrew rule to the electric forces of the sun we find that if we mentally stand off the south pole, the positive current is receding and the negative approaching, and as the photosphere is made up of positive ions the rotary direction should be from left to right, and this is just what we find. We can mentally assume a position off the south pole of the sun and see the great solo-planetary wheel, its hub, its immense spokes of force, their terminal planetary bulbs, and its fanciful marginal rim of negativities, rotating from left to right in the upper segment of the cycle, just as we can mentally picture the cyclic whirl of matter in the field of induction of a wire through which flows an electric current. The fundamental principle is the same, and the cyclic direction follows a common law.

Observation of the sun's spots has shown that the equatorial zone has a rotary period of 25 days, while at the latitude of 40° the period is 27 days. In regard to this phenomenon it must be remembered that cohesive force in the photosphere is relatively absent. The explanation of this rotary peculiarity is rendered possible when we consider the sun as a great electrolyte. Fig. 7 indicates the direction of the central electric currents in the sun towards the equator. Positive ions accumulate at the north and negative ions at the south pole. The induced currents are

shown as flowing in the opposite direction, or from the equator to the poles, as charged ions (Fig. 7). Now, we see that the positive ions accumulating at the north pole will exercise a retarding influence over the induced positive current, and the negative ions accumulating at the south pole will retard the negative induced current. The retarding influence will be in direct proportion as the distance from the equator. It is possible that the portions of the sun's mass around the poles (including its central rod) have no rotary motion, or rotate in the opposite direction to that of the photosphere. It is obvious that the velocity of photospheric rotation is directly proportional to the distance from the inhibitory polar potentials.

Another aspect of the electric conditions of the sun must be referred to: Great embankments of positive and negative ionized matter, absorbed from the planets, and built up at their respective poles (Fig. 7) periodically exceed the control of the primary electric currents, and just as ions in an electrolyte are attracted, and by union set energy free, so the ions in the sun are attracted towards the equator and by union set free vast quantities of ether, thus causing the disturbances manifested as sun spots. Analogous reverse or polarized currents admit of easy demonstration.

Viewing the sun as a great electrolyte with the primary currents passing through its center, and a diffused periphery constituting the field of induction, we must regard the lines of force radiating from the primary current as extending in a wheel-like manner to the limits of the solo-planetary space. These lines of force will extend until neutralized by induced or opposing forces; but we must consider that the greater part of this space is filled with the non-neutralizing substance, ether. Hence, we must conclude that the primary currents of the sun are neutralized by the induced currents of the photosphere and potentials of the planets,

interplanetary ether being only a medium of conveying force. Further as the photosphere rotates so must the planets rotate, only the former maintains the normal circular path, and thus the explanation of the movements of the photosphere merely involves the law of positive ions rotating round a current in a given direction, together with certain laws of attraction and repulsion. In the photosphere we see evidence of a circular movement in which forces, acting according to Newton's law of gravitation between positive elements, and Ampere's law of repulsion between currents of opposite direction, are mutually neutralized. Although the mutual neutralization of these forces acting according to their respective laws is preserved throughout the solo-planetary space, yet, problems of planetary orbits are more numerous than those of photospheric rotation, and are more difficult of solution. It must be clearly comprehended that static forces merely attract or repel, and that it requires a current movement to produce a rotation, which in its simplicity is circular or cyclic in form. It will be evident that all deviations in the orbits of planetary bodies from the simple circular movement of the photosphere are explainable by the action of static forces; and it will be evident that the circular movement and its direction are the effects of current forces, and that true *circularity* is the primary element of all orbits.

PLANETARY MOTIONS. The motions of the earth and those of the other planets are mainly responsive to current and static forces in the sun. The electric currents of the earth (as those of the photosphere) are induced currents, although the induction is directed by the differential polarities of the earth as an electrolyte. To solve the problem of the earth's motions we must clearly understand that the sun and planets are positive bodies having a mutual attraction according to Newton's second law of

force (Newtonian attraction). If we conceive that matter within the solo-planetary space consists of an equal amount of positive and negative units, but that owing to the concentrativeness of positive units and diffusibility of negative units they become unequal in their distribution, the positive quality of certain bodies and the negative quality of others will be easily understood. A study of the movements of cometary bodies, together with spectroscopic evidence, is convincing that comets are negative masses, perhaps in some instances with positive nuclei, condensations from the distant sphere of negativities; and that the sun and planets, including our moon, are positive bodies condensed within the central sphere of positivities. (Fig. 10)

If the forces according to Newton's law of gravitation, and those according to Ampere's law of repulsion, are applied to the earth, and that body placed so that its equatorial plane is identical with that of the sun, the earth would describe a complete circle, if not disturbed by other forces. Accepting the circular path within the plane of the sun's equator (with terrestrial equinoctial conditions obtaining) as the normal orbit, we will proceed to consider the causes which produce the departure from normality. It is evident that the direction of the rotary movements of the earth and other planets conform to the direction of the rotation of the photosphere, all being within a common electric field, and all moving as positive ions round electric currents flowing in constant directions.

