



UNIVERSAL PRINCIPLES OF

SPACE AND MATTER

A Call for Conceptual Reorientation

Paramahansa Tewari

*UNIVERSAL Principles
Of Space and Matter*

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To
Bhagavan Shree Sathya Sai Baba
the One, the Motivator,
the Inspirer, the Incarnation

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Preface

I have always felt that any proposition of entirely new concepts in physical theories requires explicit expressions of the reasons, howsoever simple, that led to the framing of the hypothesis. This aspect, that needs partly biographical account, was omitted in my earlier works. However, I intend to briefly fulfill this task in this revised edition, mainly because, the principles proposed here require conceptual reorientation from the existing trend in the contemporary physics.

Half a century has elapsed since a lecturer gave a fascinating explanation of “inertia” in a classroom, during my Intermediate Science College days around mid fifties. He placed on a table a slip of paper, keeping it in position with a paperweight resting on it. Then, when he briskly pulled the paper slip out from the underneath of the paperweight, it hardly showed any noticeable movement. “A body at rest tends to remain so due to the principle of inertia”, he explained, attributing to Newton this discovery. It was also brought home to us (students) that even if the downward force of gravity was absent; then also, the paperweight shows its innate tendency to stay at rest. The other intriguing fact discussed was this: Assuming the absence of gravity force on a body, if it is displaced from its rest-position and, thereafter, the force causing the displacement is withdrawn, still the body will continue to move until some external force acts on it to change its course.

Can an *inert* matter (body) placed in a vacuum, when displaced from its rest position, develop reaction against the displacement from the medium of the vacuum surrounding it, considering the fact that the “absolute vacuum” has been supposed (Newton) to be “empty” and “inactive”¹? Also, if the body set in motion has not acquired additional “something” from some

¹ Later I came across Newton’s statement: “I call ‘vacuum’ every place in which a body moves without resistance”—Isaac Newton’s Principia, Alexandre Koyre & I. B. Cohen.

source at the time of its start, what is it that carries it forward on and on, even when the external force is removed? Could there be a “storing mechanism” that stores energy *within* the body at the time of its initial start, such that it carries the body forward despite the removal of the force that started it?

Another phenomenon, that appeared strange, taught to us was gravitation—the operation of the gravitational force of attraction between cosmic bodies, whose masses could be supposed to be located at their respective centers, through the intervening medium of “nothingness”. This principle (Newton) too defied clear understanding. These questions gripped my mind off and on, compelling me to brood over the mystery of inertia and gravitation, even during the period of college graduation in electrical engineering subjects.

During my long career in engineering profession extending for about four decades, almost all the time I was engaged constructing and executing large nuclear power projects. As a preparation for the nuclear technology, during the initial few years after graduation, I acquainted myself briefly through self study and training, with atomic physics, nuclear structure, and topics like, radioactivity, fission and fusion, brief outline of Planck’s and de Broglie’s works, photoelectric and Compton effects, wave-particle behavior of light etc. (Einstein’s special theory of relativity was casually learnt through popular books out of sheer interest). Of these interesting topics, the ones that seemed most thought provoking were the concept of an electron treated as “point-mass” and “point-charge”, and the annihilation of electron with positron. A “point”, geometrically, is supposed to be “dimensionless”, merely indicating the location. How was one then to conceive that the “mass” and “charge” of electron—well proven for their substantiality (reality, energy content) through the experimentally measured forces (fields) produced by them, could be located in a “dimensionless” region? Also, the dual behavior of light (wave-particle) appeared inconceivable, because the properties of a particle are poles apart from those of a wave; and if certain experiments do confirm the dual behavior of light, could it not be that the interpretations of these experiments are faulty, if the interaction of space (if at all it is substantial in a subtle way) is not taken into account?

While engaged in my profession, I pondered over these questions for almost a decade, time and again as a spare-time interest, despite frequent in-between interruptions for months together. And then, as if impelled by some forceful inner inspiration to dwell deeper into the basic nature of space, matter, and their inter relationship; within less than five years of intense thinking (1970-74), though still off and on, it dawned to me that the structure of electron, that might explain its basic properties of “mass” and “charge”, should be conceived by taking into account the “medium of space” (hereafter, referred as “space”) as well; by attributing space with “fluidity” and some such properties that explain the behavior of electron, observed experimentally. Thus, my concentration was focused thereafter more on speculating and deciphering the properties of space, most suited to explain structure of electron, and matter in general.

The concept that initially emerged in my mind soon became a comprehensive one; it developed bit by bit in steps, day by day. It describes creation of stable matter from the dynamic medium of space; explains mass, inertia, gravitation, light, and reveals a common factor in the presently known universal constants; analyzes motion and orbital stability of the cosmic bodies in the solar system, nuclear structure etc. And, despite the fact that the foundation of this new theory is more basic than the classical Newtonian mechanics, relativity and quantum physics; yet, in “fundamental” aspects, it turned out to be identical with some of the main principles of Rene Descartes—the great French Philosopher, as contained in his celebrated Vortex Theory. The conviction on the substantiality and validity of my own insight on the absolute nature of space was greatly strengthened when, after framing the postulates of the theory, I found more than a decade later, a close similarity with the works of Descartes, especially on his realization that mobile ether¹ fills the universal space; and not only propels the cosmic bodies along their courses, but also is the very “substance”² of all the cosmic matter in the universe.

The most recent finding (1998) from my works—the space vortex theory (abbreviated as SVT), is the quantitative determination of free-fall acceleration on the surfaces of the Earth, planets and the Sun; which has defied calculation so far from the principles of Newtonian mechanics or

¹ During my college studies, I was aware on the existence of ether for the transmission of light; but not as the substance of matter, as conceived by Descartes.

² The word “substance” has gone out of fashion with the advent of quantum physics; I consider it the most appropriate word to indicate the entity that constitutes the medium of space.

relativity theory. The orbital radii of the planets around the Sun have also been theoretically determined (2001) with a new equation (hitherto unknown

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in physics), dependent upon their “electrical charge”, “mass”, and “orbital velocity”. Through SVT, it has been possible to find mostly the “rights” in the unitary theory of Descartes and Faraday’s concept of fields; whereas, in addition to the “rights”, “wrongs” too have been pinpointed in classical mechanics, photon-nature of light, relativistic concept of time, and the very foundation of quantum physics. However, as brought out in detail later, but for Einstein’s concept that light has the limiting speed in the universe (1905), the process of creation of matter from space—most crucial aspect of SVT, would have been far more difficult to conceive.

This theory strengthens the existing foundations of classical mechanics, and points towards an alternative to quantum physics. The new basic equations, derived in SVT, would not have been possible, perhaps, prior to the knowledge of electron’s annihilation—a phenomenon detected only in the thirties of the 20th century after positron’s discovery. In this sense, the stage for framing a basic theory of matter that takes into account, primarily, the space dynamics and space interactions, as this theory does, was prepared only around the middle of the last century.

I am grateful to Dr. J. A. Wheeler, Center Director, university of Texas, Austin, for his valuable comments (1975-1984) on my earlier works specially those, pertaining to the initial papers and booklets, that enlightened me further; and encouraged me to dwell deeper to explore interrelationship between space and matter.

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November 2001

Introduction

By the close of the 20th century, despite immense advancement of knowledge in all the branches of science, the mystery shrouding the *nature* of space and the *fundamental* particle of matter, particularly their *interrelationship*, if any, still persists. The 19th century concepts of *absolute space*, *absolute time* and *absolute simultaneousness* have undergone major modifications in the 20th century's relativity theory and quantum-physics, so much so, that there is a recurrent doubt on the truth of some of the physical knowledge on space and matter so far gained through classical science and philosophy. Our understanding of the universe would have been far better, had *intelligible* explanations of the key-stones of classical physics—the phenomena of “inertia” and “mass”—introduced¹ (Descartes, Newton) in the 17th century, would have come forth. The mass-energy equation (Einstein), early in the 20th century, provided a quantitative relationship between mass and energy, but the *origin* of mass as well as the nature of the *fundamental* state of energy that appear in this equation, continue to remain obscure.

Descartes conceived¹ the principle of inertia with his postulate on the eternal existence of a *property-less* fluid as a universal dynamic substratum (ether, space), in which, vortices of the *same fluid* evolved as matter, and moved either relative to the fluid substratum, or were carried with its flow. A simple mechanical explanation for inertia (continuing rectilinear motion of

¹Descartes' concept of inertia; Newton's use of mass in his laws of motion; Isaac Newton's Principia-Alexandre Koyre & L. Bernard Cohen.

moving bodies), clear and unambiguous, though qualitative, could be had from Descartes' concepts on the nature of space and matter, and their *interdependence* structurally. The Cartesian philosophy, acclaimed for doing away with *action at a distance* for the then known gravitational and magnetic forces, explained phenomena through *physical contacts*, and was dominant for over a century after Newton's Principia. Later on, however, acceptance came again to the weird principle of "action at a distance" operative mysteriously in the supposed *void ness* of space, while the property of inertia was attributed to some "innate" property in atoms. These strange ideas (for which Newton was then heavily criticized) became the corner stones for the conceptual foundation of Newtonian mechanics, and continue today for very complex reasons created (as I conclude through this as well as my earlier works¹) due to (a) the acceptance of *void ness* in space; (b) *solidity* of material particles; and (c) serious *misconceptions* on the fundamental nature of light—the latter formed the very foundations of the special theory of relativity and quantum physics.

It may appear surprising if I raise the age-old question: "what is the basic entity (substance)² of which the universe is composed?" But has this question not remained unanswered in a straightforward way except, of course, partly and qualitatively by Descartes through his Vortex Theory in the 17th century? The ancients too had pondered over this question. The Upanishads pinpoint aakaash (space medium, absolute vacuum) as the *first entity* from which matter in the forms of air, fire, water, and earth are produced. Confining here to the scientific aspects alone (excluding the attribute of consciousness), *the universal space as per the Upanishads can be logically interpreted to be a dynamic fluid with no material properties*. While some of the Greek philosophers (Anaxagoras, Aristotle and others) too conceived space to possess certain substantial reality, the conception of Descartes was most scientific and clearly enunciated.

Quite opposed to the above concepts that posited *substantiality* (energy content, reality) to space, Leucippus and Democritus conceived a universe of "atoms and void". According to them the reality existed solely in

¹The Physical Universe (1974); The Substantial Space and Void nature of Elementary Material Particles (1977); Space Vortices of Energy and Matter (1978); The Origin of Electron's Mass, Charge, Gravitational and Electromagnetic Field from the Empty Space (1982); Space is the Absolute Reality (1982), Proceedings of ICSTA, International Publishers, East-West, Niederschocklstr, 62, 8044 Graz, Austria; Beyond Matter (1984); Beyond Matter -A Comprehensive Theory of the Material Universe (1995), Editor: Wolfram Bahmann, Feyermuhler Str. 12, D-53894 Mechernich; Physics of Space Power Generation (1996).

² The entity that constitutes space; and in dynamic states is cosmic energy and matter.

matter, and not in the medium of space. The Newtonian space, simply expressed, is the same as the void-space of Democritus. (Newton is not

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unambiguous in his definition of space. However, on the role of space in the creation of matter, and its mobility, his following statement¹ is clear. “Absolute space, in its own nature, without relation to anything external, remains always similar and immovable”. Also, Newtonian mechanics does not take into account interaction of matter with the space-medium; and hence is unlike Cartesian philosophy, which postulates space to be substantial, creative and dynamic).

Despite the opposition from the Newton’s philosophy, the general acceptance of ether’s existence in space, at least as a carrier for the light-wave, which shows properties of diffraction and interference, continued. Faraday’s concepts of the existence of real and continuous fields in electric and magnetic phenomena strengthened belief in the reality of ether as the very medium of space. In the later half of the 19th century, models² of ether—vortex atoms, molecular vortices, electron vortex, were being developed by some great minds of the time (Maxwell, Helmholtz, Rankine, MacCullagh, Lord Kelvin, C.A.Bjerknes, Sir Oliver Lodge, Larmor and others) in bold attempts to unify space, matter and its fields and forces, into a single reality of dynamic space. However, around the end of the 19th century, briefly speaking, two main formidable difficulties seem to have arisen in the further development of the ether theories. Firstly, ether has to transmit light, which has an extremely high speed unknown in material media. And, if light is considered similar to a mechanical disturbance in material medium, then for ether, the quantity: $(\text{elasticity} / \text{density})^{1/2}$, which is proportional to the speed of the disturbance, must have a very high value. Even assuming a low density for the ether, its elasticity in the above relationship will equal that of steel, if it has to transmit light at its enormous speed. Low density and high elasticity for the same substance are contradictory properties. Thus, there came a dead end on the postulation of the properties of the ether; and this seems to have happened because it was all along, after the overthrow of the Cartesian philosophy and the start of Newtonian mechanics, *presupposed* by most natural philosophers that

¹ The Changeless Order, The Physics of Space, Time and Motion, Arnold Koslow.

² A History of the theories of Aether and Electricity; Sir Edmund Whittaker F. R. S.

ether's properties must necessarily be similar to a material medium. The second problem was connected with the stability of the ether vortices: the stream lines in a ether-vortex may dilate outwards, thereby, leading to the

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dissipation of the vortex motion. Therefore, a vortex structure for electron was concluded to be unstable.

While the above difficulties, related with the development of a vortex-structure of matter, were yet to be addressed, the special theory of relativity (STR) propounded by Einstein (1905) did not take into account any substantiality of space and, thereby, negated the very existence of ether, though this theory was not, basically, framed to investigate the creational aspect and the structure of matter. Further, in Einstein's own words (1950)¹: "Since the field exists even in vacuum, should one conceive of the field as a state of a "carrier", or should it rather be endowed with an independent existence not reducible to any thing else? In other words is there an "ether" which carries the field; Because one can not dispense with the field concept, it is preferable not to introduce in addition a carrier with *hypothetical* properties". (The trend of branding *nonmaterial*² properties (assigned to ether) as *hypothetical* continuing even today, is the result of the overpowering influence of materialism that has in past hindered seriously framing of a basic theory on the creation of matter from the medium of space. Evidently, Descartes' postulate of *property less* ether has been taken lightly in the post relativity era and, sometimes, commented upon even derisively by some authors of popular literature.)

May be, ether has no properties akin to matter and, hence, unlike matter, it is not detected through experiments and also not directly experienced through the senses. In that case, attributing it with *nonmaterial* properties should not be taken as hypothetical, as long as the known basic-properties of matter, so far remaining unexplained with regard to their origin, can be deduced from the *nonmaterial* properties assigned to the ether. For, unless the origin of the *most* fundamental properties of "mass", "inertia" and "electric charge", that matter possesses and our senses perceive, is discovered; and the processes through which these properties got associated with matter are clearly and logically explained, and shown unambiguously

¹ On the Generalized Theory of Gravitation—A. Einstein; Scientific American, April 1950, Volume 188, No. 4 pp 13-17.

² Properties that are different from the known properties of matter.

that space (ether) has no part to play in these explanations; then alone ether can be termed *superfluous*. And on the argument that ether's existence cannot be experimentally detected: *What if the concrete proof of the ether's existence lies in the very fact that the bodies exhibit the properties of mass,*

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momentum, kinetic energy and charge? Since the existence of ether has not been detected experimentally, our task is to frame theories that construct matter from the ether as a substance, and energy fields produced by it due to its dynamics; such that the matter so constructed conforms to the experimentally observed material properties. And, thereby, infer the properties of space from the postulates that enabled the formulation of the above theory.

Right at the fundamental level of classical as well as modern physics, there are several unanswered questions and unexplained phenomena. For instance, how is the origin of the universal energy and matter explained? What relationship matter has with space in regard to its *structure*? Is it indeed independent of space with regard to its energy content, as Democritus had conceived? Can the medium of space not be a *mass less* entity, and still capable of interaction with matter? What mechanism works behind the gravitational attraction, and how is the very origin of gravitation explained? And above all how does one define the most *fundamental form* of energy without making use of the *mass* and *charge* properties of matter, which could as well be not the primary properties? These are only the few of the many vital questions that have not been answered explicitly through the existing theories and, therefore, to look for the alternative concepts and undiscovered laws, even if it comes to a major revision of the modern physical conceptions on the nature of space and matter as provided by the classical, relativistic and quantum theories, is justified scientifically and philosophically. This is the most crucial step for further progress in attaining physical knowledge of the universe in the right direction to get over the impasse briefly mentioned above.

In the following pages, the cosmic principles governing the laws of the universe are postulated. The process of creation of mass, electric charge, gravitation and their associated fields and effects from the postulated nonmaterial medium of space and its dynamics (vortices) are described; the most basic state of cosmic energy is defined and the fundamental particle of matter is identified; the universal constants are derived; the structural interrelationship between the space and matter revealed; an inward force on

nuclei of atoms responsible for their stability against internal repulsive forces discovered; orbital stability of the planets in the solar system by detecting additional electrical repulsive forces between the Sun and the planets explained; and the orbital distances of the planets theoretically determined.