In Fig. 18 let the broken line indicate the normal circular pathway of the earth round the sun, and the unbroken line the present elliptical orbit, and let us account for the deviations from normality by the application of the laws noted. We have already stated that the obliquity of the earth's orbit from the plane of the sun's equator was attained as a resultant of two or more orbits by the union

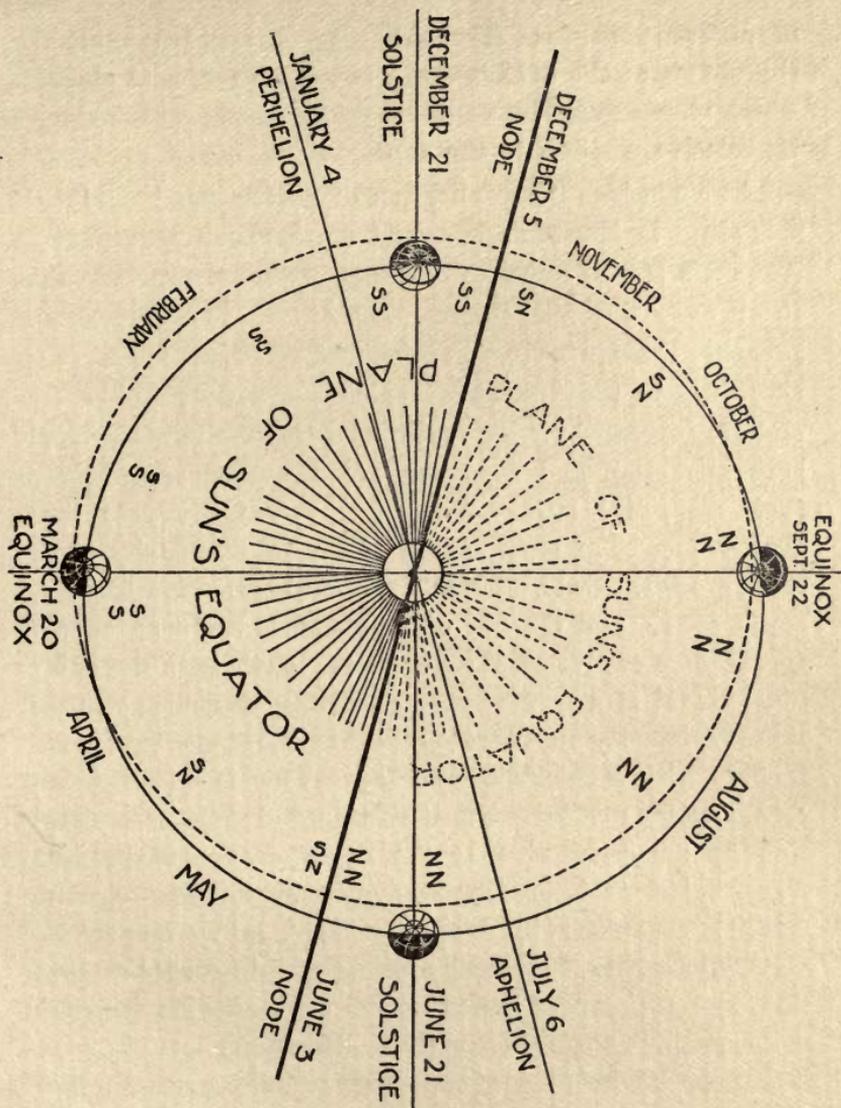


FIG. 18. The Broken Line indicates Normal Circularity; the Unbroken Line the Earth's Orbit; the plane of the paper indicates the Plane of the Ecliptic; and the Radiating Lines the Plane of the Sun's Equator. The letters N S denote the Approximating Poles of the Sun and Earth. The North Pole of the Sun is indicated as pointing upward. The eccentricity of the earth's orbit is only 1-60, it being exaggerated in the figure; and the points at which the ellipse cuts the circle are only approximately indicated.

of different masses. The obliquity does not account for the phases of the earth's orbit, but is an essential element which allows static forces to act on the planet, as it changes its relative position to the sun.

If we consider the application of gravitational attraction according to Newton's law, and of repulsion according to Ampere's law of opposite currents, we must conclude that in all cases they will balance each other. If the earth approaches the sun nearer than the normal circuit attraction according to the first and repulsion according to the second are increased; if the earth is beyond the normal circuit both attraction and repulsion are decreased according to their respective laws. We can therefore eliminate these laws as factors of modification of normal circularity of the earth's orbit. Only, as the law of gravitation is based on static forces, and the law of repulsion is based on current forces, it is clear that the nearer the earth is to the sun it must travel at a greater rate according to Ampere's third law, the velocity not being opposed by Newton's law; which accords with Kepler's second law. This is an important consideration: Newtonian attraction and Amperian repulsion oppose each other to the limit of the gravitational force, but there is no factor in gravitational law opposing velocity according to Ampere's third law. Hence, the earth approaches the vernal equinox with increased momentum, and approaches the autumnal equinox with decreased momentum. It is apparent that as Newton's law of attraction and Ampere's law of repulsion give the normal orbital path, and as the oblique modification of this path has been shown to be the result of union of two or more bodies, we may eliminate these elements from further consideration, only remembering that according to Ampere's or Kepler's law the momentum is increased or decreased in accordance with the distance of the earth from the sun.

Heat and light radiations may possess the property of repelling bodies and thus reinforce the repulsion of electric currents of opposite directions. These energies, however, are chiefly important (as regards orbital revolutions) in being sources from which electric currents are transformed. We see comets approach the sun and retreat from that body, when apparently they are equally under the influence of the solar rays.

On March 20th—the vernal equinox—the poles of the earth are equidistant from the sun's center. At this date the earth is 7.15° south of the sun's equatorial plane, and its orbit and the normal circuit are about straight. Obviously the two south poles (Fig. 18 SS) of the bodies approximate, and hence their electric currents are not parallel. Mass attraction according to Newton's law, and repulsion according to Ampere's law, being balanced, the acting forces are those of repulsion. Two south poles approximating cause mass repulsion, while the currents tend to straighten by repelling the south and attracting the north; and the polar forces also act in the same way by likes repelling and unlikes attracting. In addition, the earth enters this portion of its orbit with increased momentum, as a result of the increased rotary velocity, according to Ampere's third law, which tends to force it in a straight path, according to Newton's first law. The planet is thus carried beyond the normal circuit.