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From the insight gained through the SVT into the structure of matter and its complete dependence on the medium of space; and the conclusions borne out from the new concepts aided with the discovery of additional fundamental laws in micro as well as macro cosmic systems; conceptual as well as mathematical errors in some vital areas of contemporary physics have been noticed. Some of the phenomena misinterpreted currently are: nuclear structure, basic nature of light, gravity, creation of universal matter, orbital stability of cosmic bodies, concept of time etc. This work is intended to convey to free thinkers, scientific philosophers, researchers and seekers of scientific truth, that major portion of the modern quantum physics needs to be recast; some aspect of special relativity, that revised the traditional concept of time, also requires omission (because it is shown that the very nature of light is such that its velocity is invariant in respect to all inertial systems without resorting to time dilation); Newton's celestial mechanics and equation on gravitational attraction require modifications; and revival of the Cartesian space of substantiality is the urgent need of the hour.

The theory describes the construction of the universe of the cosmic space and matter with a single substance, a single field, a single fundamental particle, and a single universal constant.

Cosmic Principles

1.0 Postulating a Non-material space

Recording here of the sequential inflow of thoughts may be useful to the critics and researchers, because I have often felt that the considerations that lead to the creation of new theories, howsoever naive or involved, if clearly spelt out by their authors, would enable faster scrutiny for the correctness or otherwise of the new principles involved.

Through the following simple chain of reasoning, some of them even trivial, I had arrived some three decades ago at the cosmic principles that regulate the working of the universe of space and matter.

For quite a few years, the physical picture of circular magnetic field lines existent in space around a current-carrying conductor haunted me as I thought deeply on their positive action in creating attractive and repulsive forces in space, depending upon the directions of the currents in the presence of more than one conductor. The directional aspect of the magnetic field lines made me believe that the electrons constituting the current in the conductor, that produce these fields, might have some rotational feature, such that, through the continuity of space, they transmit their own rotation, exhibiting the same as circular field lines. However, there was no further insight on the structure of electron and its relationship with space gained through this line of thinking, though, I got some intuitive feeling that space might be a fluid medium, and may have a substantial reality; that is, directly or indirectly it is connected with energy.

Next in my enquiry came the phenomenon of gravitation. Can the gravitational acceleration (free-fall acceleration) on the earth's surface be not explained due to radial pressure from space (absolute vacuum), supposing that 'space' is a fluid entity? Pressure on the Earth can be created

similar to 'hydrostatic pressure', provided, space is postulated as a fluid with certain 'density', howsoever small it may be. If, however, we assign the property of density (which signifies 'mass') to space as its basic property in order to explain the assumed gravitational pressure on the Earth, how would the "origin" of mass itself in space be explained?

The universe, as we know, is broadly divided into two major entities—space and matter. The basic properties of material media have been identified as: mass, discreteness, compressibility, viscosity etc. As stated above, the properties of matter, if assigned to space, will lead to a serious difficulty, in the sense, that the explanation on the very origin of these properties in space, shall have to be found; and, in the absence of any sound explanation, eternal existence of universal matter together with all of its associated properties will need to be postulated. The universe will have to begin with the whole of its matter, inherent with each of its properties. Mere explanation that matter came from energy will not be tenable, unless the *fundamental* nature of energy is defined, and the process of creation of matter from this energy is distinctly explained. In contrast to the above philosophy, I thought, space can be assigned with *non-material* properties, provided the properties of matter can be derived as specific "states" or "conditions" of space. These states could be "motion", "rotation" (circulation), "acceleration", etc., of the fluid-space. This approach may lead to the possibility of creation of cosmic matter from the non-material and, yet, substantial medium of space; where "*non-material*" signifies an *incompressible, zero-mass, non-viscous, continuous, and mobile (fluid) substratum*. With the above basic considerations, briefly stated, the following first universal principle was arrived at.

Cosmic Principle 1

The space of the universe is an eternally existent, nonmaterial, continuous, isotropic, and fluid substratum.

1.1 On fluidity of space

All material fluids including air, water, have limits to the speed at which they can have steady flow; beyond this speed, their flow becomes turbulent and breaks down. It is known that sound effect is produced with

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alternate pressurized / depressurized zones created in the medium of air forming a wave, transmitting at the speed of sound. Basically, the production of the sound wave starts with the process of movement of the molecules, that is, oscillation of successive small elements of air-molecules about their mean positions as the wave passes through. If a sound source moves at supersonic speed, a limit to the speed involved with the oscillatory displacement of the molecules can be expected. This creates a 'shock wave' moving at speed higher than sound. From above it can be inferred that the maximum speed of the air molecules in steady flow (relative to space¹) is limited to the speed of sound in the air. In other words, the actual steady flow of air molecules does not exceed the speed of the transmission of pressurized / depressurized zones, or the sound-effect in the air.

In general, the limit to the steady flow of fluids is, evidently, due to the discreteness, inter atomic / molecular forces, and inertial property of matter. The steady flow of water too, beyond a certain speed, breaks down into turbulent flow creating vortices in the regions of high velocity gradients. (Fig-1 shows that in fluids, shear stress is directly proportional to velocity gradient; it provides a clue, that, if the flow of space has to break down, it will require maximum possible velocity gradient). The space, postulated as a *non-material* fluid, mass-less and continuous, could have been postulated to flow at infinite speed, but for its already known property of transmitting light in (and relative to) absolute vacuum at speed of 3×10^{10} cm/s, which, though enormous, is yet finite. To some extent similar to the observed limits on speed of displacement of air molecules at supersonic transmission, and also the speed-limit on the flow of water and other fluids that nature imposes; one can speculate that the flow of the *fluid space* too has a limit, such that it breaks down if it just exceeds the speed of light (c) in the absolute vacuum.

The additional argument calling for a limit to the flow of space is as follows. Prior to relativity theory, there was no argument against a simple statement such as: 'if the velocity of light relative to the absolute vacuum is

¹ "Space" signifies, henceforth, non material fluid.

c, an observer moving towards a light source at velocity v , will find an apparent (relative) velocity of light as $c+v$. This, however, as per Einstein's special theory of relativity (STR), is not true. The observer, moving towards the source, will still measure the velocity of light as c , quite independent of

his own speed and direction, that is, either towards or away from the source. The speed of light c becomes the "limiting" speed of material bodies in the universe as per STR. Encouraged by Einstein's insight on the speed-limit on the motion of matter despite the well known apparent contradiction in the two postulates of STR; and forced by a self imposed necessity of retaining only *one substantial entity* (fluid space) as the reality of the universe which, when in motion, could generate energy, and create matter in the condition of its breakdown; I adopted in the following postulate, the limiting speed c as the maximum possible speed for the flow of the fluid space itself.

Cosmic Principle 2

The space has a limiting speed of flow equal to the speed of light relative the absolute vacuum; and a limiting angular velocity, when in a state of circulating motion.

By postulating a speed-limit to the fluid space, a process or mechanism for the creation of universal matter from the absolute vacuum was discovered; which otherwise would not have been possible but for Einstein's independent conclusion at the start of the 20th century on the limit to the material motion.

1.2 On Universal Motion

Axial rotation of the planets and their orbital motion around the sun are the known facts since centuries. Motion of the stars and galaxies, at unimaginably high speeds, have also come to light. High frequency oscillation / vibration of atomic particles is another example of motion associated with the micro matter. The other aspect of universal motion, most significant, is its regulation and orderliness. The planets describe elliptical orbits around the sun, and the same pattern of motion is seen in the planet-satellite system. The deepest insight in the existence of natural motion that

contemporary physics has is up to the motion of the orbital electrons in atoms (Rutherford), neglecting for the present its interpretation based on quantum physics. *That there could be actual rotational motion, in the very structure of electron, of the entity that constitutes it, is not yet known.* To trace the fundamental source of universal motion, following alternatives

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present themselves: Postulate on the eternal existence of universal matter (atomic state) in a state of motion in empty space, letting the origin of energy (and its basic nature), that constitutes this matter, remain unexplained. The other alternative is: Postulate on the eternal existence of *substantial* space inherent with motion, that may reveal the origin and nature of cosmic energy, creation of matter and its basic properties, controlled motion of cosmic bodies, and annihilation of matter back to spatial energy. The choice of the second alternative is obvious, because of its all-encompassing nature. Accordingly, the following postulate was made:

Cosmic Principle 3

The universal space is eternally inherent with motion.

1.3 Implications of the Postulates

In STR, as per the article “On the Electrodynamics of Moving Bodies, 1905” Einstein writes: “The introduction of a “luminiferous ether” will prove to be superfluous in as much as the view here to be developed will not require an “absolutely stationary space” provided with special properties, nor assign a velocity-vector to a point of the empty space in which electromagnetic processes take place”. Evidently, Einstein is postulating transmission of light in the medium of space devoid of ether and, hence, he terms it as “empty space”. Further, by not assigning any velocity-vector to any point in the empty space, the medium of space in STR becomes, in a true sense, a void¹-extension. And, in this void ness of the universal space, it is *presupposed* in STR, that matter and the phenomenon of light can still exist. However, the three postulates of my own work (space vortex theory) that assign the medium of space with the most basic properties and inherent motion, define space as the primary substratum of the fundamental reality, existent eternally even in the absence of matter and fields. In brief, the

¹ “Void” is defined here to be that region which has neither matter nor energy fields.

concept of space in STR is diametrically opposed to the postulates of SVT. However, as stated earlier, the limiting speed of material motion in STR is postulated here at the *most fundamental* level as the limiting speed of flow of the fluid-space itself.

Discovery of Charge and Mass Equations

2.0 *Creation and stability of void in space*

The creation of fundamental matter involves breakdown of space in circulating motion. Fig.2-1 shows a circular irrotational vortex of space with concentric streamlines. The circulation has a steady flow so that the velocity and acceleration fields in the vortex do not change with time. If this vortex pertained to a fluid that possessed a constant density, ρ , the element of fluid of cross sectional area dA , and volume, $dA dr$, will have mass, $\rho dA dr$. The two opposite accelerations that balance on this element are: outward acceleration due to circulation of the fluid, and the inward net pressure force divided by the mass.

$$\text{Force / mass} = dp dA / \rho dA dr = u^2 / r. \quad (2.1)$$

In an irrotational vortex, it can be shown that the velocity of a space point at a distance r from the center is given by

$$ur = \text{constant}. \quad (2.2)$$

In this vortex, since the fluid-space is mass less, ρ is zero. Hence, on the element considered, there is neither an outward force proportional to its mass and acceleration, nor a pressure-differential proportional to the force acting inward due to mass. Thus in the vortex of the mass-less space outward radial acceleration field due to circulation is not opposed by any inward acceleration field. Considering a circular streamline of radius r , the

outward radial acceleration, u^2 / r , acting simultaneously on diametrically opposite points, creates a “tearing action” tending to split open the fluid medium¹ of space.

Suppose that the velocity gradient at the center of the vortex reaches the limiting angular rotation (ω) of space points at radius r_e , such that

$$\omega = c / r_e \quad (2.3)$$

where c is the speed of light in absolute vacuum. This will create a *spherical void* –a *space less, field less* and, hence, *energy less* zone –at the vortex center. The reason for the void to be spherical is as follows.

Refer to Fig.2-2, showing the cross section of the spherical void by the plane Z-Y. The circle C rotates around the Y-axis tracing a sphere. The point P_z , at intersection of C and Z-axis, will have a tangential velocity c (down the paper), at which the flow of space breaks down. The radius r_e of C, from (2.3), is determined by the ratio c/ω . Consider a point P at the circle which will have tangential velocity $\omega r_e \sin\theta$, down the paper, provided this point too has the same angular velocity ω as the point P_z . The velocity gradient at P_z is c/r_e which is also the velocity gradient at P, that is, $\omega r_e \sin \theta / r_e \sin \theta$, or, ω . Thus, though the tangential velocity of space varies from zero at P_y to maximum at P_z , the velocity gradient for all in-between points remains constant at ω (Principle 2). Under these considerations the geometry of the void created at the vortex center, due to the breakdown of space, is concluded to be spherical. The aspect of stability of the void is discussed below.

The creation of the void reverses the direction of the out ward acceleration field² that created the void, because, the sphere of the void (without any energy within it) relative to the circulating space around it, is at negative potential. The acceleration field is shown inward in Fig. 2-3, which is another diametrical cross section of the spherical void.

As described above, the radius of the void, r_e , is determined by the postulate of constancy of the limiting angular velocity, ω , and the limiting linear velocity of space points, c , as per Eq.2.3. With this relationship it is seen that ω is also the limiting *velocity gradient*, c / r_e , just prior to the creation of the void (point P_z , Fig.2-2). At each point of the spherical interface, common between the void and space (hereafter referred as

¹The use of the term “medium” for space is justified considering the properties of non material fluid assigned to space.

² Acceleration of fluid space at a point is termed acceleration field.

‘interface’), angular velocity of rotation about the axis Y-Y' has the same limiting value ω and limiting velocity gradient (Fig.2-2), whereas, as stated earlier, the limiting velocity of space, c , is only in the diametrical plane at right angles to the axis of rotation, tangential at each point of the circle at the interface cut by the plane at right angles to Y-Z plane. The circulation velocity of space, varying from zero at point P_y at the axis of rotation to c on the interface-circle mentioned above in the diametrical plane, produces maximum radial and inward acceleration, c^2 / r_e , on each point of this circle; and of lesser magnitude on other points. The interface, though constituted of spinning fluid-space, on account of the constancy of ω on each of its points, rotates similar to a surface of a rigid spherical shell of negligible wall thickness.

The stability of the void is due to the following two factors: Considering the section of the interface with the diametrical plane (Fig.2-3), where the velocity gradient (ω) is c / r_e , if the void shrinks to smaller radius, the value of ω increases; which is not possible as per the Principle 2; the void thus enlarges back to the original size. In case the void tends to grow to larger size, the *inward* acceleration field c^2 / r_e opposes this increase; also, any increase in r_e decreases the velocity gradient ω to lesser magnitude, which is no more sufficient to sustain the void. The sphere of the void is thus reduced to its original size. The other factor is the property of non-viscosity of space, which maintains the space-vortex eternally, except for its annihilation on meeting a similar vortex, with oppositely oriented velocity field (discussed later). Further, the energy-less void being a region of negative potential, the acceleration field, c^2 / r_e , on the interface has inward direction and, therefore, prevents dilation of streamlines, thereby, preventing dissipation of space-circulation away from the interface. Thus, the void is seen to be dynamically stable—its volume being regulated due to the constancy of ω and, consequently, the constancy of c and r_e , dictated by the absolute¹ properties of the medium of space.

2.2 *Fundamental Particle of matter*

It is inconceivable that the universe will have more than one entity as its *most basic* reality; that is, it will be absurd to imagine that the universe has different kinds of “spaces” or many structures for the *fundamental* matter with varying basic properties. Hence, it was postulated that the most

¹ Properties of space, being non-material in nature, are defined to be absolute; unaffected by various conditions of temperature and pressure as applicable to material media.

basic property of the universal medium of space is expressed by the single universal constant ω that limits its angular rotation and leads to the creation of a fundamental stable vortex. While the void of a *definite volume* is enclosed within the space-vortex, the vortex itself extends throughout the whole universal-space through its *velocity field*¹. *This space-vortex structure with the fixed volume of dynamically stable void at its center is defined as the fundamental particle of matter.* It is seen that the fundamental particle is spread throughout the universe as a real entity (in terms of energy content) except for an ultra-small² central zone of void-ness or non-reality. The properties of “electric charge” “mass”, and “inertia” of the fundamental particle, and the “energy fields” associated with its structure are derived in the following pages.

Fig.2-4 shows, generally, different conditions (states) of space, with and without fields and matter. The medium of space, of which we have the experience, is constituted of particles of matter, fields and energy, as shown diagrammatically in Fig.2-4c. Fig.2-4b shows a volume of dynamic space with velocity fields but without particles of matter. In Fig.2-4a, the non-material space in static state without matter, fields, and energy is represented.

2.3 *Generation of fields*

The space in circulation at speed c within the volume of the spherical void prior to its creation is, qualitatively, the basic state of energy³. At the instant of creation of the void, this energy is pushed out from within the void, and distributed in the continuous space as continuously varying gravity and electrostatic field. The fields, so created, form the structure of the fundamental particle, which thus becomes integral with the whole universal space. On account of the property of non-viscosity of space, the void enclosed within the dynamically stable interface at the center of the vortex, and the above fields, remain eternally existent without any loss of their strength. These energy fields terminate at the interface; and are discontinuous within the void. A rough representation of the same is shown in Fig. 2-6a. The fundamental particle has been shown below to be the electron; that there exists a discontinuity of the fields at electron center is, hitherto, an unrecognized fact in the contemporary physics (Fig. 2-6b).

¹ The motion of space leads to generation of “velocity field”.

² The radius of the spherical void is derived further.

³ Quantitative definition of energy is given further.

2.4 Unit Electric Charge

The electric charge is the effect of space-circulation (vacuum circulation in contemporary terminology) produced on the interface of the fundamental particle of matter. It is derived as follows:

Refer Fig. 2-2. Consider an elemental surface on the interface, which has an area, $dA = 2\pi r_e \sin\theta r_e d\theta$. The tangential velocity of space at each point of the elemental surface is, $\omega r_e \sin\theta$. The electric charge on the elemental surface is defined as the surface-integral of the tangential velocity of space on each point of the surface:

$$dq = 2\pi r_e \sin\theta r_e d\theta (\omega r_e \sin\theta) = 2\pi c r_e^2 \sin^2\theta d\theta.$$

From (2.3), $c = \omega r_e$. Integrating for the total electric charge, q_e , on the interface,

$$q_e = \int_0^\pi 2\pi c r_e^2 \sin^2\theta d\theta = (\pi / 4) 4\pi r_e^2 c. \quad (2.4)$$

The surface integral of the tangential space velocity on the interface is defined as the unit of electrical charge of the fundamental particle of matter.

The dimensions of charge are: L^3 / T . In CGSE system of units,

$$(\text{cm})^3 / \text{s} = \text{CGSE unit}. \quad (2.5)$$

Substituting the experimentally determined value of the charge of electron, which is a stable particle with unit charge (4.8×10^{-10} CGSE) in (2.4), and using the relationship in (2.5), the void radius is calculated as: $r_e = 4 \times 10^{-11}$ cm. A comparison with the magnitude of the classical electron radius, which in modern text books is taken as: 2.82×10^{-13} cm, showed that r_e should be about 142 times larger. However, the following reference¹ supported the results obtained from Eq.2.4. "There are several lengths that might aspire to be characteristic of the dimensions of the electron. If we proceed from modern theoretical electrodynamics, which has been established better than any other field theory, the conclusion seems to be that the electron has enormous dimensions, not 10^{-13} cm, as expected from

¹ Philosophical Problems of Elementary Particle Physics; George Yankovsky; Progress Publishers, Moscow, 1968.

classical physics, but 10^{-11} cm (a hundred times greater!)”. This value of the radius of electron (10^{-11} cm), and its close ness with the radius of the spherical void derived above from Eq.2.4, suggested that the “fundamental particle of matter” described earlier is itself the electron—already discovered by the close of the 19th century. The discovery of positron (1932) in the 20th century is, in fact, a rediscovery of electron itself; because, relative to the electron, an oppositely rotating similar vortex is defined here as a positron. An electron moving away from an observer (electron axis coinciding with the line of motion) is seen as a positron by another observer to whom this electron is approaching. Fig.2-5 shows, qualitatively, attractive and repulsive forces between these particles through the interaction of their velocity fields; while quantitative relationships follow further. In (a) of Fig.2-5, the velocity-field in between the particles is increased. From (2.2), increase in u results in the proportionate decrease of r ; and hence the particles are brought closer with an attractive force between them. In (b) of Fig.2-5, due to decrease of the velocity field in between the particles, r has to increase proportionately and this causes a repulsive force between similar particles.

Questions have been raised in recent time by some knowledgeable scientists; as to why an electron, being a unit of charge, does not explode due to repulsive forces within its own parts. Here is an example of a serious “conceptual hindrance”, which means that due to inappropriate knowledge on the structure of an entity inquires that are not relevant can obviously arise, and consequently incorrect conclusions can be drawn. Since electron is considered presently to be a “point-charge”, in which some kind of charge is distributed in its structure up to its center; and, since, similar charges must repel each other, hence the electron must explode! The reason for the stability of the electron, however, is due to the fact that, firstly, the electron is not a point-charge; secondly, the central-void in the electron’s vortex structure does not contain any charge inside; also the inward acceleration field of the highest possible strength on the interface of the electron leads to its eternal stability as discussed above, except during the phenomenon of annihilation (discussed later). Further, any speculation on fractional charge, which can be stable, is not possible, because the central void of electron with smaller radius cannot be stable; moreover, there cannot be fractions to the spherical interface of the electron.

The distribution of charge on the interface has axial symmetry (Fig.2-2)—not spherically symmetrical charge distribution, as conventionally supposed.

Eq.2.4, is, hereafter, referred as *charge equation*.

2.5 Fundamental Mass

The property of mass in fundamental matter (hereafter, referred as electron) arises due to the breakdown of space-circulation at the center of the electron, and consequent creation of a dynamically stable spherical void and the associated gravitational as well as electrostatic field in space. The derivation of mass of electron from the vortex structure is as follows.

Refer Fig.2.2. Consider an element of void-volume, dV , within the spherical interface.

$$dV = (\pi r_e^2 \sin^2 \theta) r_e d\theta = \pi r_e^3 \sin^2 \theta d\theta.$$

The tangential velocity of space acting at the interface of this element is, $\omega r_e \sin \theta$. The physical process of creation of mass, dm , of this element is imagined due to volume, dV , of fluid space being pushed out, at the time of void creation, at the above speed, $\omega r_e \sin \theta$, tangentially through the interface. The mass of the elemental void-volume is defined as

$$dm = dV (\omega r_e \sin \theta) = dV (c \sin \theta).$$

Integrating for the total mass of the void

$$\int_0^{\pi} (\pi r_e^3 \sin^2 \theta d\theta) \omega r_e \sin \theta = (4 \pi / 3) r_e^3 c.$$

$$m_e = (4\pi / 3) r_e^3 c, \quad (2.6)$$

m_e , being the mass of electron.

$$\text{Fundamental mass} = \text{Fundamental void volume} \times c \quad (2.7)$$

The volume-integral of space-circulation velocity within the void, at the instant of its creation, is the mass of the fundamental unit of matter (electron).

The Eq.2.6 will be referred as “mass equation”. Here, difference between rest mass and relativistic mass is not made as explained below.

It was earlier shown that the void at electron center is dynamically stable with radius r_e and space circulation c . This leads to the creation of only one size of stable void. Therefore, all the particles of matter, nuclei and atoms, will have their masses in *exact multiple* of electron mass. The mass of electron, during motion relative to space, will remain constant up to the speed c , because the fluid space ahead of a moving electron can be displaced only up to a maximum speed c ; and thus the volume of the void remains constant; therefore, the mass of electron, which is proportional to the volume

of the void (2.7), also remains constant. The relativistic increase in mass at speed of electron closer to light speed, as experimentally observed, is due to reaction from the fluid space due to production of additional acceleration field (discussed in later chapter).

The structure of electron shows that it is neither a point-charge, nor a point –mass; there is also no energy of extremely high density at electron center, as believed today. Instead, the structural energy is distributed in the medium of space starting from the interface. These conclusions are against the prevailing concepts of classical, relativistic and quantum physics, as far as the location of mass or energy at electron center is concerned.

The proportionality of mass on the limiting velocity field (c) and also on the volume of the central void (2.6) shows that *mass is not energy*, which is an erroneous modern concept. “*Mass is proportional to energy*” is a more accurate statement. Also, *the mass of a body is directly proportional to the total volume of the independently existing sub-micro voids in the composition¹ of the body.*

As against the above structure of electron, if the medium of space is postulated to have the property of density (mass/volume), howsoever small, and the mass of electron is supposed to exist at its center as a dense compaction of the mass of space; then, the mass-equation derived above will remain undetected and the mystery of mass shall not be revealed.

2.6 Dimensions and units of mass

The dimensions of mass from Eq.2.6 are: L^4/T . In CGS system of units, the unit of mass is, cm^4 / s . With the use of experimentally determined mass of electron, the computed mass of a molecule of water, and the known numbers of molecules in one cm^3 of water; relationship between “ cm^4 / s ” and “gram” is approximately determined below:

From charge equation (2.4), the electron radius is

$$r_e = (q_e / \pi^2 c)^{1/2} . \quad (2.8)$$

The electron charge is experimentally determined as 4.8×10^{-10} CGSE. Expressing ‘CGSE’ as ‘ cm^3 / s ’ from (2.5), $q_e = 4.8 \times 10^{-10} cm^3 / s$, and substituting this value of electron charge and the value of c in (2.8)

$$r_e = (4.8 \times 10^{-10} cm^3 / s)^{1/2} / (\pi^2 3 \times 10^{10} cm / s)^{1/2} = 4 \times 10^{-11} cm. \quad (2.9)$$

¹ Discussed further while analyzing the structure of particles/atoms.

With the above radius of the void, its volume is: $V_e = (4\pi / 3) (4 \times 10^{-11} \text{ cm})^3 = 2.67 \times 10^{-31} \text{ cm}^3$. The mass of electron, experimentally determined, is $9.11 \times 10^{-28} \text{ g}$. Though, the concept of density in its structure is not applicable because of the central void, the ratio of electron mass and the volume of its void will be indicative of the proportionality of the quantity of mass with the “unit volume” of void. From above, this ratio, m_e / V_e , is: $9.11 \times 10^{-28} \text{ g} / 2.67 \times 10^{-31} \text{ cm}^3 = 3.42 \times 10^3 \text{ g} / \text{cm}^3$.

One molecule of water is about $2.88 \times 10^{-23} \text{ g}$. Since the mass of the water molecule has to be in exact multiple of electron mass, the ratio, m_e / V_e , calculated above for electron, will also be applicable to the water molecule. Using this ratio, the void-volume in the water molecule is: $V_H = 2.88 \times 10^{-23} \text{ g} / (3.42 \times 10^3 \text{ g} / \text{cm}^3) = 8.4 \times 10^{-27} \text{ cm}^3$. Since one cm^3 of water has 3.34×10^{22} nos. of molecules, void-volume in one cm^3 of water is: $3.34 \times 10^{22} (8.4 \times 10^{-27} \text{ cm}^3) = 2.8 \times 10^{-4} \text{ cm}^3$. From mass equation (2.6), and mass and void-volume relation ship (2.7), equivalent mass that one cm^3 of water, due to its void content, has is: $(2.8 \times 10^{-4} \text{ cm}^3) 3 \times 10^{10} \text{ cm} / \text{s} = 8.4 \times 10^6 \text{ cm}^4 / \text{s}$. Since, the mass of one cm^3 of water is one gram, from above, we have the relationship:

$$\text{gram} = 8.4 \times 10^6 \text{ cm}^4 / \text{s}. \quad (2.10)$$

Alternatively, the above relationship can be found through a simpler method: Substituting the values of electron radius r_e from (2.9), and the experimentally determined mass, in mass equation (2.6)

$$9.11 \times 10^{-28} \text{ g} = (4\pi / 3) (4 \times 10^{-11} \text{ cm})^3 (3 \times 10^{10} \text{ cm/s}).$$

From which
$$\text{gram} = 8.8 \times 10^6 \text{ cm}^4 / \text{s}. \quad (2.11)$$

The results obtained from (2.10) and (2.11) are close. Taking average of the above values,

$$\text{gram} \approx 8.6 \times 10^6 \text{ cm}^4 / \text{s}. \quad (2.12)$$

2.7 Energy in Electron Structure

Linear as well as accelerating motion of space are the basic states¹ of energy (defined in the next chapter). The circulation of space, forming the

¹ “State” signifies “condition”.

electron's interface and spreading throughout the universal space, is the structural energy of electron; it is computed as follows.

Refer Fig.2.2. Consider an elemental “disc of void” of volume, $dV = (\pi r_e^2 \sin^2 \theta) r_e d\theta = \pi r_e^3 \sin^2 \theta d\theta$, which is created due to the displacement of space through the interface at tangential velocity, $\omega r_e \sin\theta$, or, $c \sin \theta$ (since $\omega r_e = c$), at the instant of electron creation. The mass of this disc element, as defined in Section 2.5, is:

$$dm = dV (c \sin \theta) = (\pi r_e^3 \sin^2 \theta d\theta) c \sin \theta = \pi c r_e^3 \sin^3 \theta d\theta. \quad (2.13)$$

The disc element has an area at the interface equal to $(2 \pi r_e \sin \theta) r_e d\theta$; and has an inward radial acceleration field, $a_f = \omega^2 r_e^2 \sin^2 \theta / r_e \sin \theta = c^2 \sin \theta / r_e$, at each point on it. Consider the process opposite to the void creation—the case of collapse of the interface to zero radius (as it happens during annihilation, which is discussed later), when each point at the interface of the elemental disc will be displaced along the radius, $r_e \sin \theta$, with the above inward acceleration field acting on it. The energy released due to collapse of the disc element is defined as

$$\begin{aligned} dE &= dm a_f (\text{field displacement}) = (\pi c r_e^3 \sin^3 \theta d\theta) (c^2 \sin \theta / r_e) r_e \sin \theta \\ &= \pi c^3 r_e^3 \sin^5 \theta d\theta. \end{aligned}$$

Total energy released due to collapse of the spherical void, which is also equal to the creation energy, is given by

$$E = \int_0^\pi \pi c^3 r_e^3 \sin^5 \theta d\theta = (4/5) (4\pi r_e^3 c / 3) c^2 = (4/5) m_e c^2, \quad (2.14)$$

where, from mass equation (2.6), m_e is substituted for $4 \pi r_e^3 c / 3$.

Eq.2.14 was already discovered by Einstein, however, its physical meaning as to why the speed of light ‘ c ’ appears in the mass- energy equation, stands now explained; signifying the actual space-circulation in the structure of the fundamental matter, even when it is stationary relative to space. Such a conclusion cannot be drawn in STR because of its presupposition on the *emptiness* of space, since the question arises as to what is it that circulates at c . And yet, without making use of the postulate on the *limiting* speed of flow of space, which clearly is similar to Einstein’s

philosophy, though he applied it to the limit of material motion in an extension of *nothingness*, I could not have conceived of a system of creation of matter from the non-material medium of fluid space.

2.8 Angular Momentum of Electron Vortex

The intrinsic angular momentum of the spinning interface of the electron is found as follows. Refer Fig. 2.2. Consider an element of void-volume $dV = \pi r_e^2 \sin^2\theta r_e d\theta$, which, at the interface, has tangential velocity of space, $\omega r_e \sin\theta$. Its mass from (2.6) will be

$$dm = dV \omega r_e \sin\theta = (\pi r_e^3 \sin^2\theta d\theta) c \sin\theta = \pi c r_e^3 \sin^3\theta d\theta,$$

and angular momentum

$$dL = dm (\omega r_e \sin\theta) r_e \sin\theta = (\pi c r_e^3 \sin^3\theta d\theta) c r_e \sin^2\theta = \pi c^2 r_e^4 \sin^5\theta d\theta.$$

The angular momentum for the whole interface

$$L = \int_0^\pi \pi c^2 r_e^4 \sin^5\theta d\theta = (4/5) [(4\pi/3) r_e^3 c] c r_e = (4/5) m_e c r_e. \quad (2.15)$$

The intrinsic angular momentum of electron is directly proportional to its mass, speed of light and electron radius.

2.9 Mass Density Limit

The entire mass of electron is due to its void-content, and not due to the electric charge as seen from the mass-equation (2.6). The concept of “electromagnetic mass” becomes superfluous now that the agencies of mass and charge are shown to be distinct. Also, *since creation of only one stable vortex- structure of electron with least mass and least volume is possible, there comes a maximum limit to density— $3.42 \times 10^3 \text{ g / cm}^3$, as calculated in section 2.6. Nuclear radii are presently considered to be in the range of 10^{-12} cm to 10^{-13} cm, due to which the density of the nuclear mass becomes of the order of 10^{14} g / cm^3 , or even higher. It is also estimated that the density of matter in white dwarf is of the order of 1000kg per c.c. However, it can be*

positively stated that *matter, either in terrestrial or cosmic regions, cannot possess density higher than 3.42 kg per c.c.*

2.10 Spin Magnetic Moment

Refer Fig.2-2. Consider an infinitesimal ring-element of charge: $dq=dA \omega r_e \sin \theta$. Magnetic moment due to this charge element, is defined as

$$\begin{aligned} d\mu &= dq (\omega r_e \sin\theta) r_e \sin\theta \\ &= (2\pi r_e \sin\theta r_e d\theta) (\omega r_e \sin\theta) (\omega r_e \sin\theta) r_e \sin\theta \\ &= 2\pi c^2 r_e^3 \sin^4\theta d\theta, \end{aligned}$$

and total magnetic moment of electron is

$$\mu = \int_0^\pi 2\pi c^2 r_e^3 \sin^4\theta d\theta = 2\pi c^2 r_e^3 (3\pi/8) = (3/4)(\pi/4)(4\pi r_e^2 c) cr_e = (3/4)q_e cr_e. \quad (2.16)$$

The magnetic moment of electron is directly proportional to its charge, speed of light and electron radius.