The electric currents of the sun and earth must become parallel shortly after March 20th, when there is attraction between the proximate poles—the north of the earth and the south of the sun (Fig. 18); and the polar attraction is accompanied by polar mass attraction. But both phases of attraction are slight at the beginning, and the first is resisted by the action of the currents against distortion of their paths from parallel directions (Ampere's second law),

and the latter by momentum (Newton's first law). As the earth, on moving forward in its orbit, turns its north more towards the sun's south pole, polar mass attraction increases, but evidently just as attraction would become predominant the earth crosses the solar equatorial plane on June 3d, when two north poles approximate, and polar mass attraction ceases, and is replaced by repulsion from the strain of distorted fields, due to the angular paths of the electric currents of the two bodies, according to Ampere's second law. Polar approximation, however, has gained an impetus which carries the north of the earth sunward until the summer solstice on June 21st. The increased orbital speed according to Ampere's or Kepler's law, and the repulsive force of two south or negative poles approximating, from the perihelion to the equinox, give a momentum, which with the straightening of the paths of the electric currents of the two bodies after June 21st, carry the earth to its aphelion on July 6th, the maximum divergence of its orbit from the normal circular path; the main opposing force being mass attraction resulting from approximation of opposite poles during the period ending June 3d.

At the summer solstice, June 21st, the north pole of the earth reaches its relatively maximum approachment to the sun. This pole has pointed sunward since June 4th against the relatively greater attraction of the south pole by the sun's north, and against the resistance of parallel currents to the distortion of their paths since the end of March. The opposing forces now become dominant: The electric currents tend to straighten their course, and the south pole of the earth is attracted by the north pole of the sun, hence, relatively the north pole of the earth is turned back by the conjoint action of these forces. In addition, although the two north poles still approximate, there is an absence of polar mass repulsion, owing to the concentrativeness of

positive potentials. Now mark: Notwithstanding that there is approximation of similar poles—north to north—from July 6th to the autumnal equinox, the earth's orbit contracts, and the conclusion is inevitable that the chief cause is the absence of polar mass repulsion owing to positive concentrativeness. In fact, reversely, apposition of the positive poles, with an intervening mass of ether in the interstellar space, may give polar mass attraction. Concurrently with the positive polar action there is decreased momentum, which lessens the resistance to the approachment of the two bodies; and at the same time the electric paths tend to straighten, which is done by relatively attracting the negative and repelling the positive pole, which, it must be remembered, is not a movement of translation of the earth's mass.

On September 22d, the autumnal equinox, the earth's orbit is about even with the normal circuit, and its poles are equidistant from the sun's center. At this time the earth is 7.15° north of the equatorial plane, and hence the two north poles approximate, and therefore the paths of the electric currents are not parallel. The same forces are dominant, although modified, for a short period after September 22d, as those previous to that date. When the electric currents become parallel the south pole of the earth and the north pole of the sun approximate, and this presentation prevails until December 5th, when the earth crosses the equatorial plane of the sun. Hence, during this period there is polar mass attraction between the two bodies. Now, observe that the earth enters this period—from September 22d onward—without the increased momentum, and without the repulsion of like forces which occur at the vernal equinox. It follows that the planet's course during the period of polar mass attraction from the approximation

of the south pole of the earth to the north of the sun effects a contracted orbit, which, after December 5th, is continued to the perihelion by the momenta.

On January 4th the earth is at the perihelion, its point of maximum orbital constriction relative to the normal circuit. The two south poles approximate and the south of the earth is repelled and its north is attracted. The approximation of two south poles implies mass repulsion. The movement of translation and the relative polar movement continue until the vernal equinox, at which date we commenced the consideration of this part of the subject.

This period—from perihelion to the vernal equinox—is the great repulsive period of the earth from the sun during its orbital course. The period is analogous to the repulsive phase of cometary orbits, and the same fundamental force of repulsion between negative potentials, or the diffusibility of negative units, is the cause in both instances. When we come to study the causes of the eccentric paths of comets this fact will be more clearly shown.

Compare the period from aphelion to the autumnal equinox with that from perihelion to the vernal equinox, and we see in the one a contracting orbit although two north (positive) poles approximate, in the other an expanding orbit when two south (negative) poles approximate, and we must be struck with the correctness of the great fundamental conception of the concentrativeness of positive ultimates and the diffusibility of negative ultimates, as expressed in Fig. 13. It is true that there is increased momentum during the expanding period and decreased momentum during the contracting period, but these facts are sequential to the same great law of ultimate units being differentiated on the bases of an inherent attraction in positives, and an inherent repulsion in negatives. We observe in the earth's orbit manifestations of negative diffusibility

just as we observe in its atmosphere manifestations of the same principle; of positive concentrativeness just as we observe in the earth's mass manifestations of this principle; and just as we observe manifestations of both principles in the distribution of matter within the solo-planetary space; and we have a right to conclude on this additional evidence (as we have formerly concluded from electrical, chemical, physical, and physiological evidence) that these principles are fundamental, and of universal application.

COMETS.

The number of these bodies is considered to be enormous; perhaps they are innumerable. It is only the ones that appear brilliant from the earth that are rare. The perihelia of some of them are less than five million miles, and a large proportion of them come within the earth's orbit. The inclination of their orbits to the ecliptic range from 0° to 90° . The constituent parts of a comet are: (1) The coma, a nebulous cloud of matter, faintly shining, and spherical or oval in shape. (2) The nucleus, a bright star-like point near the center of the coma, commonly appearing as the comet approaches the sun. There may be two or more nuclei. The coma and nucleus constitute the head. (3) The tail, a train of light, stretching from the comet, following the head when approaching, and preceding the head when receding from the sun—the tail is always directed from the sun. The dimensions of comets are enormous, the head being sometimes larger than the sun. A comet less than 10,000 miles in diameter would likely escape observation. When a comet approaches the sun its head usually contracts, and expands again on receding. This feature was particularly noticeable in Enckes' comet, which at perihelion had a volume $1/10,000$ th of its original dimension, expanding in an equal degree on receding. The length of the tail of a comet varies from 10,000,000 to 100,000,000 miles. The comet of 1882 was 8,000 times the bulk of the sun. Notwithstanding their bulk, their densities being low, the aggregate amount of ponderable matter is extremely small compared with that of planetary bodies.