2.11 Sharper Distinction between Energy and Matter

With the aid of the foregoing descriptions of the creation and stability of electron and its basic properties, a sharper distinction between energy and matter is possible to be made. In Fig.2-4, the medium of space is shown (a) in a stationary state *without* mass, energy, fields and matter. A certain volume of this space in motion, as shown in (b), is now inherent with velocity fields, that is, cosmic energy, but still *without* mass; this is because, there is no space-point in this volume where fields are discontinuous and void is created. Similar to space, fields are energy-conditions but *without* mass. The volume of space shown in (c) possesses electrons (matter) as well as fields. In this case, the volume that encloses only the fields and not the electron-interface is still without mass, though it has energy; whereas, the volume that encloses electrons too possesses mass of the electrons. “Empty space”, currently used in scientific literature, is considered to be that region that has no fields and matter, without recognizing the fact that this very so called “empty space”, when in dynamic state, is the most basic entity—the universal cosmic energy.

Fundamental States of Cosmic Energy, fields and forces

3.0 Energy for the Creation of Electron

The creation of fundamental matter, discussed earlier, required circulation (rotation) of space at limiting speed in a vortex formation. We can therefore define the fundamental state of energy as follows:

The medium of the nonmaterial fluid space in linear or circulating motion is the fundamental state of energy.

Supposing the existence of a single irrotational circular vortex (Fig.2-1) in the universe, the circular streamlines and the velocity fields will extend up to the end¹ of the universal space, and thus create a “dynamic space”, which *is* the cosmic energy. If the speed of rotation of space, at the center of the electron vortex, does not reach the limiting speed c , an electron, associated with the property of mass, will not be created; and yet, this mass-less universe shall have cosmic energy through out the medium of space. Thus, the *mass-less spatial cosmic energy is more fundamental than matter, which possesses the property of mass. The medium of space and spatial energy can exist without matter; but matter cannot be created are exist without space.*

In case, the speed of space circulation at the vortex center reaches the limiting speed c , and creates an electron, then as stated before, the energy of space-circulation from within the void² is forced out and distributes itself in space as electrostatic and gravitational fields; thus creating a *discontinuity* of

¹ The substantial reality of the universe, having been proven through its capability of material creation, we can conceive an enormously large sphere of dynamic space existent in an endless extension of nothingness (void-ness), as the most basic state of the universe.

² “Void” shall mean the electron’s central void of fixed volume unless otherwise specified.

the fields at the interface, leaving the void field-less. Since, energy of the electron structure is located in the whole of space, except within its central void, in a real sense, the electron *is* energy, rather than, electron *contains* energy.

3.1 Electrostatic Field Energy

An expression for the electrostatic field of electron is derived below from the structure of the electron.

Refer Fig.3.1. (Fig. 3.1a can also be seen for better clarity). Consider a sphere of radius r , cut by a plane parallel to the X-Z plane containing a circle C of radius $p_1 y_1$. The radius r (op_1) passes through the interface of the electron at point p , and meets C at point p_1 . In the diametrical plane X-Z of the void, a point z at the interface, will have tangential velocity of space, ωr_e , that is c (down the paper); the tangential velocity of space at point z_1 in the plane X-Z (down the paper), from (2.2), will be, $c r_e / r$. The velocity of space u_2 , at p , tangential to circle C_1 , is $\omega r_e \sin \theta$, whereas, at p_1 , tangential to circle C, the velocity of space is: $u_1 = (\omega r_e \sin \theta) r_e \sin \theta / r \sin \theta = c r_e \sin \theta / r$; inward acceleration field at p_1 , along $p_1 y_1$ is

$$a_f = u_1^2 / r \sin \theta = (c r_e \sin \theta / r)^2 / r \sin \theta = c^2 r_e^2 \sin \theta / r^3. \quad (3.1.1)$$

The component of a_f along the radius op_1

$$a_r = a_f \sin \theta = c^2 r_e^2 \sin^2 \theta / r^3. \quad (3.1.2)$$

The radial electric field E at p_1 is defined to have the following relationship with the radial space acceleration field a_r derived above.

$$dE/ dr = a_r = c^2 r_e^2 \sin^2 \theta / r^3,$$

from which

$$E = - c^2 r_e^2 \sin^2 \theta / 2 r^2, \quad (3.1.3)$$

which is an inward field created by the electron (also by a positron, if the same is considered) with the minimum value of r equal to r_e , because the void is field less.

The tangential component, a_t , of the acceleration field a_f (3.1.1) at point p_1 , has its direction changing in each quadrant of the circle C ; and hence not taken into account for the generation of the radial electric field.

The magnitude of E at the interface, along the Y -axis, for $\theta = 0$, is zero; and in the transverse plane for $\theta = \pi / 2$, at point z_1 distant r from the origin

$$E_{tr} = - c^2 r_e^2 / 2 r^2. \quad (3.1.4)$$

The maximum value of E is at the interface in the transverse plane for $\theta = \pi/2$, and $r=r_e$,

$$E_{MAX} = - c^2 / 2. \quad (3.1.5)$$

The electric potential ϕ at z_1 from (3.1.4) is given by

$$d\phi / dr = E_{tr}$$

$$d\phi = E_{tr} dr = (c^2 r_e^2 / 2 r^2) dr$$

$$\phi = - c^2 r_e^2 / 2 r.$$

In irrotational vortex, from (2.2),

$$c r_e = u r.$$

Therefore,

$$\phi = - c r_e (u r) / 2 r = c r_e u / 2. \quad (3.1.6)$$

From (3.1.6), it is seen that in a space vortex, the velocity field u is the most fundamental field in the universe, which creates the electrostatic potential. Basically, the velocity field of the electron vortex in the universal space is the *only* reality associated with the electron. The mathematical expression to this reality has been given through the above equations of electric field and potential, in order to show that space points¹ undergo real acceleration due to electric charge; and this effect, termed as *electric field*, interacts with matter and other electric charges creating forces of attraction and repulsion. For instance, attraction between an electron and a positron (Fig.2.5a) can be

¹ There are no discrete points in the continuous medium of space; “space-point” has been used in a geometrical sense.

calculated by using Coulomb's equation for interaction between the charges with the concept of the electric field, and also explained through the superposition of the velocity fields (Chapter-2.4). The increase in the magnitude of the velocity-field in-between the vortices, creates a force in space to attract the particles closer, because in an irrotational flow around a curved path, the product of velocity field and the radius is constant. Since the velocity has increased, the radius gets reduced proportionately, by generating a real force by space. Similarly, between two electrons (Fig.2.5b), the reduced velocity-field produces in space repulsive force to increase their separating distance.

A simple picture of electric field distribution in electron structure is shown in Fig. 2-6, in which (a) represents a discontinuity of electric field at the center, and its inward direction; whereas, contemporary physics adopts (b) wherein the field continues up to the center, and has reverse direction.

Coulomb's law—the law of interaction of point charges, which was experimentally determined, can be derived from (3.1.4) as follows.

Multiplying and dividing the right-hand-side of (3.1.4) by $(\pi/4)4\pi$, and rearranging terms,

$$E_{tr} = -c^2 r_e^2 (\pi/4)4\pi / 2r^2 (\pi/4)4\pi = -2c [4\pi r_e^2 c \cdot \pi / 4] / \pi (4\pi r^2).$$

Replacing the quantity in the bracket in the numerator of the right hand side of the equation, we have,

$$E_{tr} = -2/\pi (c/4\pi) q_e / r^2 \tag{3.1.7}$$

The above equation shows that the electric field, which is “force per unit charge” is directly proportional to the charge, and inversely proportional to the square of the distance from the charge, which is as per Coulomb's law.

3.1.1 Dielectric Constant and Permeability Constant

The higher magnitudes of electric fields of electron, are confined within the diametrical plane at right angles to the axis of rotation, and its neighboring parallel planes; the field distribution has axial symmetry (Fig.2-2); rather than spherical as in classical physics given by Coulomb's equation,

$$E = (1/4\pi\epsilon_0) q_e / r^2 \tag{3.1.1.1}$$

where, E is the electric field at a point, ϵ_0 is the dielectric constant of the vacuum, and r is the distance of the point from the electron center. In the vortex structure of electron, unlike classical model, a point on the interface of electron, has the value of E as $c^2 / 2$, whereas, at the axis of rotation it is zero. Also, r in (3.1.1.1) is equal to r_e at the interface of the electron. Substituting these values in the above equation, and expressing q_e in terms of r_e and c from the charge equation (2.4), we have

$$c^2 / 2 = (1/4\pi\epsilon_0) (\pi/4) (4\pi r_e^2 c) / r_e^2 ,$$

from which,

$$\epsilon_0 = \pi/2c. \tag{3.1.1.2}$$

The dielectric constant of the vacuum is inversely proportional to the speed of light.

For spherically-symmetrical charge distribution on electron, as is taken in classical physics, the electron's interface will have to possess the maximum tangential speed of space, c , at each point (electron charge will become: $q_e = 4\pi r_e^2 c$), which, with axially rotating interface is not practicable. However, an assembly of several electrons on any spherical surface of a body, or, a spherical volume packed¹ with electrons, will give spherically symmetrical charge distribution. In such cases of spherical symmetry, in order to have maximum possible value of E as c^2 , rather than $c^2/2$ as in (3.1.5), the expression for the dielectric constant taken is: $\epsilon_0 = 1/c$, in place of (3.1.1.2); for determining the maximum value of charge and the electric field, this equation has been used for the computation of the electric charge of the cosmic bodies and the electrical force in the nuclear structure. With this relationship of the dielectric constant, (3.1.1.1) becomes

$$E = (c/4\pi) q_e / r^2 \tag{3.1.1.3}$$

From Maxwell's equation it was derived that

$$c = 1 / (\mu_0 \epsilon_0)^{1/2} \tag{3.1.1.4}$$

where μ_0 is the permeability constant of the vacuum. From this basic relationship it had been possible to predict that light is an electromagnetic effect. Substituting for ϵ_0 in (3.1.1.3), its value from (3.1.1.2)

¹ In Chapter-7 spherical assembly of electrons in the nuclear structure has been analyzed.

$$c = 1/(\mu_0 \cdot \pi / 2c)^{1/2}.$$

$$\text{Or, } \mu_0 = 2 / \pi c. \quad (3.1.1.5)$$

It is seen that *permeability constant of the vacuum is inversely proportional to the speed of light*. However, the physical significance of “c”, that appears in the expressions of the dielectric as well as permeability constants, is the revelation that the fundamental matter, electron, has a spin of space at speed c in its structure.

3.1.2 *Electrostatic Energy in electron vortex*

For a stationary electron, the “energy density” in its electrostatic field in the universal space as per classical physics is computed as, $\epsilon_0 E^2 / 2$, where E is the electric field at a distance r from the electron center. With the use of this relation of the energy density, the electrostatic energy in the velocity field of electron vortex is calculated as follows.

The electric field E of electron on an elemental ring of space area, $(2 \pi r \sin \theta) r d\theta$, at a distance r from its center, from (3.1.3)

$$E = -c^2 r_e^2 \sin^2 \theta / 2 r^2. \quad (3.1.2.1)$$

The energy density at a distance r from electron center, using relationships of (3.1.1.2) for substitution of the value of ϵ_0 and (3.1.2.1) above

$$\epsilon_0 E^2 / 2 = (\pi / 2c) (c^4 r_e^4 \sin^4 \theta / 4 r^4) / 2 = \pi c^3 r_e^4 \sin^4 \theta / 16 r^4.$$

From the elemental ring area calculated above, the element of space volume is: $2\pi r^2 \sin \theta d\theta dr$. The total electrostatic energy is

$$\begin{aligned} U &= \int_{r_e}^{\infty} \int_0^{\pi} (\pi c^3 r_e^4 \sin^4 \theta / 16 r^4) 2\pi r^2 \sin \theta d\theta dr. \\ &= (16 / 15) (\pi^2 / 8) c^3 r_e^3. = \pi / 10 [(4\pi / 3) r_e^3 c] c^2. \end{aligned}$$

Replacing the quantity in the bracket by m_e

$$U = (\pi / 10) m_e c^2. \quad (3.1.2.2)$$

It is seen in the above integral that the lower limit of r is the void-radius r_e of electron, and not zero, as is the case with a point-charge, which will have infinite amount of energy in its electrostatic field when r is taken as zero. As stated before, r cannot be less than r_e , because the void at the electron center is field-less. *The existing inconsistency of locating energy in the field with the point-charge concept of electron gets removed with the vortex structure¹ of electron.* The electrostatic energy (3.1.2.2) is less than the total electron-creation energy in space derived in mass-energy equation (2.14). The difference should appear as electron's gravitational energy in space, which is analyzed later.

3.1.3 Gauss' Law

A further proof to the charge equation (2.4), dielectric constant equation (3.1.1.2), and for electric field (3.1.3), can be found by deriving Gauss' Law as follows.

Consider a Gaussian surface, a sphere in space of radius r , with an isolated point charge at its center. From symmetry considerations the electric field E is taken normal to the surface and has the same magnitude at each point on it. As per Gauss' Law, the electric flux (Φ_E) and the charge q inside are connected as

$$\epsilon_0 \Phi_E = q \quad (3.1.3.1)$$

or $\Phi_E = q / \epsilon_0$

and $\epsilon_0 E (4\pi r^2) = q \quad (3.1.3.2)$

In case of electron vortex, the spherical interface of radius r_e replaces the Gaussian surface; the electric field, starting from the interface, has axial symmetry. For calculating the electric flux on the interface, consider (Fig. 2-2) an element of area $dA = 2\pi r_e \sin\theta r_e d\theta$, which has at each point the electric field given by (3.1.3); substituting, $r_e = r$, electric flux is given by

$$\Phi_E = \int_0^\pi (-c^2 \sin^2\theta/2) 2\pi r_e^2 \sin\theta d\theta = (4\pi/3) c^2 r_e^2 = -2/3 [\pi/4 \cdot 4\pi r_e^2 c] 2c/\pi.$$

¹ "Vortex structure" of electron signifies "Space vortex of electron enclosing the central void of fixed volume".

Replacing the quantity in the bracket by q_e , and substituting $1/\epsilon_0$ for $2c/\pi$, as derived in (3.1.1.2), we have,

$$\Phi_E = (-2/3) q_e / \epsilon_0, \quad (3.1.3.3)$$

which is Gauss' Law except for the factor $(-2/3)$ due to the electric field of electron being axisymmetric. Gauss' law is one of the fundamental relationships in the electromagnetic theory, from which Coulomb's Law is derived. Both these laws have been derived above with the space-vortex structure of electron, thus proving that the charge-equation and the relationship for dielectric constant (3.1.1.2) are more fundamental equations than the Coulomb and Gauss' laws.

Questions have been raised on the minimum range of operation of the Coulomb forces, and it is believed that the law is valid up to 10^{-13} cm. However, this range is about 400 times less than the electron radius, which should be the *minimum* range of operation for the Coulomb's forces.

3.2 *Mass energy*

With the consideration of the inward action of the acceleration field on the interface of electron during the process of its annihilation with a positron, work done during the collapse of the void has been calculated (2.14); this energy has been taken to be the same as that required for the creation of the electron; The energy continues to reside in electron structure as space circulation in a dynamically stable condition discussed earlier. Since electron is the fundamental particle of matter, which alone in different numbers can assemble stable particles/matter like protons, nuclei, neutrons; a general *mathematical* relationship between mass and energy is the same as given by Eq.2.14.

From the structure of the electron-vortex it is evident that the effect of mass, experienced as a proportionate force when a body (say, held in hand) is rotated, is due to the interaction of the fluid-space with the constituent electron's spherical interfaces, despite the fact that the interfaces contain a void within.

The effect of mass is due to the negation of energy at electron center.

3.3 *Momentum, Kinetic Energy, and Inertia*

Consider motion of the *spherical interface* of electron relative to the fluid-space medium, neglecting for the present the space circulation of the vortex around it (Fig.3.2a). The space-less void within the interface, during motion, leaves a cavity trailing behind it (Fig.3.2b). The displaced fluid-space, ahead of the moving-interface, circulates back to fill the cavity, similar to what can be expected in the event of uniform motion of a spherical body in an ideal fluid (Fig. 3.2c). The circuitous motion of the fluid-space creates inward acceleration field on the front half of the interface as a reaction from space. The work done in overcoming this reaction creates velocity fields that carry the interface continuously forward due to zero viscosity of space. A detail analysis is as follows.