Spectroscopic investigation shows the presence of luminous carbon compounds, cyanogen being suggested. When a comet approaches very near the sun its spectrum gives evidence of the presence of metals—sodium, magnesium,

iron. There is evidence pointing towards comets changing their spectra with their distance from the sun. A comet approaching the sun increases in brightness, and the newly formed nucleus emits envelopes or streamers of light, from the side nearest the sun, which concentrically follow each other, with a periodicity of some hours. The nucleus during these processes usually grows smaller and brighter just before the liberation of each wave of light. Although the nucleus of the comet seems to oscillate there have been no evidence of continuous rotation.

The material forming the tail is supposed, at least partly, to be emitted by the nucleus, and it is the opinion of observers that this material is repelled by both the comet and the sun. As the comet passes around the sun at its perihelion, its tail swings round with a tremendous velocity, so that the tail continues to be the relatively distant part. (Fig. 7.)

When a comet moves in an ellipse it returns at regular intervals, but if its orbit is hyperbolic it is never observed again. Professor Pierce suggested that the home of the comet is a shell of nebulous matter accompanying the solar system, and lying between it and the nearest fixed stars.

We have designated the outer portion of the solo-planetary space, constituting the rim of the great wheel, as the region of negativities. This is the "home of the comets." The first conception that presents in regard to these bodies is that they are negative masses. Some of them, however, act as if possessing positive nuclei. Evidently they are not polarized, and do not possess electric currents; but incident light may be transformed into electrical charges by the differential potentials of their elements. This method of charging can be demonstrated by throwing light on a metallic surface, when the metal and the atmosphere are charged differentially.

Each molecule of ponderable material, whether positive or negative, has a certain inductive potential, and the greater this potential the greater the intermolecular spaces of the material. (Fig. 2.) The intermolecular spaces are modified by pressure. Now, when molecules are brought under the influence of a greater potential (as the potential of the sun) their inductive potentials are partially neutralized, the intermolecular spaces are accordingly diminished in size, and the substance becomes more dense. This phenomenon is illustrated by the formation of a cloud of vapor when aqueous gas is brought into an electric field; a fact demonstrated by Townsend in experiments recorded by Professor Thomson. It is easily understood that with the increasing density, as the comet approaches the sun, there will be evolved large quantities of ether from the molecular interspaces, the radiation of which will cause streams of light to emanate from the nucleus. In addition, a molecule, or a mass, of high potential passing through ether will polarize and depolarize the ether in its course, thus impulses in the ether are sent out from the cometary mass.

When we come to consider the causes of differentiation between the orbits of comets and those of planets, the most striking features are the absence of polarity, and consequent absence of electric currents in the cometary mass, and their presence in the planetary body. Hence, in considering cometary phenomena, we can eliminate Ampere's law of repulsion between currents of opposite direction, and the orbital variations arising from the differentiated poles in the moving body, which are determining factors as to the course followed by planets. This simplifies the matter to gravitational attraction according to Newton's law, and attraction or repulsion according to the law of likes and unlikes as occurring between the north or south pole of the sun and a body of similar or dissimilar quality to that of the

proximate solar pole. In fact, if we confine Newtonian gravitation as applying to attraction between two positive bodies, we may be able to eliminate it from consideration in reference to the orbital course of comets; leaving only attraction between dissimilar, and repulsion between similar (negative) forces, as applying to these bodies. We must consider a comet as a mass of negative matter, without poles, and without electric currents; although particles of a cometary mass may be differentially charged by incident rays from the sun. Heat and light rays falling on a mass, and meeting resistance, may be transformed into electric charges, the more positive elements being positively charged, and the more negative elements being negatively charged; if, however, the resistance to the passing of the rays is slight the elements will be charged oppositely to their own potentials. It must also be considered that negative elements are not electric conductors.

We can conceive that from the domain of diffusible negativity, perhaps many times larger than the space embraced within the orbit of Neptune, during the period of transition from the nebulous state to partial condensation, great masses of matter will gravitate towards the center of the solo-planetary space. Matter within this region must rotate round the sun in a common orbit, perhaps as a great circular band of nebulosity, negative in character as a whole, but spotted with multitudinous condensations of positive nuclei. At certain periods, when the relative positions of the outer planets are favorable to attraction, immense nebulous masses lose their equilibrium and start towards the sun. We must here recall the relative position of the sun's equatorial plane to the solo-planetary space (Figs. 7, 10). It is conceivable that the cometary masses may be diverted from their equilibrated orbits either north or south of the sun's equator, by the planetary influence, the

forces at work at this stage being the attraction of masses—positive potentials on the part of the sun and planets, and negative potentials on the part of the comets. If, however, processes of condensation have progressed to a certain relative point there may be a large positive nucleus to the mass. In this case there may be a true Newtonian gravitational attraction between positive bodies. It must be considered, however, that as a body condenses, it becomes polarized, with induced electric currents, and hence a true planet is born, rotating in a true planetary orbit.