The interface is moving relative to space (Fig.3.2a) at uniform speed v displacing the fluid space. A point P at the interface displaces space horizontally at velocity v , which has two components, radial and tangential, as shown. While the radial velocity components at the front of the interface indicate the outflow velocity of space, similar velocity components at the rear are due to the inflow of the fluid space into the cavity left behind due to the interface motion (3.2b). Therefore, as regards the contribution to the work done in moving the interface, the rear radial velocity field cancels the work done by the front radial field. The tangential velocity component, $v \sin\theta$, at each interface point, however, remains as the resultant velocity field.

In Fig.3.2a, an infinitesimal element of the interface of void-volume, $dV = (\pi r_e^2 \sin^2 \theta) r_e d\theta$, displaces space at velocity, $v \sin \theta$, as shown above. From mass-equation (2.6) the mass of this element

$$dm = dV c = (\pi r_e^3 \sin^2 \theta d\theta) c,$$

and momentum is defined as

$$dp = dm (v \sin \theta) = c v \pi r_e^3 \sin^3 \theta d\theta.$$

Integrating over the whole interface for the momentum,

$$p = \int_0^\pi c v \pi r_e^3 \sin^3 \theta d\theta = [4\pi / 3. r_e^3 c] v.$$

Substituting the quantity in the bracket by m_e from mass-equation (2.6)

$$P = m_e v. \tag{3.3.1}$$

This expression for momentum comes out to be the same as in classical mechanics; it, however, gets clear that *if the electron does not have the central void, it will neither have mass nor momentum.*

The tangential velocity, $v \sin\theta$, produces at each point on the interface (Fig.3.2d), an inward radial acceleration, $a_r = v^2 \sin^2 \theta / r_e$, against which, at the front-half of the interface, the space is displaced. Considerations will show that a linear displacement of the interface up to a length, r_e , sets the volume of space equal to its void-volume in motion at velocity v , whereas, only *half of this volume* flows out against a_r . As calculated above, consider the element of volume dV , with mass, $dm = (\pi r_e^3 \sin^2 \theta d\theta) c$. The work done in displacing space of volume dV and equivalent mass dm , against the acceleration field a_r , up to a length r_e (linear motion of the interface) is defined as kinetic energy

$$dE = dm a_r r_e.$$

Integrated over half the surface of the interface

$$E = \int_0^{\pi/2} c(\pi r_e^3 \sin^2 \theta d\theta)(v^2 \sin^2 \theta / r_e) r_e = (9\pi/64)[4\pi/3 \cdot r_e^3 c] v^2.$$

Replacing the quantity in the bracket by m_e from mass-equation (2.6)

$$E = (9\pi/64) m_e v^2 \approx (1/2) m_e v^2, \quad (3.3.2)$$

which is close to the expression for the kinetic energy in classical mechanics. The kinetic energy is due to: (a) motion of a body *relative to space*; and (b) production and *association of velocity field* with a moving body; kinetic energy is the *most basic state* of energy, which is *independent* of the structural energy. The velocity field can have any value varying from zero to the speed of light, whereas, in material structure, the maximum circulation of space must necessarily reach c and remain constant.

Principle of inertia points towards the property of non-viscosity of space, as well as void-content in matter. The acceleration field in the structure of electron, and also the gravity field (discussed further) are *inward* fields that keep the electron held in position with “pressure”¹ from space. A body displaced from rest acquires velocity field and momentum (3.3.1); on collision with other bodies the momentum is transferred as per the existing

¹ The word “pressure” is used in material media like hydrostatic pressure on the surface of a body. The force-effect of the inward fields on the electron interface will need coining of another expression.

principle of classical mechanics. Further, an electron in motion cannot acquire velocity field if it is a *point mass*, because a *dimension less* point can have no energy; energy requires certain zone, howsoever small, for its distribution. Neither, a point-mass can possess momentum and kinetic energy. It is the *spherical interface* of electron at the vortex center that, combined with the non-viscous space, exhibits the mechanical as well as the electrical properties including inertia. With this description of inertia it gets evident that Descartes, the discoverer of the principle of inertia in the form it appears in Newton's equation, had rightly postulated *property less* space, and assigned matter with the property of *extension*.

As stated earlier, the other aspect of inertia as per which a body at rest continues to remain so, follows from: (a) the *inward* acceleration field (F.g.3-2d) which acts radial on each point of the interface of electron; and (b) the radial gravitational field (discussed in the next chapter) acting *inward* on each point of the interface. The above two fields hold electron stationary if the same is un-interacted by other external forces; In case of neutral atoms where charges are nullified, the inward gravity field tends to hold them stationary in space. Thus, a force applied externally on an atom, is reacted by the structural forces of the atom, till the applied force moves it, creating velocity field, which carries the atom perpetually, if not opposed by other forces. The principle of inertia remains un-explained with the contemporary physics, because, the *void-space* concept, adopted presently, enables neither development of a physical theory on the structure of matter, nor helps in pinpointing the cause of reaction from the space on the moving matter. The point-mass concept of electron is the additional handicap.

3.4 Centrifugal Force

The above analysis of inertia is applicable to the linear motion of electron (matter) relative to the medium of space, which is stationary with respect to the surface of the Earth. In case of uniform circular motion in relatively static space, the velocity field associated with the body describing the circle undergoes changes in direction, producing acceleration (outward); thus creating centrifugal force directly proportional to the square of speed and inversely proportional to the radius, as per Huygens rule (1673). If an electron (or, atom) is located within a circular space vortex, and rotated around the vortex center with no relative motion with respect to its surrounding space, there will not be generation of any additional velocity field and, hence, no centrifugal force will act on it. *The production of the*

centrifugal force in a body describing a curve requires relative motion with respect to its neighboring space.

3.5 Universal Space Motion

The universal space has highly organized inherent motion as “vortices of space” around cosmic bodies. In micro cosmos, the space vortex with the least possible core dimension, as described earlier, is the electron, with the interface radius of the order of 4×10^{-11} cm. The central core of proton vortex (Sec-7) has radius of about 12 times the electron radius. On similar pattern, in macro cosmos, the space vortices enclose individual planets, stars, and galaxies that form the central cores of their respective space vortices. Another striking similarity between the fundamental matter and the planets/galaxies is in their material structure, such as: the electron has a central void enclosed by a space vortex; so also, nuclei/atoms, planets, stars and galaxies (constituted with multiple independent electrons) possess larger volumes of void; and each is enclosed within its own space vortex excluding, of course, such cosmic bodies that do not rotate axially (Moon, Mercury, etc.).

High velocity fields in the vortices around these cosmic bodies cause their axial rotation perpetually¹ due to zero viscosity of space. The orbital-motion of the satellites, planets and stars, around their respective primaries, are also caused due to the velocity fields of these cosmic vortices. Taking example of the solar system, it is explained below that the orderly orbital motion of the planets and satellites is the result of the regulation by the velocity fields of the space vortices.

3.5.1 Solar Space Vortex

The solar system consisting of the satellites, planets, and the sun is a large space-vortex with the sun at its center. Fig. 3-3 shows, partially, the solar space vortex, which is in the equatorial plane of the sun and at right angles to its axis of rotation. This forms the planetary plane. The velocity field of the space vortex surrounding the Earth, rotates it axially, whereas, the planet Mercury has no vortex around, for its axial rotation. For simplicity of the sketch, only two planets— mercury and earth, are shown. The other planets too have their respective space vortices within which the

¹ The strength of the velocity fields in the vortices may reduce in due course, due to material creation, discussed later; and in that case, the rotation of the body may diminish.

satellites are located. The velocity field of the solar vortex carries the planets and, similarly, the satellites are moved by the vortices of their respective planets. Neither the planets, nor the satellites¹ have, normally, relative motion with respect to the medium of space in their immediate vicinity and, hence, their orbital motion does not develop centrifugal force on them. In simple words, the planets are carried along by the streamlines of the solar vortex, whereas, the satellites follow, generally, the streamlines of the planetary vortices.

Looked from the top of the planetary plane the sun and the planets rotate anti clockwise (Fig. 3-3). From this it is inferred that their space vortices, that impart angular momentum to them, also have anti clockwise rotation. From Fig.2-5a it is seen that space vortices with opposite rotations attract each other electrically. It, therefore, follows that had there been a planet with axial rotation opposite to the sun, it will fall on to it under electrical force of attraction. The repulsive electrical force between the sun and the planets is calculated further; however, it can be inferred here that, by and large, *in all the star systems in the universe including our own solar system, the axial rotations of the stars and their associated planets have to be in the same direction for the stability of these systems.*

3.5.2 Velocity Field Distribution in Solar Space Vortex

Refer Fig.3.4 showing the sun's side view (taken spherical for simplicity of calculation) with radius R_s , and the Earth in the planetary plane, which is transverse to the axis of the sun's rotation. The velocity fields in the vortices around the sun and the Earth are shown as circular streamlines. The planetary plane has been taken disc shaped, with its thickness equal to the diameter of the sun. Consider an elemental area dA on the rotating surface of the sun such that

$$dA = 2\pi R_s \sin \theta R_s d\theta. \quad (3.5.2.1)$$

The period of axial rotation of the sun varies from 26 days at the equator to 37 days at the poles. If the average angular velocity of rotation be ω_s , then the tangential velocity at the elemental surface will be

$$V_s = \omega_s R_s \sin \theta \quad (3.5.2.2)$$

¹ Satellites and planets that do not possess axial rotation, like moon, mercury etc. have complex orbital motion, and may develop relative motion with respect to their neighboring spaces, as discussed later.

where V_s is also the velocity field of space in immediate vicinity of the surface and tangential to the elemental area dA .

Due to V_s acting on each point of dA there will be an *inward*¹ acceleration a_s such that

$$a_s = V_s^2 / R_s \sin \theta. \quad (3.5.2.3)$$

From (3.5.2.1) and (3.5.2.3), the product, $dA a_s$, is

$$d\phi_s = (2\pi R_s^2 \sin \theta d\theta) [(\omega R_s \sin \theta)^2 / R_s \sin \theta]$$

where ϕ_s is defined as “space acceleration flux”.

Integrating for θ varying from 0 to π

$$\phi_s = 2\pi R_s (\omega R_s)^2 \int_0^\pi \sin^2 \theta d\theta = \pi^2 R_s (\omega R_s)^2. \quad (3.5.2.4)$$

From (3.5.2.2), for $\theta = \pi / 2$, V_s has a maximum value on the Sun’s surface in the equatorial (planetary) plane of the sun: $V_{sm} = \omega R_s$. Substituting this relationship in (3.5.2.4)

$$\phi_s = \pi^2 (V_{sm})^2 R_s. \quad (3.5.2.5)$$

Due to zero-viscosity and continuity of the medium of space, the acceleration flux ϕ_s remains constant at every spherical space surface concentric with the sun’s center. Fig.3-4 shows a spherical space surface S . From (3.5.2.5)

$$(V_{sm})^2 R_s = \phi_s / \pi^2 = \text{constant}.$$

Or
$$V_{sm} \propto 1 / \sqrt{R_s}. \quad (3.5.2.6)$$

From above it is seen that the tangential velocity V_{sm} at the sun’s surface, and also of space-point in contact with the sun’s surface (stated before), falls inversely as the square root of the distance from the sun’s center due to the above-mentioned constancy of the acceleration flux. If, in the solar vortex,

¹ The nuclei of the atoms constituting the sun have independent electrons in their structure. Similar to electron which, due to central void, has inward acceleration field on its interface, the sun and the planets too have inward acceleration field on their surfaces.

V_t is the tangential velocity-field on the circumferential points of a circle of radius r in the planetary plane (sun's equatorial plane) concentric with the sun; then from (3.5.2.6)

$$V_t \propto 1 / \sqrt{r} = k / \sqrt{r} \quad (3.5.2.7)$$

where k is a constant pertaining to the solar space-vortex.

It was stated in Section 3.5.1, that the velocity fields of the solar vortex move the planets. Therefore, from (3.5.2.7) it follows that the orbital speed of the planets should be inversely proportional to the square root of the distance from the sun's center which, in fact, is as per Kepler's third law, as shown below.

Kepler's law is:
$$T^2 \propto r^3 \quad (3.5.2.8)$$

where T is the period of any planet of the solar system, and r is its distance from the sun's center. Substituting in the above equation, $T = 2\pi r / V$, where V is the orbital velocity of the planet

$$(2\pi r / V)^2 \propto r^3$$

Or
$$V \propto 1 / \sqrt{r} \quad (3.5.2.9)$$

A theoretical proof to the third law of Kepler (3.5.2.8), which is supported by the astronomical measurements, is provided by deriving this law (3.5.2.7) with the concept of "space acceleration field" acting on the surface of the sun in the solar vortex.

3.5.3 Free-Fall Acceleration on the sun's surface

Consider the innermost planet of the solar system, Mercury, which has orbital speed of 47.9 km/s, and the mean distance from the sun's center: 57.9×10^6 km; substituting these in (3.5.2.7)

$$k = 47.9 \times 10^3 \text{ m/s} (57.9 \times 10^9 \text{ m})^{1/2} = 11.52 \times 10^9 \text{ m}^{3/2}/\text{s}. \quad (3.5.3.1)$$

Maximum tangential velocity of space (V_{sm}) on the periphery of the Sun, in the planetary plane is now found from (3.5.2.7) by substituting the value of k and the mean- radius of the sun:

$$V_{sm} = (11.52 \times 10^9 \text{ m}^{3/2} / \text{s}) / (6.96 \times 10^8 \text{ m})^{1/2} = 4.367 \times 10^5 \text{ m/s}. \quad (3.5.3.2)$$

This tangential velocity-field will create on the surface of the sun in the planetary plane an *inward space acceleration field* of maximum value:

$$a_{fm} = (4.367 \times 10^5 \text{ m/s})^2 / 6.96 \times 10^8 \text{ m} = 274 \text{ m/s}^2. \quad (3.5.3.3)$$

As per the classical mechanics, the *surface gravity* of the sun is also 274 m/s^2 , which happens to be exactly the same as the *space acceleration field* derived above. Further, as per Newton's gravitational theory, which is presently accepted, surface gravity on the sun is due to its mass; and free-fall acceleration on its surface is due to gravitational attraction. Quite different from these conclusions of classical physics, it is the solar space-vortex creating space-circulation around the sun that, in turn, produces inward acceleration field for free-fall of bodies on the sun's surface. The above derivation of the free-fall acceleration (3.5.3.3) has not made use of the "mass" property of either the sun, the planet Mercury, or the medium of space. *Therefore, the "free-fall acceleration" on the sun's surface is primarily caused by an inward acceleration field in the surrounding solar space vortex, creating force on bodies to fall downwards on its surface.* And even if it is proved that mass of the sun is also proportional to the maximum velocity field in the solar space vortex (which has been shown below), free fall acceleration is not *directly* caused by the mass of the Sun.

3.5.4 Free fall Acceleration on the Earth's Surface

Refer Fig.3.5. The Earth is enclosed within a space vortex that, as stated before, imparts axial rotation to it; and the Moon cannot be supposed to have space vortex around it, since it does not possess axial rotation. The Earth along with the Moon is carried by the solar space vortex in an elliptical (assumed circular for simplicity) orbit. The velocity field in the Earth vortex carries the Moon around the Earth with an orbital speed of 1017 m/s (derived from the period of 27.3 days; radius of the orbit: $3.82 \times 10^5 \text{ km}$). From (3.5.2.7)

$$V_m \propto 1 / \sqrt{r} = k_e / \sqrt{r} \quad (3.5.4.1)$$

where V_m is the orbital velocity of the Moon; r is its distance from the Earth center; and k_E is a constant pertaining to the Earth's space-vortex.

Substituting the values of V_m and the radial distance of the Moon's orbit, given earlier,

$$k_e = (1017 \text{ m/s}) \times (3.82 \times 10^8 \text{ m})^{1/2} = 1.987 \times 10^7 \text{ m}^{3/2} / \text{s}. \quad (3.5.4.2)$$

Substituting in (3.5.4.1), the values of k_E and, r , which is the known radius of the Earth, maximum tangential velocity of space, in the equatorial plane and in close vicinity of the Earth surface, is determined as:

$$V_t = (1.987 \times 10^7 \text{ cm}^{3/2} / \text{s}) / (6.37 \times 10^6 \text{ m})^{1/2} = 7.8 \times 10^3 \text{ m/s}. \quad (3.5.4.3)$$

There exists a space-circulation at 7.8 km/s around¹ the Earth's surface in its equatorial plane that imparts axial rotation to it and also develops an inward acceleration field which is:

$$a_e = V_t^2 / R_e = (7.8 \text{ km/s})^2 / 6370 \text{ km} = 9.55 \text{ m} / \text{s}^2. \quad (3.5.4.4)$$

where R_E is the radius of the Earth. The inward acceleration field derived above is seen to be so close to the presently accepted surface gravity of the Earth: 9.81 m/s^2 , obtained from the experimental measurement.

The proof on the real existence of the space vortices around the Earth and the Sun lies in the above derivations of the free-fall accelerations on the surfaces of these cosmic bodies.

The free-fall acceleration² for the other planets, calculated similarly, is given in Table 1 (Appendix).

Due to the assumption in classical mechanics that space is empty, it would not occur that from the rotation of the Moon one should work out the rotation of *space* around the Earth at the level of the ionosphere, as carried out above, because what is the meaning of rotation of a *void* space. To conclude, it is the presupposition of empty space that has prevented so far the discovery of surface gravity through space dynamics. *The physical aspects of a phenomenon are precursors to the quantitative findings.*

If the mass property, in case of the sun and the Earth (other planets too), is the cause for attraction of bodies that fall on their surfaces, then, taking a clue from mass-equation (2.6), the maximum velocity fields in their respective vortices (that determine free-fall accelerations) should determine

¹ It is shown later that space circulation at 7.8km/s takes place at a height around ionosphere.

² Marco Todeschini, in Desisive Experiments in Modern Physics (Theatine Academy of Sciences, 6. Piazza Umberto 1- Chieti, Italy) has also calculated Earth gravity considering a stream of fluid space around the Earth.

their mass also. The following computation of the mass is independent of the surface gravity and also the gravitational constant.

From (2.6) mass of the electron is proportional to its maximum velocity field c , and the volume of its single void. Similarly, for the sun, we can write

$$M_s = V \times V_s = (V \times c) V_s/c$$

where V is the volume of the sun; V_s : maximum velocity field in the sun's vortex; M_s : mass of the sun.

Since, the volume of the sun is composed of multiple electronic voids in the nuclei and atoms constituting the sun, V_s is less than c and, therefore, M_s is reduced by a factor V_s/c as shown in the above relation. Substituting the value of V and V_s in the above equation

$$\begin{aligned} M_s &= (4\pi/3) R_s^3 V_s = (4\pi/3) (6.96 \times 10^{10})^3 (4.367 \times 10^7 \text{ cm/s}) \\ &= 6.16 \times 10^{40} \text{ cm}^4/\text{s} = 6.16 \times 10^{40} (\text{g} / 8.6 \times 10^6) = 7.16 \times 10^{33} \text{ g} \end{aligned}$$

where from (2.12), $\text{gram} = 8.6 \times 10^6 \text{ cm}^4/\text{s}$.

Presently, accepted mass of the Sun is:

$$M_s = 1.99 \times 10^{33} \text{ g}$$

which is reasonably¹ close.

From the calculations made on similar lines the mass of the planets is given in Table 2 (Appendix).

The difference in the calculations for the mass of a planet is that the maximum velocity field in the planetary vortex is added with the velocity field of the solar vortex at the orbit of the planet. For example, maximum velocity field in the Earth's space vortex (7.8km/s) is added with the solar vortex field at the orbit of the earth (29.8km/s, orbital velocity of earth). It is seen from Table 2 (Appendix) that while mass of the sun comes out more than 3.6 times the presently accepted value, all the other planets are lighter. In fact, the mass of the Earth comes to about 12 times smaller than accepted today.

From the considerations of the stability of the forces on the orbiting planets, their mass (Appendix, Table 1) has been calculated later; the values obtained (Appendix, Table 2) are to some extent different, in case of the

¹ The Essential Tension— The Function of Measurement in Modern Physical Science, Thomas S. Kuhn: "In the theoretical study of Stellar magnitudes agreement to a multiplicative factor of ten is often taken to be reasonable".

Earth and Mars particularly, from those in Table 1. The mass of the planets obtained from the considerations of the stability in the orbit (Table 1) is to be considered closer to the real value.

The space circulation in the vortex of the sun from (3.5.3.2) is: 4.367×10^5 m/s; this can increase to a maximum possible speed c , as the sun grows with more of self-created matter. From this it is inferred that the maximum mass of the sun in future will be: $(3 \times 10^8 \text{ m/s}) / (4.367 \times 10^5 \text{ m/s})$, that is 687 times the present mass.

3.5.5 Descartes versus Newton—on Gravitation

Descartes conceived existence of a property less ether-vortex in the solar system with Sun as the center. The individual vortices of the planets were caught in this larger vortex and were carried along in their orbits. (Leibniz supported Cartesian concept of all pervading ether and believed that the ‘planets are moved by their ethers’ and hence depart from the rectilinear paths¹ describing elliptical orbits; under this concept he is also said to have proved the first two laws of Kepler). Descartes hardly used “mass” in his explanations. “Gravitation he explained by a settling down of bodies toward the center of each vortex”². And bodies fell on Earth due to impact of ether on them.

Newtonian space in the solar system is empty and, evidently, based on Descartes’ principle of inertia for continuing linear motion of moving bodies, it was argued that but for a central force towards the sun the planets will go off at tangent to their orbits. Newton imagined action of outward centrifugal force as per Huygens’ principle to act also on the planets moving in cosmic space which, too, as per him, was as void and inert as the terrestrial space; and to counteract this force he coined “centripetal force” of equal and opposite in direction—gravitational force of attraction due to the mass of the sun on the planets—to act inward on the planets for their stability in the orbit. He did not accept a situation (Cartesian space) that the space itself could carry the Moon and, thus, could be stationary with respect to it (Moon), though with respect to the Earth, it (space) would circulate around it along with the Moon. The other argument that he placed against Descartes’ theory was that it did not account for the quantitative observations on planetary motion like Kepler’s.

¹ Isaac Newton’s Principia—Alexandre Koyre & I. Bernard Cohen.

² Pioneers of Science—Sir Oliver Lodge

The foregoing analysis (Section-3.5.2), now rules out the above objections by deriving the third law of Kepler (3.5.2.7) with the postulate of a non-material fluid vortex in the solar system. And, further, without postulating the real existence of solar space-vortex, and a continuously varying velocity-field in it, how else can the free-fall accelerations on the surfaces of the sun and planets (Sections-3.5.3 and 3.5.4) be ever accurately derived?

3.5.6 Derivation of Newton's Gravitational Force Equation

Refer Fig.3-4. Consider a space-point P in the planetary plane of the solar vortex, distant r from the vortex center. From (3.5.2.7), its tangential velocity is:

$$V = k / \sqrt{r}.$$

Squaring both the sides

$$V^2 = k^2 / r.$$

Or

$$V^2 r = k^2.$$

Dividing both the sides by r^2

$$V^2 / r = k^2 / r^2. \quad (3.5.6.1)$$

If there is a planet at P of mass m, its orbital speed v will be equal to the velocity- field V of space. Also, the space acceleration field V^2 / r at P will be *inward*, because its maximum value at the surface of the sun (3.5.3.3) is inward; and will fall inversely as the square of the distance (3.5.6.1). The acceleration field will be subjecting the planet at P to an inward acceleration v^2/r and, consequently, an inward force towards the center of the solar vortex. Multiplying both sides of (3.5.6.1) with the mass of the planet

$$m v^2 / r = k^2 m / r^2. \quad (3.5.6.2)$$

As per Newton's equation of gravitational force between this planet and the sun

$$m v^2 / r = G M_s m / r^2. \quad (3.5.6.3)$$

From (3.5.6.2) and (3.5.6.3) it is seen that

$$k^2 = G M_s \quad (3.5.6.4)$$

where G is gravitational constant, determined experimentally.

From the presently known values of G and M_s

$$G M_s = (6.67 \times 10^{-8} \text{ cm}^3/\text{s}^2 \text{ g})(1.99 \times 10^{33} \text{ g})=1.327 \times 10^{26} \text{ cm}^3 / \text{s}^2. \quad (3.5.6.5)$$

From (3.5.3.1), solar space vortex constant

$$k = 11.52 \times 10^9 \text{ m}^{3/2} / \text{s} = 11.52 \times 10^{12} \text{ cm}^{3/2} / \text{s}$$

from which $k^2 = 1.327 \times 10^{26} \text{ cm}^3 / \text{s}^2. \quad (3.5.6.6)$

Thus, from (3.5.6.5) and (3.5.6.6), it is found that

$$k^2 = G M_s \quad (3.5.6.7)$$

From above, it is seen that the quantity “ GM_s ” appearing in Newton’s gravitational force equation (3.5.6.3) is obtained from Kepler’s law.

In (3.5.6.7), the product of the gravitational constant and mass of the sun is equal to the square of the solar vortex constant k, whereas, the solar vortex constant k, in (3.5.2.7), is equal to the product of the orbital velocity of any planet and the square root of its distance from the sun. We thus find that the physical aspects of “ k^2 ” and “ GM_s ” are entirely different; here is a highly complex situation confronting us in our understanding as to how these two physically different quantities are to be equated.

In (3.5.6.3), mass “m” of the planet, appearing on both sides of the equation, gets cancelled and, hence, instead of “mass”, any other property of the planet, relevant or irrelevant, if substituted, will make no difference to the result of the equation, mathematically. Newton used “mass” to determine centrifugal force, $m v^2 / r$, which he postulated to act on moon or any planet during motion in the orbit; it has, however, been shown (3.5.1) that the planets are not subjected to centrifugal force. (The centrifugal force is replaced by electrical repulsive force between the sun and the planets as described later; stability of moon is also analyzed separately). Postponing the analysis of stability of the planets and satellites in their orbits to a later

stage, it is concluded here that appearance of “mass” of a planet in gravitational force equation (3.5.6.3) used in celestial mechanics to obtain centrifugal force (*outward*) is erroneous; though, mass is still used to calculate an *inward* force towards the Sun. (As shown further, mass of a planet, interacted by the inward acceleration field of the solar vortex, does produce an attractive force between the sun and the planet.)

Canceling “m” on either side of (3.5.6.3), we have

$$v^2 / r = G M_s / r^2. \quad (3.5.6.8)$$

Similarly, canceling “m” in (3.5.6.2)

$$v^2 / r = k^2 / r^2. \quad (3.5.6.9)$$

Evidently, (3.5.6.9), derived from the principles of SVT and also consistent with the Kepler’s third law, is a more fundamental relationship compared to (3.5.6.8) since, “k”, derived from the astronomical measurements, enables determination of free-fall acceleration on Sun’s surface (Sec.3.5.3); whereas, (3.5.6.8), with two unknowns, G and M_s , can not be used to derive free-fall acceleration. It has also been seen earlier that free-fall acceleration on the sun is not directly determined by its mass. The reason, as to why the free-fall acceleration derived from the new concept of the solar space vortex is the same as the presently accepted surface gravity on the sun’s surface, is due to the substitution of “ $G M_s$ ” in Newton’s Eq. (3.5.6.8), in place of “ K^2 ” of Kepler’s equation (3.5.6.9). And, similar is the case of free-fall acceleration on the Earth’s surface, and of other planets too.

The constant G is determined experimentally on the Earth in space, static with respect to its surface, using the following equation on universal gravitation:

$$F = G m_A m_B / r^2 \quad (3.5.6.10)$$

where F is the force developed between two masses m_A and m_B , separated by a distance r. This force has been actually measured, and leaves no doubt on the existence of an attractive gravitational force between two masses; but the magnitude of the constant G will depend upon the correctness¹ of the above equation. A body of mass m on the Earth surface, from (3.5.6.10), will experience a downward force

¹ The correctness of Newton’s equation has been checked later.

$$F = m g = G m M_e / R_e^2, \quad (3.5.6.11)$$

where g is the surface gravity of the Earth of mass M_e and radius R_e . Canceling ‘ m ’ on either side of the above equation

$$g = G M_e / R_e^2. \quad (3.5.6.12)$$

Classical physics considers the surface gravity “ g ” to be the same as “free-fall acceleration” (3.5.4.4), derived earlier with the principles of SVT. Here again we notice that free-fall acceleration as per Newton (3.5.6.12) is proportional to mass; whereas, as per (3.5.4.4), which is derived from the Earth’s space-vortex, it is independent of mass, and proportional to the square of the maximum space-circulation velocity around the earth.

Currently, in contemporary physics, as stated before, there is no theoretical derivation of the surface gravity (g) of the Earth, which can be compared with the experimentally measured value. Similarly, G is also experimentally determined from (3.5.6.10). Thus, though (3.5.6.12) is an unproven relationship, yet the mass of the Earth is computed from it with the measured values of g and G , and the astronomical measurement of r . And, mass of the Sun is also determined with (3.5.6.3) which was shown earlier to be an erroneous relationship, because planets are not subjected to centrifugal forces in their orbits. For deeper understanding, and validity or otherwise, of Newton’s equation on universal gravitation the constants “ g ” and, also, “ G ” have been derived from the first principles in the next chapter, from the very structure of the fundamental matter.

3.6 *Electrical Repulsive Forces between the Sun and Planets*

Similar to the structure of electron (Fig.2-2) in which the spherical interface surrounded by a space vortex, produces electric charge effect; the Sun and the planets (with axial rotation) too, possessing space vortices enclosing them, are charged cosmic bodies. Their electric charges will be directly proportional to the product of their respective surfaces and the tangential velocity of rotation of the material surface in the equatorial plane, as per the relationships in the basic charge-equation of electron (2.4). Here is another example of uniformity of reproduction of nature’s design and laws applicable in sub micro as well as macrocosmic phenomena. The solar charge is calculated as

$$Q_s = (\pi / 4) (\text{solar surface}) V_{sm} \quad (3.6.1)$$

where V_{sm} is the maximum tangential velocity of the sun's surface in the equatorial (planetary) plane.

$$Q_s = (\pi / 4) 4\pi (6.96 \times 10^{10})^2 \times (1.945 \times 10^5 \text{ cm/s}) = 0.928 \times 10^{28} \text{ esu} \quad (3.6.2)$$

where, from (2.5), $\text{esu} = \text{cm}^3/\text{s}$, in CGSE system. Presently accepted value of the solar charge¹ is 10^{28} esu , which is extremely close to the above derivation. Similarly, electric charge of the Earth, due to axial rotation, is proportional to the product of the surface and its tangential velocity in the equatorial plane:

$$Q_e = (\pi / 4) 4\pi (6.37 \times 10^8 \text{ cm})^2 (0.464 \times 10^5) = 1.85 \times 10^{23} \text{ esu}. \quad (3.6.3)$$

Electric charge of the sun and the planets is tabulated in Appendix (Table 1).

It is significant to note that the sun and the planets have the same rotational direction; which means that their charges have the same sign and, therefore, produce repulsive forces among them. As already stated (Section 3.5.1), it can be concluded that *stable systems of stars and their associated planets will have the same direction of axial rotations universally.*

Using (3.6.2) and (3.6.3), Coulomb's force between the sun and the Earth is given by

$$F_e = (c/4\pi) Q_s Q_e / r^2 \quad (3.6.4)$$

where r is the distance between them. Substituting the values from (3.6.2) and (3.6.3)

$$F_e = [(3 \times 10^{10} \text{ cm/s})/4\pi](0.928 \times 10^{28} \text{ cm}^3/\text{s}) (1.85 \times 10^{23} \text{ cm}^3/\text{s}) / (1.5 \times 10^{13} \text{ cm})^2$$

where, from (2.5), $\text{cm}^3/\text{s} = \text{esu}$ or CGSE unit.

$$F_e = 1.822 \times 10^{34} (\text{cm}^4/\text{s}) \text{ cm/s}^2.$$

Substituting from (2.12), $\text{gram} = 8.6 \times 10^6 \text{ cm}^4/\text{s}$

$$F_e = 2.12 \times 10^{27} \text{ dyne}. \quad (3.6.5)$$

¹ The Morality of Nuclear Planning—H. C. Dudley (1978), Kronos Press, Glassboro, New Jersey 08208, USA.

It is seen that the Earth in its orbit is subjected to an electrical repulsive force from the sun, rather than a centrifugal force of classical celestial mechanics. And, such is the case with each planet (with axial rotation). A check can be made on the magnitude of F_e given by (3.6.5) by comparing it with the gravitational attraction between the sun and the Earth using Newton's equation, and the values of the masses accepted today:

From (3.5.6.10), gravitational force between the sun and the Earth:

$$F = GM_s M_e / r^2 = (6.67 \times 10^{-8} \text{ cm}^3/\text{s}^2 \text{ g})(1.99 \times 10^{33} \text{ g})(5.98 \times 10^{27} \text{ g}) / (1.5 \times 10^{13} \text{ cm})^2.$$

$$F = 3.52 \times 10^{27} \text{ dyne.} \quad (3.6.6)$$

The gravitational force of attraction (3.6.6) is about 1.66 times more than the electrical repulsion (3.6.5), and can be taken to be approximately equal but for the fact that the mass of the sun used here is 3.6 times less, whereas, the Earth mass¹ taken is about 12 times larger, as calculated in Sec.3.5.4, Table 2. With these values, the repulsive force from the sun will be about 3.4 times greater than the gravitational attractive force, leading to an instability of the Earth's orbit. The above inequality of the two opposite forces casts doubt on Newtonian celestial mechanics. The stability of the planets taking into account electrical repulsive forces between the sun and the planets is discussed ahead.