A comet may commence its centripetal course at any part of the negative region, but at some point of its inward course, probably in the neighborhood of the orbit of Jupiter, it will get northward of the equatorial plane of the sun. This relative position will be brought about by attraction between the north poles of the sun and inner planets and the negative mass of the comet. Could a negative cometary mass fall into the north pole of the sun? No. Regarding the possibility of such an event resulting from gravitation and momentum, it must be considered that it is relative attraction that must decide the course. When the comet approaches the north pole of the sun what previously was attraction becomes a repulsion, the polar region being the seat of tremendous negative electric energy seeking the solar positive pole. However negative the comet may be, it is less negative than the charges on the ions pouring into the north (positive) pole of the sun. (Fig. 7.) Attraction when the comet approaches this region of concentrated force becomes relative repulsion. Relative repulsion can be demonstrated by the attraction of a feather by a positive charge, concurrently air being relatively repelled although negative. The negative comet then sweeps around the sun, crosses the equatorial plane, and is brought under the influence of the solar south

(negative) pole. No force of attraction ever manifests in such velocity as the repulsive forces, between the two negatives, shown by the rate of travel in the sweep of the comet's tail, as it passes into the region of solar polar negativity. Like a rifle ball the comet is shot into space, the tail leading the way, as it is relatively more negative, back again, if its orbit is hyperbolic, to its nebulous home, where its elements are probably diffused never to reform as a cometary body. Could a comet enter the solo-planetary space from the outside? Hardly; it would be diffused into ionic fineness to the limit of ponderable cohesiveness in crossing the boundary where interspatial radiations equalize.

Matter constituting a comet has a tendency to break up into sections having mutual repulsion. Sometimes the nucleus divides into two, and the tail also divides in like form. The writer cannot miss an opportunity to compare analogous conditions. Let the astronomer study karyo-

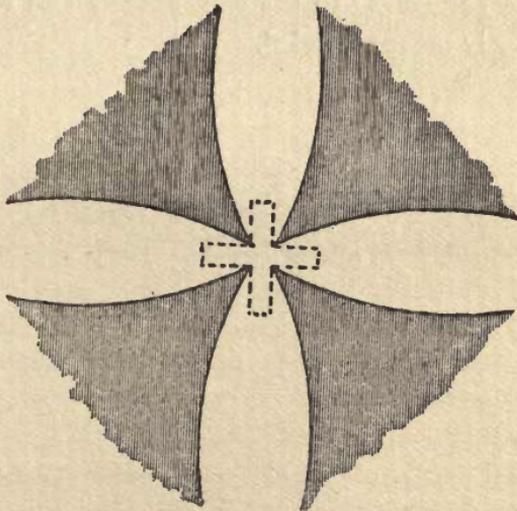


FIG. 19. Negative Diffusibility: The broken line indicates the shape of the cathode, the rays from which diffuse under great decrement of pressure, and assume the form of the Phosphorescent Pattern.

kinesis as manifested in a human cell, and watch the segmentation of the nucleolus or centrosome (one of the largest known molecules). Let him see how the cathode rays, independently of anodal attraction, spread out, as if each electrified particle were endowed with the spirit of repulsion. This is strikingly manifested in Goldstein's phosphorescent patterns of cathodic streams. These and numerous other phenomena are undoubtedly based on the principle of repulsion inherent in negative units and exhibited whenever negative potentials predominate.

If it be conceived that matter within the solo-planetary space is constituted of positive and negative units in equal proportions, that these units are distributed within the space according to the concentrativeness of the one kind, and the diffusibility of the other (Fig. 10), and that these react in accordance with the fundamental law of attraction and repulsion as reformulated and generalized in this article, and elsewhere by the writer, then, the differential phenomena pertaining to the sun, planets and comets will be more easily comprehended.



THE MOON.

The surface of the moon nearest the earth presents evidence of the absence of both ocean and atmosphere. Our satellite is said to turn on its axis every time it revolves in its orbit, its axial and orbital revolutions being considered as periodically equal. It shows some evidence of polarity; that is, it slightly turns its poles alternately towards the earth. All the evidence obtained by observation points to the moon being incapable of sustaining either plant or animal life, and this is the opinion expressed by astronomers.

The moon turns on its axis just the same as the Himalaya Mountains turn on their axis! The mountains keep their base towards the earth's center, and so does the moon, and the same law of Newtonian attraction governs both. The conception of the earth's circumference having extended to the moon's orbit will render it clear that there is no axial rotation of the moon as an individual body. The moon, however, loses time, and instead of revolving in its orbit every 24 hours as do the mountains on the earth's surface, it takes 28 days, owing to the resistance of the sun's forces.

Matter in the moon undoubtedly varies in its electrical conductivity. If we compare dry and wet clay electrodes we will at once see that part of the proximate surface may not be an electric conductor, if moisture is entirely absent, which is doubted by some observers. Matter in the interior of the moon, and part of its surface, however, being metallic in character, must possess this property in a high degree. Incidence of radiant energy, conductivity and polarity of the body, elements in the production of electricity, indicate the presence of lunar currents. If currents are present, they would

tend to make the moon rotate on its axis; but the rotation, if made, would be in reference to the sun as a center, not to the earth as a center, the lunar gravity conditions would have to be overcome, and the satellite would then become an independent planet. The conditions cannot be ascertained from comparing the moon to the earth because the rotation of the earth on its axis makes the center of gravity at the geometric center, while the center of gravity of the moon may be a point very near the proximate surface, just as the center of gravity of the comet is within its head. The moon's orbital revolution probably was primarily identical with the earth's axial revolution, and was the result of Newtonian attraction between the earth and the sun; and the reaction of electric currents, primary on the part of the sun, and induced on the part of the earth; according to this conception the earth and moon being then one body. The lunar proposition is that of a body having electric currents induced by those of one center, while it is rotating around another. The currents of the earth, and those of the moon, having one general direction, do not repel each other. Besides, both being induced, they are largely neutralized by the solar currents. It is conceivable, however, that the moon was entirely a separate condensation from that of the earth, both belonging to the same primary band of matter, but having separate orbits. The smaller body, coming within the gravitational influence of the larger, assumed its present orbit as a satellite. This speculative thought does not in any way modify the conclusions formulated in this article regarding present lunar conditions.

Furthermore, as the more diffusive elements of the comet are always the most distant from the center round which it rotates, this may be the case with the elements of the moon. The moon in its orbit may be likened to a

comet approaching its center of attraction, all of its elements being attracted, but in different degrees, and the more diffusible being left behind. The tendency to this arrangement of the elements is obviated on the part of the earth (and other planets) by an axial rotation which makes the earth's atmosphere uniformly distributed. The polar phases of the moon, however, may admit in principle the same explanation as those of the earth. The distal side of the moon may have an atmosphere, may be an electric conductor, and may be the supporter of vegetable and animal life. The evidence is negative, but deductive reasoning goes far to render it probable that the necessary conditions for the support of life are present. Veritably, if observers could find evidence of there being a lunar aurora polaris, or other evidence of polar charges, the man in the moon would be no longer considered mythical.

The polarity of the moon is evidence of the presence of the aurorae now or in the past. When it is considered that the molecules of solids are largely positive, giving a mass like the moon a large positive potential, it is inconceivable that such a body should exist without attracting a negative atmosphere. The moon must be considered as an island at a distance from its continent, but partaking of the latter's general character. It may be considered as a section of the earth embracing the atmosphere, ocean, and land, lifted upwards (it may have been really left behind in a contraction process) and presenting its base to the earth, and we view it as we mentally view the base of a mountain from the earth's center. We can mentally picture the base of such a mountain as we view the lunar barren presentation, while the opposite surface is covered with the products of an advanced civilization. It may be advanced as militating against the possibility of life on the moon that the long (half its revolutionary period) cold

nights and hot days would be prohibitory, but the terrestrial conditions in the polar regions are based on practically longer days and nights, and life is consistent with the sequent conditions.

A relatively large quantity of heat must be absorbed by the surface of the moon during its day. This heat again radiating during the night will modify the temperature of its atmosphere. Another thought, although speculative, will present possible conditions. We see in the thermo-electric cell (Fig. 4) heat applied to one junction, A, converted into electricity by differential potentials, and emitted as heat at another junction, B. Now, when the sun is shining on the proximate surface of the moon, the proximate surface is represented by junction A; the polarities of the moon are represented by the different metals, and the opposite surface of the moon is represented by junction B. Clearly, the sun's rays, intensely beating on dry, metallic areas of the proximate lunar surface, are split up into electric currents flowing toward the lunar poles, where, instead of creating aurorae polares, the currents are reflected and neutralize in the equatorial regions on the opposite lunar surface, and radiating as heat therefrom, produce a warmth throughout the lunar nights. But would not this thermo-electric action take place conversely, and warm this side of the moon during its wintery night? No; at least not to the same extent. The opposite side of the moon absorbs heat radiations and to a great extent localizes the energy as does the surface of the earth. Rays of light and heat incident to the proximate surface of the moon to some extent are reflected, but their ether must be largely dissociated into electric currents, there being little localization of energy. Again, would not similar thermo-electric action take place on the earth? Again, no. Such action is prohibited by the short nights, the

essential condition of the thermo-electric cell being a difference in the temperature of the junctions, of a magnitude so great as to overcome the accompanying resistance to electric currents. Surely, the moonites possess a veritable paradise, their island home being heated by day and by night. Is the long lunar night a period of darkness? This query leads to another conception. Evolutionary processes in the moon must be more rapid than in the earth; hence discoveries are made by intuitional reasoning. That the poles of the moon were charged with a tremendous difference of potential was probably known early to the lunar inhabitants. Therefore, not being content with the starlight of their long night, they found a means of tapping this polar energy and putting it to practical uses. Running insulated silver rods to the neighborhood of the poles they could convey this electric energy to the habitable portion of the moon and thus by means of the electric light artificially set their whole domain ablaze. Could a similar use of polar energies be made on the earth? It is doubtful. Evidently terrestrial poles are not so strongly electrified as those of the moon, and they are further apart. The problem then is to find an electric conductor that would give less resistance to the current than the resistance offered to the convection currents, chiefly passing through ether to the poles of the sun. On the moon from natural advantages the problem is easier of solution. The lunar electrolytic pole is evidently electrically charged to about its full capacity, hence slight electrolytic polarity is manifested.

Pressure depending on gravitation is different in the moon from that on the earth, but the synthetic conditions essential to an organic molecule do not depend on gravitational pressure, so much as upon the pressure of incident light and heat radiations on a resisting surface. Life

may be more ephemeral, plants may assume forms of inconceivable delicacy, and the winged variety of animals may predominate. Evolution may follow different lines and the human type of beings may evolve along different pathways to those followed on the earth. It is true that the atmosphere must be less dense than that of the earth, but gravitational weight is less for equal masses, and thus the equilibrium of a vital organism to its surroundings

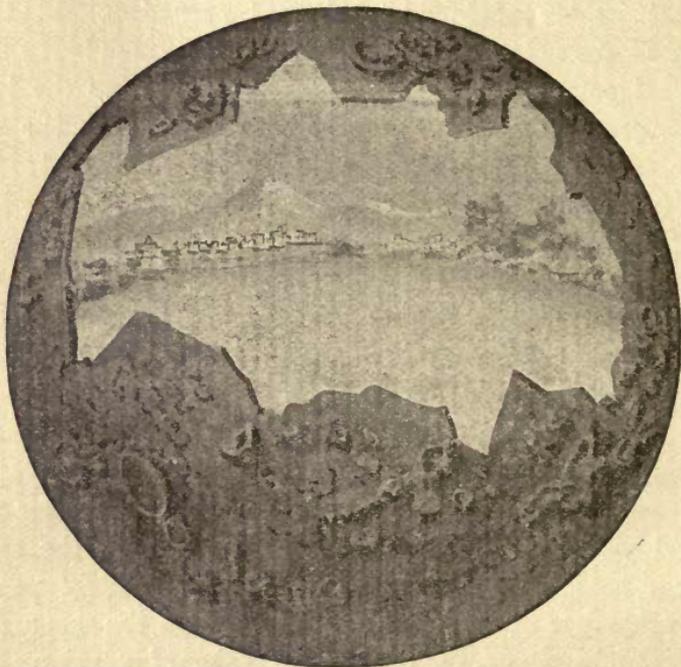


FIG. 20. The writer's conception of the distant surface of the moon. A glimpse through our satellite.