3.7 *Electric field gradient on the Earth surface*

In Section 3.5.4, space circulation around the earth in the equatorial plane from (3.5.4.3) was calculated as 7.8 km/s. It was conjectured that due to atmospheric belt around the earth, the space circulation is reduced to 0.466 km/s on the Earth surface—inferred from the tangential velocity of surface rotation in the equatorial plane (Fig.3-5). Let us suppose that the space circulation increases in direct proportion to the height as we go up vertically in the atmosphere (material medium) from the surface, say, up to ionosphere, which is taken at a height of about 110km, till it attains the maximum value of 7.8 km / s. With these values, the gradient in velocity field for *one kilometer* of height will be: [(7.8 km/s)-(0.466 km/s)] / 110 km = 0.067 km / s.

¹ Accurate masses of the Earth and other planets have been found with consideration of their stability in the orbits—tabulated in Table 1 (Appendix).

The electric charge of the Earth, calculated earlier (3.6.3), is with respect to its center, or with respect to an external body like the Sun, planet, etc. Relative to an observer on the Earth surface, who rotates along with the earth and the medium of space in its immediate vicinity, the charge is zero. However, in view of the gradient of space-circulation calculated above, in the equatorial plane, maximum drift of space at a height of one kilometer will be 0.067 km/s, and zero at the Earth surface; thus producing an *average* drift of $(0.067\text{km/s})/2$, that is, 0.034km/s across one kilometer height. This drift of space (velocity field), from (3.1.6), creates most fundamental state of electric potential surrounding the Earth. The electric charge of the Earth due to this velocity field is

$$Q_e = (\pi/4) 4\pi (6.37 \times 10^8 \text{ cm})^2 (0.034 \times 10^5 \text{ cm/s}) = 13.6 \times 10^{21} \text{ cm}^3/\text{s}. \quad (3.7.1)$$

The electric field due to the above Earth charge is radially downward on its surface, and given by

$$\begin{aligned} E &= (c/4\pi) Q_e / R_e^2, \\ &= [(3 \times 10^{10} \text{ cm/s})/4\pi] (13.6 \times 10^{21} \text{ cm}^3/\text{s}) / (6.37 \times 10^8 \text{ cm})^2, \\ &= 0.8 \times 10^{14} \text{ cm}^2/\text{s}^2. \end{aligned} \quad (3.7.2)$$

where E is the electric field in the equatorial plane, and R_e is the Earth radius.

Work done in raising one CGSE of charge (which is cm^3/s) for one meter against the above electric field is

$$W = (\text{cm}^3/\text{s}) (0.8 \times 10^{14} \text{ cm}^2/\text{s}^2) \times 100 \text{ cm} = 0.8 \times 10^{16} (\text{cm}^4/\text{s}) \text{ cm}^2/\text{s}^2.$$

Converting, cm^4/s , in, gram, from (2.12)

$$W = 0.8 \times 10^{16} (\text{gm} / 8.6 \times 10^6) \text{ cm}^2/\text{s}^2 = 0.093 \times 10^{10} \text{ erg} = 93 \text{ J}. \quad (3.7.3)$$

One coulomb of charge moved in an electric field produces one volt with expenditure of one joule of work, as per the existing relationship: 1 volt = 1 joule / coulomb. Thus from (3.7.3), 93 J of work done against the Earth's electric field in moving the unit charge to a height of one meter is indicative of the existence of 93 V at a height of one meter in the atmosphere surrounding the Earth. This explains as to why "over flat desert country, or

over the sea, as one goes upward above the ground the electric potential increases by about 100 volts/m in the air¹.

3.8 Lightning Potentials and Atmospheric Electricity

The circulation of space in planes parallel to the Earth's axis of rotation is a continuing process due to the non-viscous nature of space; as a result very large voltage gradient (about a million volt of electrostatic potential every 10 km height till ionosphere) exists permanently in the terrestrial space substratum, independent of the atmospheric conditions. Since the velocity field increases with the height above the Earth the ionosphere has higher potential with respect to the ground. This electrostatic potential across the atmosphere is the constant voltage source for the observed atmospheric electricity. The electric field of this potential ionizes the particles. During rains, dust-ridden air and ionized particles reduce the dielectric strength of the atmosphere, causing lightning discharge due to already existing millions of electrostatic potential gradient in space.

The velocity-field in the ionosphere forces down the electrons (also negatively charged ions) towards the Earth; this way it separates the positive and negative ions of ionized particles—sending downward to Earth the negative ions, and positive ions upward to the ionosphere. The inward acceleration field, responsible for free fall acceleration on the Earth surface (3.5.4.4), prevents upward dispersal of the particles of ionosphere and, thus, a conducting layer built of ionized particles is constantly maintained in the ionosphere.

3.9 *Earth's Magnetic Field*

Presently, it is believed that the source of Earth's magnetic field is due to the existence of mainly iron group elements at its center, creating magnetic effects along north-south poles. Quite contrary to this, it is shown below that the terrestrial magnetic field is caused by a large current around the globe in the ionosphere, circulating from west to east in planes parallel to the magnetic equatorial plane.

The electric charge of the Earth surface was calculated (3.6.3) as: 1.85×10^{23} CGSE, or 6.16×10^{13} coulomb. The velocity field due to circulation of space around the Earth was identified as the agency to produce the charge. In Sec. 3-8 it was stated that this very velocity field creates

¹ The Feynman Lectures on Physics; Volume 2; page 9-1.

electric field, which ionizes and also separates ions. Hence, it can be assumed that the charge of the positive ions contained in the ionosphere is equal to the Earth's charge. (The velocity field beyond the ionosphere falls inversely as the square root of the distance from the Earth's center, and this region is not taken into account for this analysis).

The Earth rotates on its axis once in 24 hrs. Consider a stationary plane passing through the Earth and containing the axis. The charged ions in the ionosphere pass through, at right angles to this plane, as they are carried by the space circulation (velocity field), thus involving flow of charge with respect to time; and constituting a current (dc) around the earth as calculated below.

The revolution made by the Earth along with the space circulation up to the ionosphere in unit time is: 1 revolution / (24 x 60 x 60) s = 1.157×10^{-5} revolution /s. The electric current produced in the ionosphere circulating around the globe is the flow of charge in unit time:

$$I = Q_e (1.157 \times 10^{-5}) /s = (6.16 \times 10^{13} \text{ C}) (1.157 \times 10^{-5}) /s = (7.127 \times 10^8 \text{ C})/s.$$

Refer Fig.3.6. Magnetic field¹ intensity at a point N along the axis of a current carrying circular loop of radius r m at a distance b m from the ring is

$$H = r^2 i / 2 b^3 = r^2 i / 2 (r^2 + l^2)^{3/2} \quad \text{A/m} \quad (3.9.1)$$

where, i A is the current and l is the axial distance of the point from the loop center. In case of the spherical Earth, l = r; N: North magnetic Pole; i: dc current in the ionosphere. Therefore, from (3.9.1)

$$H = r^2 i / 2 (r^2 + r^2)^{3/2} = i / (2 \sqrt{8}) r \quad \text{A/m.} \quad (3.9.2)$$

Substituting radius of the Earth R_e for r in (3.9.2)

$$H = i / (2 \sqrt{8}) R_e = (7.127 \times 10^8 \text{ C/s}) / 2.828 (6.37 \times 10^6 \text{ m}) = 0.198 \times 10^2 \text{ A/m.}$$

Converting A/m in oersted (CGSM)

$$H = (0.198 \times 10^2 \text{ A/m}) 4 \pi \times 10^{-3} = 0.249 \text{ Oe} \quad (3.9.3)$$

¹ Standard Handbook for Electrical Engineers—Donald G. Flank/H. Wayne Beaty; page: 2-6.

which is less than the presently accepted value of magnetic field intensity¹ of 0.66 Oe at the poles. One reason for this discrepancy could be in taking the velocity field of 0.466km/s (at the surface of the Earth) for the calculation of the charge of the Earth, even when the spherical zone up to the ionosphere, where velocity field is 7.8km/s, is under consideration in the above analysis. An average of velocity fields at the Earth surface and in the ionosphere is: (0.466km/s + 7.8km/s)/2, that is, 4.13 km/s. With this value, the circulating current in the ionosphere will proportionately increase; and with similar calculation as above, the magnetic field strength at the poles is found to be 2.2 Oe, which is close to the value 2 Oe found in some regions.

3.10 *Mass of the Earth and its Orbital Stability*

The mass of the Earth cannot be computed from (3.5.6.12), as is being done presently (classical physics), because of the problems discussed in Sec.3.5.6. However, mass can be determined by analyzing the stability of the Earth in its orbit, taken circular for easier calculation.

In Fig-3-7, the velocity field of the Earth's vortex (b) has been superposed (c) with the solar-vortex velocity field (a). Though there is no relative motion between the Earth and the surrounding space, yet the pressure (action of the downward field) from space, proportional to the resultant inward-acceleration-field produced by the above velocity fields, acts on the Earth's center; just as a body, static on the Earth surface is subjected to the inward free fall acceleration. As seen in the figure (c), the velocity field on the farther side of the Earth is increased, whereas, on the side nearer to the Sun has decreased, due to which, the resultant acceleration field "a" acts inward on the Earth which is moving along the orbital radius r, and is given by:

$$a = (29.8 \times 10^5 \text{ cm/s} + 7.8 \times 10^5 \text{ cm/s})^2 / r = (1.413 \times 10^{13} \text{ cm}^2 / \text{s}^2) / r. \quad (3.10.1)$$

The inward force F on the Earth (center) due to the above acceleration and in opposition to the electrical repulsive force (3.6.5) is

$$F = M_e \times a = M_e (1.413 \times 10^{13} \text{ cm}^2 / \text{s}^2) / r. \quad (3.10.2)$$

Equating the above two opposing forces acting radially on the Earth, from (3.6.5) and (3.10.2)

¹ Hand book of elementary physics—N. I. Koshikin, M. G. Shirkevich; Mir Publishers, Moscow.

$$M_e (1.413 \times 10^{13} \text{ cm}^2/\text{s}^2) / r = 2.12 \times 10^{27} \text{ dyne.} \quad (3.10.3)$$

Substituting, $r = 150 \times 10^{11} \text{ cm}$ in (3.10.3)

$$M_e = 2.25 \times 10^{24} \text{ kg,}$$

which is 2.66 times less than the presently accepted value ($5.98 \times 10^{24} \text{ kg}$). The masses of other planets computed on similar basis are tabulated in Table 1. It appears that the electrical repulsive forces from the Sun, Jupiter, Saturn and Neptune, acting some time in past at the time of their alignment (if such alignment is possible), have tilted Uranus such that its axis is inclined with respect to the planetary plane by almost at right angles; it is therefore that the velocity field due to its axial rotation has not been taken into account for calculation of the inward force that opposes the electrical repulsion; though, in case of the Earth (3.10.1) and other planets, the resultant of velocity fields (due to axial as well as orbital rotations) has been taken for calculation of inward acceleration field.

The mass of the planets in Table 1 (Appendix) can be taken closer to the actual mass because these have been derived with orbital stability considerations, as compared to the values of mass in Table 2. It is seen from Table 1 that the presently accepted masses of the planets are wide apart from the actual values that they should have. Saturn should be about two and half times heavier in mass; Jupiter's mass is close to the actual value; Mars is nearly twice as massive as presently considered; Both Uranus and Neptune should have nearly the same mass. The proof for the correctness of mass of the planets, calculated from equations similar to (3.10.3), is provided in the following Sec. 4, by determining the orbital radii of the planets.

The forces on the Moon, Mercury and Venus¹ that do not possess space vortices around them, acting in their orbital motion are conjectured as follows.

In Fig.3-5 the Moon, shown in the space-vortex of the Earth, is subjected to an inward acceleration, v_m^2/r , created by the velocity field of the vortex and, hence, a central force, $M_m v_m^2/r$, acts on it towards the Earth's center. As the tangential velocity of the Earth's vortex carries the moon in the orbit, the above central force tends to deviate its path radially towards the Earth, thereby producing *relative motion* with respect to the space

¹ Period of rotation for Venus being 243 days, its electrical charge, compared to other planets, should be negligible.

medium, and creating an outward centrifugal force in opposition to the above-mentioned inward central force. In this way, a restraining force is produced that regulates movement in the orbit. In addition, gravitational attraction of the Earth is also operative. The stability of such cosmic bodies that do not rotate axially, in their orbits, is more complex than those possessing axial rotation.

3.11.1 *Orbital Radii of the Planets*

In (3.10.1), it is seen that the velocity-field that produces inward acceleration (and consequently inward radial force) on the Earth, is the resultant field obtained by the superposition of the fields of the Earth's space vortex as well as the Sun's space-vortex; and if this velocity field (Fig. 3-7c) is denoted by v_0 , then (3.10.2) becomes

$$F = M_e a = M_e v_0^2 / r. \quad (3.11.1)$$

Equating (3.6.4) for electrical repulsive force, with the above attractive force between the Earth and the sun

$$(c/4\pi) Q_s Q_e / r^2 = M_e v_0^2 / r, \quad (3.11.2)$$

and from above

$$r \propto Q_e / M_e v_0^2, \quad (3.11.3)$$

since, solar electric charge Q_s is a constant, unlike the planets, that have differing quantities of electrical charge. It follows from (3.11.3), that *the orbital radius of a planet (with axial rotation) is directly proportional to its electric charge, and inversely proportional to the mass; it also varies inversely as the square of the resultant velocity field, which, as defined above, is greater than the orbital speed of the planet.* Whereas, from Newton's Eq. (3.5.6.3), the expression for the orbital radius is:

$$r \propto 1 / v^2, \quad (3.11.4)$$

in which the orbital radius is independent of the mass and charge of a planet.

The constant of proportionality in (3.11.3) can be found by substituting the values (Appendix, Table 1) of the solar charge, and the

orbital radius, mass and the resultant velocity field (v_0) of any of the planets. We can, however, choose Jupiter, which, being the largest planet, and located in an orbit about six times less distant than Neptune, has better possibility of accuracy of its astronomically measured properties, like diameter, distance, rotation etc.

$$\text{From (3.11.3),} \quad r_j = K Q_j / M_j v_0^2, \quad (3.11.5)$$

where, r_j is the radius of Jupiter's orbit, Q_j is the electric charge of Jupiter; M_j is the mass, and v_0 is the resultant velocity field on Jupiter (Table 1).

$$\text{From (3.11.5),} \quad K = (r / Q_j) M_j v_0^2.$$

Substituting the values in the above equation

$$K = (778 \times 10^{11} \text{ cm})(8.34 \times 10^{29} \text{ g})[(41.8 + 13.1) \times 10^5 \text{ cm/s}]^2 / 6.4 \times 10^{26} \text{ CGSE},$$

from which

$$K = 3.06 \times 10^{30} \text{ g cm}^3 / \text{CGSE s}^2. \quad (3.11.6)$$

The orbital radius of the Earth is now found by substituting in (3.11.5), the values pertaining to Earth from Table 1, as follows.

$$r_{\text{earth}} = (3.06 \times 10^{30} \text{ g cm}^3 / \text{CGSE s}^2)(1.85 \times 10^{23} \text{ CGSE}) / (2.25 \times 10^{27} \text{ g})(37.6 \times 10^5 \text{ cm/s})^2$$

$$\text{from which,} \quad r_{\text{earth}} = 176 \times 10^6 \text{ km.}$$

The astronomical measurements² show that the Earth's orbit is 150×10^6 km away from the Sun's center.

The orbital radii of some other planets, computed on similar lines, are compared with the accepted values (in bracket) as follows. Mars: 228.8×10^6 km (228×10^6 km); Saturn: 1439×10^6 km (1430×10^6 km); Uranus: 2886×10^6 km (2870×10^6 km); Neptune: 4195×10^6 km (4500×10^6 km). (In case of Uranus, as explained in Section 3-10, velocity field due to axial rotation has not been taken into account, because this planet almost rolls on its side.) The above figures show striking closeness between the computed values and the experimental measurements.

² PHYSICS, 4th Edition, Volume 1, Resnic / Halliday / Krane.