may be similar to that on the earth. It may be argued that if there were water to any large extent on the moon it would be attracted by the earth to its proximate surface, and in support of the argument may be quoted the lunar influence on our tides; but the relative position of the physical elements in the moon, as we have said, is regulated by the moon's motion, just as the relative position of

the elements on the earth must be regulated by the earth's motion, and as they are regulated in a cometary mass, approaching the sun, by its motion. As the moon's motion is more like the comet's motion than like the earth's, comparison must be made with the former, rather than with the latter. Nature delights in differentiations, and has evolved two types of revolving bodies, the planet and the comet. The moon partakes of some of the qualities of each. It is a planetary body with cometary orbital conditions.

A peculiar circumstance in relation to an intelligent being on the moon would be his inability to see the earth, the center around which he revolves. He could reason that such a center must exist, and he might send expeditions to the margins of his habitation, just as we send expeditions towards the terrestrial poles, but his efforts would probably be vain in getting a view of our planet, owing to the lunar atmospheric conditions.

COSMIC REFLECTIONS.

A planetary system would fall to pieces, like an oxygen molecule in a partial vacuum, if it were not bolstered up by other systems. The light from the stars is evidence of this interdependence, and of force passing from one system to others. The grand equilibrium of all matter and all force in all space under a universal pressure must be a determining factor in the production of natural phenomena. If the solar system be accepted as the celestial unit, then we can conceive that the systems are arranged in some form of order, in which their positive poles in general point to the celestial north, and their negative poles to the celestial south; all in harmonious adjustment, each passing through independent cycles, but each exercising a polarizing influence on environing systems; each possessing all the essential forces for its own evolutionary processes, yet evolving in complete unison with interstellar forces. Each unit system must possess a domain directly proportional to the magnitude of its forces, and must bear a constant relationship to the universal equilibrium, the maintenance of which must furnish a resistance to the mutual encroachment of planetary systems.

The equilibrium of all matter in space must bear a certain analogy to the equilibrium of a given amount of gas in a partial vacuum. With the decrement of pressure the molecules divide and redivide until an equilibrated condition is attained, chemic affinity is overcome and the law seems to be: As the pressure decreases the molecules decrease in dimensions and increase in potentials, with increased fields of induction which fill the space. Up to the critical point the vacuum tube is occupied by force from the increased potentials of the dissociating molecules, whose fields of induction in the aggregate are commensurate with

the space. It is conceivable that if the solar systems were reduced in number within a given space the others would so adjust themselves that all space would be filled with force, the universal equilibrium being thus maintained as the equilibrium in a partial vacuum is maintained.

Astronomers describe a great luminous starry band encircling the solar system called the Galaxy or Milky Way. This band apparently is relatively immovable, while the solar system revolves on its axis within, and occupies part of the area enclosed by the band. It was Herschel's opinion that the plane of the Galaxy bears the same relation to the universe as the ecliptic plane to the solar system. The galactic plane cuts the ecliptic plane at an angle of about 60° .

The stars in the celestial vault, as seen through a telescope, are mostly condensed near the galactic belt, appear least numerous in the regions most distant from it, and more numerous the nearer the region is to it. With powerful telescopes a large majority of stars are actually observed in the Galaxy. The nebulae appear as irregular masses of luminous clouds, and appear to be most numerous where the stars are least numerous, or, the more distant the region from the Milky Way the greater the number of nebulae are observed.

If Herschel's idea is correct, there are two great cosmographical lines at right angles to each other: One drawn through the "galactic equator," and indicating, in general, the equatorial direction of the universe; and the other drawn through the "galactic poles" indicating, in general, the polar direction of the universe. It is conceivable that an infinite number of lines of infinite length drawn parallel to the equatorial line may pass through the equatorial planes of an infinite number of galaxies. The conception may be expressed thus: At whatever point of

space an observer may be placed, that point will be where the "equatorial plane" of a galaxy is cut by a line drawn through its "poles." The conception implies that the view we have of the starry universe is, in the main, the view presented independently of the location of the viewpoint.

A solar system must vary in appearances: (1) According to the phase of the cycle through which it is passing, and (2) according to whether the polar or equatorial aspect of the system is presented. The distance intervening, the dimensions of the system, and the medium through which its light is transmitted, must be modifying factors. Accepting our solar system as a cosmographical unit, and keeping in mind its equatorial and polar aspects, the question presents: Whether cosmographical units are thrown into space promiscuously, or are arranged in some general order? It is true that the ecliptic plane does not parallel the galactic plane as one might predict; but if we consider the form of solo-planetary spaces as being elliptical (probably slightly distorted by cosmic pressure), and that all space is occupied, not only by matter, but by solar systems, then it is evident that all unit systems cannot be arranged on exactly parallel lines; although, generally, their equatorial and polar planes may be uniformly disposed. Our system may be placed so as to fill a nook of the universe, and hence the necessity of its lines being oblique to the general direction. Moreover, if solar systems are endowed with the property of polarity then their tendency to arrange themselves in uniform direction is indisputable. Thus Herschel's great conception of the galactic plane being an indication of an universal order must be correct.

If we mentally picture the simple arrangement of solar systems being placed so that their lines in the main are

uniformly directed, we will see that when we point our telescopes in the general equatorial direction we are on the line of incidence of the equatorial blaze of innumerable suns, each a center of a solo-planetary space. The reflected light of their tributary planets, aurorae polares, or any other evidence of planetary systems, we have not, these being darkened by the relatively brighter light of their respective suns. Nor does it matter much, except as to the brilliancy of the particular star, in what stage of evolution the system is presented to us; only, if the solar dimensions have reached that critical point where electric energy is absent from the space, the space will show as a celestial dark spot. Probably the most brilliant evolutionary stage of a sun is when his dimensions are about equal to half of those of his maximum growth. At this period the maximum amount of energy is probably being absorbed at his poles, and such energy will regulate the intensities of his equatorial light. The qualifying term "equatorial" may be objected to, as apparently our sun gives out light from his whole surface, but it must be understood that the photosphere is a disperser of light; and that we mean to convey the idea that transformation of electric energy occurs in the central sun, and radiates as heat and light along his equatorial plane.

Now let us turn our telescopes towards the celestial north or celestial south. We are looking along the polar planes of the systems, and we have a side view of solo-planetary wheels. Mainly we are in the shadows of polar energies, although here and there the electric light from some great sun obliquely pierces the spaces. Furthermore, in viewing the polar aspect of the systems, we may be able to judge, from polar activities, what particular phase of its cycle a system is manifesting. If we could interpret the significance of the manifestations we might

know the relative dimensions of a sun to those of his planetary domain. It is, however, to be considered that the sun's mass from the polar aspect may show as a relatively dark spot, radiating energy being here absorbed, while the soft diffusive light may be the stream of electrified ions emanating from the various poles of his tributary planets. For instance, the nebula of Lyra presents a comparatively dark central area which may be a polar presentation of an immense sun; while the surrounding lighter area may be a polar view of his photosphere; his accompanying planets



FIG. 21. The Nebula of Lyra.

being outside the latter area, and emitting auroral lights from their poles. Lyra viewed from its equatorial aspect, or as placed in a galactic arch, may twinkle as an ordinary star. The nebula of Andromeda appears as an oblique presentation of a solo-planetary space during the cyclic epoch of chemical contraction, when matter exists in band form with intervening ether spaces. The Andromedal Sun evidently forms a central rod.

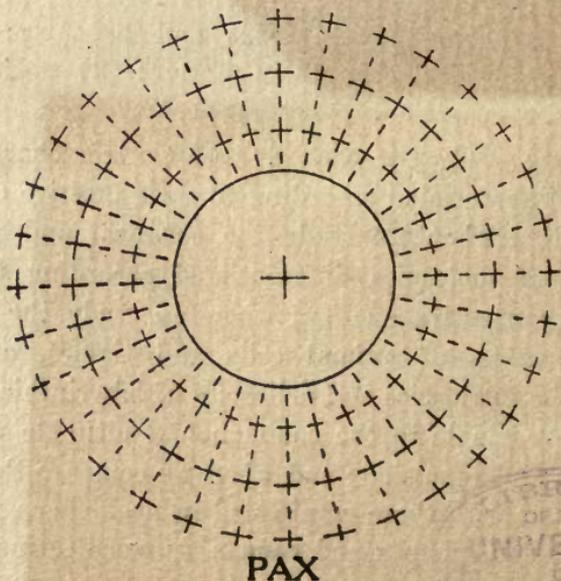
Could planetary systems revolve around a common center? No. An orbital revolution is caused by current forces, and an extraneous force sufficiently great to cause

a solar system to revolve round it, would interfere with intrinsic forces, and produce a relationship of the planets to the sun such as the moon's relation to the earth. The forces between planetary systems are radiating or static in character, and produce only static or polarized effects. There is no evidence that heat and light will directly produce rotary movements, although it is conceivable that they may possess a repulsive force, and thus be a cause of cosmic pressure. It is only when these forces are transformed into electric currents that rotation occurs. The transformation takes place through the presentation of differential or polarized potentials to the incident forces, and no such presentation is made by a solar system as a whole, although its individual parts possess the essential polarities. Heat or light passing from one solar system to another maintains its distinctive character as a displacement movement or wave motion, and can have only local effects at the points of incidence. In the broadest sense of the term, interstellar forces may be classified as follows: (1) Current forces (electric currents) producing rotation; radiating forces (heat and light) producing chemic and physical changes in matter; (3) static forces producing polarization.

When we study the character of electric charges and currents differentiated according to their positive or negative quality; when we study the chemical and physical character of molecules differentiated according to their positive or negative quality; when we study the physiologic properties of animal cells and tissues, exhibited through the intricacies and delicacies of labyrinthian structure, yet reducible to the common and ultimate units of attraction and repulsion; and when we compare these differentiations with those manifested in phenomena pertaining to the sun, planets and comets, as constituting a unit

system, we must conclude that, however complex may be the problems presented for solution, they must be solved through the formulation of a hypothesis basic to a grand generalization. The writer believes that the correctness of his conception of electric charges being composed of differential elementary units of matter is evidenced by the simple facts of natural phenomena, and that in this conception there is indicated a ground work upon which the physical structure of the universe is built; leaving, however, untouched the genetic problems of unit matter.

The Biblical Genesis might have been written thus: God made two fundamental units, and endowed one with the spirit of *attraction* and the other with the spirit of *repulsion*. He gave them relative placement, and directed one to circle to the right and the other to circle to the left; and behold, the units in their multiplicity filled all space. God made the units and the units did the rest. He views the work and pronounces it good. Glory to the Great Spirit who inspired the units.



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