The constant K determined (3.1.6) from the properties of Jupiter can be checked from (3.11.2) using the solar charge Q_s from (3.6.2), as follows. From (3.11.2)

$$(c/4\pi) Q_s = K$$

$$[(3 \times 10^{10} \text{ cm/s}) / (4 \times 3.14)] (0.928 \times 10^{28} \text{ cm}^3 / \text{s}) = 0.2216 \times 10^{38} (\text{cm}^4 / \text{s}) (1 / \text{s}) = K$$

From (2.12), using the relationship: $g = 8.6 \times 10^6 \text{ cm}^4 / \text{s}$

$$(0.2216 \times 10^{38} / \text{s}) (g / 8.6 \times 10^6) = 2.58 \times 10^{30} \text{ g} / \text{s} = K. \quad (3.11.7)$$

In (3.11.6), using the relationship of (2.5): $\text{cm}^3 / \text{s} = \text{CGSE}$

$$K = 3.06 \times 10^{30} \text{ g cm}^3 / (\text{cm}^3 / \text{s}) \text{ s}^2 = 3.06 \times 10^{30} \text{ g} / \text{s}. \quad (3.11.8)$$

The constant K derived with the solar charge (3.11.7) is close enough, compared with its value derived with the parameters of Jupiter (3.11.8).

With the derivation of (3.11.2) and the orbits of the planets from it, the following positive conclusions emerge: *The orbit of a planet is determined by its electric charge, mass, velocity field of the solar vortex propelling the planet, axial rotation of the planet, and the speed of light.* It is also seen that mass of the planets used for calculation of the orbits (Appendix, Table 1) are far different from the presently accepted values. Further, from (3.11.4), which cannot derive the orbital radii of the planets, it is evident that the celestial mechanics, used presently, is erroneous.

Referring again to (3.5.6.3), which is Newtonian expression for force between a planet and the sun, if the mass m of the planet, not being relevant mathematically as stated earlier, is cancelled from either side of the equation, then the essential element left out on the left hand side is v^2/r —the centrifugal acceleration developed in ‘ m ’. But, when ‘ m ’ itself is cancelled out, what is the entity on which this acceleration will work? The real answer is that irrespective of the existence of the planet (mass, m), the space-points on its orbit possess acceleration, v^2/r . However, this is a sensible statement only if the medium of space is accepted as a fluid reality, which remains unrecognized for gravitational interaction. Moreover, the most fundamental question as to *what* moves the planets in their orbits is not explained either by classical gravitational theory or by general relativity. Such are the considerations that go to prove inapplicability of Newton’s universal gravitational equation.

There are supporting arguments that any of the planets can be treated as a center in the solar system with respect to which the sun and the remaining planets can move, because, the issue involved here, after all, is one of *relative* motion alone. Such is the implication of the relativistic ideas generated in the 20th century as per which an observer on the Earth, compared to the one on the sun, is equally privileged to declare that he is the center of the solar system and the sun rotates around him. This conclusion is based on the empty–space concept wherein the motion of a body moving relative to space is not associated with velocity-field and, yet, its momentum due to motion is recognized. If the basic cause for momentum and kinetic energy of the moving body is not enquired, naturally, the existence of the velocity field is not revealed. The relative motion of a body static in space, with respect to an observer moving relative to the space medium, is an abstract motion, a mere appearance; whereas, the motion of the body relative to space is real, with momentum associated with the body. (Here, question can not be raised that space is undetectable, because, if that were the case, even an electron can not be created; the universe will be matter less.)

Returning to the earlier argument, when the Earth observer (E) considers himself as the center of the solar system, the sun will appear to him circling around the Earth center at 29.8 km/s (same as the orbital speed of the earth around the sun). Supposing that E postulates a space vortex theory similar to Descartes’ as per which the Moon is carried in its orbit at about 1km/s by the space-vortex around the Earth. Also, if he uses Kepler’s concept that some force from the sun drives the planets in their orbits at speeds in inverse proportion to the square root of their respective distances, he will postulate emanation of such a force now from the Earth, since he has taken the Earth as the vortex center. This vortex will extend all the way to the sun as well, moving it in an orbit at 29.8km/s relative to the Earth center. With the orbital motion of the moon and its distance from the Earth he will calculate the vortex constant (3.5.4.2), and using this constant and the distance to the sun, he will find the speed of the sun in its orbit around the Earth. Since the distance to the sun is 392.6 times greater than the distance to the Moon, E will find from his theory that the sun should have the orbital speed of $(1/392.6)^{1/2}$, that is, (1/19.8) km/s against the observed relative velocity of 29.8km/s. The result is absurd because the Earth is not the center of the solar system. Such a problem will not arise with the observer (S) at the sun. With a theory similar to E, S will determine the solar-vortex-constant with the orbital velocity and the distance of any of the planets, and get the same results on their rotation round the sun as observed. Thus, it gets evident that unless comprehensive enquiries are made on (a) the origin of the

free-fall acceleration, (b) agency behind the orbital rotation, (c) significance of the orbital distances, (d) forces leading to the stability of the planets, (e) direction of axial rotation of the sun as well as the planets, etc., the existence of the spatial interactions (velocity field) will remain hidden; and till the answers to the above are obtained through a basic universal theory, fallacious reasoning based, such as, on relative velocity in the above cited example, will continue to confuse physical analysis.

Gravitation

4.0 *Gravitational Field*

The origin of free-fall acceleration was shown in Chapter 3, to be due to the existence of the *acceleration field* in space surrounding the cosmic bodies with axial rotation. The *gravitational field*, however, has different origin; it is traced to arise from the very structure of electron, as analyzed below.

Consequent to the creation of the spherical void at the electron center due to limiting speed of space-circulation, the universal space is gravitationally energized (Fig.4.1a) through the transmission of the gravitational potential—a process starting from the interface of the electron and proceeding outwards at speed c , which is also the limiting speed for the transmission of potential in space. In this figure, the volume of space in the annular zone, marked Z, has already been gravitationally energized. Till the existence of the void—a zero-potential zone—the universal space will maintain its positive gravitational potential. The creation of matter means creation of independent voids (electrons)¹; which leads to higher gravitational potential in space. The energy used for creation of each electron is retained in space as gravitational/electrostatic potential—there being no reduction in the overall content of universal energy due to creation of electron. The gravitational process is discussed in detail below.

The creation of electron-void requires energy (2.14) of the magnitude, $(4/5) m_e c^2$, out of which as seen from (3.1.1.2), $(\pi/10) m_e c^2$, is distributed in space as electrostatic energy; whereas, the remaining, about $(1/2) m_e c^2$, stays in space as gravitational potential.

¹ Unless specific mention is made, electron will also signify positron.

In the continuous medium of the fluid-space, which is also incompressible, the volume of space equal to the volume of void¹ is pushed out spherically beyond the interface during void creation. Had the medium of space been a material fluid with certain compressibility, the displaced fluid would have formed a compressed-fluid-shell enclosing the interface and having a radial-width: $V/4\pi r_e^2$, where V is the volume of the void. However, the incompressible space can not retain a compressed-shell around the interface; due to which the displaced volume V of space continues flowing out at speed c as a compressive-shell with diminishing shell-width, and pushing space-points outward at each spherical space surface (Fig.4.1b), such that at a radius r from the void center, the radial length of displacement of a space-point is:

$$\Delta r = V / 4 \pi r^2. \quad (4.1)$$

Thus, the process of creation of electron displaces outwards each point of the universal space in due course; and this displacement remains a permanent feature in space till the existence of the electron. The length, Δr , can be defined to be proportional to the gravity field, g , of the electron at a radial distance r from its center. Expressing, V , in (4.1) in terms of electron-mass from mass equation (2.6),

$$g \propto \Delta r \propto (m_e / c) / 4 \pi r^2 = (k / 4 \pi c) m_e / r^2 \quad (4.2)$$

where k is a ‘constant of proportionality’ with the dimensions of, $1/T^2$, so that the dimensions of the gravitational field, g , obtained from (4.2) are: L/T^2 . Since the electron is the fundamental particle of matter, (4.2) is the expression of gravity field applicable in general, for all the nuclei, atoms and matter.

Due to the existence of the void at the electron center, the gravitational field is radial and inward, uniformly distributed on the interface. The space-circulation on the interface that produces electrical-field has no effect on the gravity field. It is seen from above that the actual mechanism of generation of the gravitational field is the creation of the central void in the electron structure and the reality of the space medium; but for them, with the modern concept of point-mass, the gravitational effect becomes inexplicable.

¹“Void” signifies the spherical void-volume at the electron center, unless otherwise specified.

4.1 Gravitational Interaction

Consider two stationary electrons A and B with an in-between distance R (Fig.4-2). Suppose the electrons, are not influenced by any external field except their own gravity fields, neglecting for the present their electric field also. The superposition of the inward fields between the particles, partially nullifies the fields; due to which the outer fields exert forces (F_a , F_b) to push the particles closer. Now, consider a case when the above two particles come into existence at different times. Let A be created at some instant; its gravity field will be transmitted across the distance R after a time R/c , and will continue to traverse further spherically outward at speed c . If, B is now created (later than A), its gravity field will reach A after a time R/c , and will gravitationally interact with A, because A, having been created earlier, possesses its gravity field already. Thereafter, as both the particles now have their fields (starting from their interfaces and spread-out, permanently, far in space) in contact with each other, they will have continuous gravitational attraction between them. We thus see that *if the instant of creation of matter is not involved, then, to debate whether gravitational interaction is instantaneous or with time delay is not a relevant issue*. That being the case, the Newtonian proposition that bodies (already existing) at a distance interact instantaneously and continuously, is right for the gravitational interaction. For example, the creation of the gravity field of the particles produced in particle accelerators coincides with the creation of the particles, and should interact instantly with the earth's gravity field, which is already existent at the point of particles' creation.

The above is not tenable as per modern physics (relativistic). If we take an example of electrical force between two charges that exist at some distance apart, and give a slight movement to one of them, it takes some time for the influence (electromagnetic field) to reach the second charge due to its transmission at speed of light. During the period that the influence transmits to interact with the second charge, it is argued that the momentum of the particles (charges) is not conserved. In order to conserve momentum at each moment, the field is ascribed with momentum. Because the process, which accounts for the property of mass to the particles, is yet to be known by the contemporary physics, such erroneous steps of endowing field with mass and momentum have been taken rather hastily.

In a later chapter it is shown that space-circulation, in the central zone of the sun and also around galactic center, reaches the limiting speed, thereby leading to a continuous creation of electrons, positrons, and atoms,

assembled from these particles. Even if half the fundamental particles are annihilated, the remaining half will lead to creation of cosmic matter, and the corresponding increase in the gravitational field within and beyond the solar system

4.2 Gravitational Constant

The gravitational constant for electron from (4.2) is

$$G_e = k / 4 \pi c \quad (4.3)$$

with the dimensions of, $1/LT$, because, k has the dimension of $1/T^2$, which is $1/s^2$ in CGS system of unit. Substituting the value of c in (4.3), the gravitational constant for electron

$$G_e = 1 / 4\pi (3 \times 10^{10} \text{ cm / s}) s^2 = 2.65 \times 10^{-12} / \text{cm s}. \quad (4.4)$$

The gravitational constant, experimentally determined, is:

$$G = 6.67 \times 10^{-8} \text{ g}^{-1} \text{ cm}^3 \text{ s}^{-2}.$$

Converting, gram, into cm^4/s , from (2.12):

$$G = (6.67 \times 10^{-8}) / (8.6 \times 10^6 \text{ cm}^4/\text{s})^{-1} \text{ cm}^3 \text{ s}^{-2} = 0.78 \times 10^{-14} / \text{cm s}. \quad (4.5)$$

The gravitational constant for electron (4.4) is about 339 times larger than the experimental value (4.5) of G ; because the experimental determination of G involves attraction between the atoms, rather than between free electrons. The theoretical value of G for atoms can be obtained as follows.

Consider the gravitational field of electron at its interface (4.2) where, $r = r_e$.

$$g = (k/4\pi c) m_e / r_e^2 = G_e m_e / r_e^2. \quad (4.6)$$

From mass equation (2.6) that expresses m_e in terms of r_e and c , (4.6) becomes

$$g = G_e (4\pi/3) r_e^3 c / r_e^2 = G_e (4\pi c/3) r_e. \quad (4.7)$$

From above it is seen that G_e is inversely proportional to the interface radius.

The nuclei of atoms, with dynamically stable spherical assemblies of electrons (discussed in later chapter), have their radii larger than the electron radius. Applying the proportionality between G_e and r_e given by (4.7) for electron, also between the gravitational constant G and the nuclear radius of an atom, the theoretical value of G has been approximately obtained below.

Consider the atom of lead, which was also the substance used by Cavendish in his famous experiment to determine the value of G . The atom of lead is 202.7 times the proton mass of 1.672×10^{-24} gm, that is, 3.39×10^{-22} g, or, $3.39 \times 10^{-22} \times (8.4 \times 10^6 \text{ cm}^4 / \text{s})$, which is $2.84 \times 10^{-15} \text{ cm}^4 / \text{s}$. If the radius of this nucleus is r_n , then from the mass-equation¹ (2.6)

$$(4\pi/3) r_n^3 = 2.84 \times 10^{-15} \text{ cm}^4/\text{s} / 3 \times 10^{10} \text{ cm/s}$$

or
$$r_n = 2.83 \times 10^{-9} \text{ cm.} \quad (4.8)$$

As stated above, assuming the gravitational constant's proportionality in the inverse ratio of the nucleus similar to the electron,

$$G = (r_e / r_n) G_e = (4 \times 10^{-11} \text{ cm} / 2.83 \times 10^{-9} \text{ cm}) 2.65 \times 10^{-12} / \text{cm s} = 3.75 \times 10^{-14} / \text{cm s.} \quad \text{---(4.9)}$$

Theoretically determined value of G computed above is 4.8 times larger than the experimentally determined value (4.5). The reason for this wide difference is analyzed below. It can, however, be concluded here that *the gravitational constant for the fundamental particle of matter is inversely proportional to the speed of light. Also, experimentally determined value of G should be greater for lighter nuclei with smaller radii compared to the heavier ones.*

As discussed earlier, during creation of electron, space is opened spherically up to the radius of the void; the inward gravitational field on its interface is uniformly distributed, and is directly proportional to the void-radius². Since, all universal matter is constituted of only electrons, basically, the Earth too, when taken spherical for simplicity, will have its inward gravity field directly proportional to the radius. Therefore,

¹ Mass-equation is applicable in a strict sense to only electron structure, which has a single void. Computing the nuclear radius with the use of mass-equation, will give approximate result due to the existence of space circulation around each electron-void in the nucleus; which has not been taken into account.

² "void-radius" means the radius of the "electron interface" or the "electron radius".

$$g \propto R_e. \quad (4.10)$$

The nuclei, atoms, and molecules of cosmic bodies, possess different densities. Therefore,

$$g \propto d \quad (4.11)$$

where d is the average density of Earth. From (4.10) and (4.11)

$$g \propto R_e d. \quad (4.12)$$

Similarly, gravity field of the Moon

$$g_m = R_m d_m \quad (4.13)$$

where g_m , d_m and R_m are gravity, density and radius of the Moon respectively. For gravity of the Earth and the Moon, we can assume, as explained below, that the constant of proportionality for (4.12) and (4.13) is the same.

Running ahead, in Chapter 7, that describes atomic structure, it is shown that the nuclei of atoms are constituted of electrons and positrons, held together with the strongest possible electrical and magnetic forces associated with these particles. Additionally, an inward force, due to a space-vortex enclosing the nucleus, also exists. *The nos. of electrons and positrons per unit volume can be assumed to be constant in all the nuclei.* The space-vortex around a nucleus carries with its circulation the orbital electrons (Fig.7-4). The forces arisen due to the interaction of velocity-fields in the neighboring atomic-vortices determine inter-atomic spacing, compressibility, elasticity, cohesiveness, etc. and, finally, determine density. It thus appears that the gravity field of the Earth (4.12), apart from the radius and density, is not dependent on any other property. Therefore, constant of proportionality in (4.12) and (4.13) will be the same.

From (4.12) and (4.13)

$$g / g_m = R_e d / R_m d_m$$

$$\text{Or} \quad g_m = g R_m d_m / R_e d. \quad (4.14)$$

Substituting, presently accepted values of various quantities in (4.14)

$$g_m = [(9.81 \text{ m/s}^2) 1740 \text{ km} (3.34 \text{ g/cm}^3)] / 6400 \text{ km} (5.52 \text{ g/cm}^3)$$

$$=0.164 \text{ m / s}^2,$$

against the presently accepted value of 0.167 m / s^2 for the gravity at the Moon. With this procedure, gravity fields for the planets, Mercury and Venus, that do not have space-vortex around them, come out close to the accepted values, 3.81 m/s^2 (3.78 m/s^2), 8.78 m/s^2 (8.6 m/s^2), respectively, where the quantities in the brackets are today's accepted figures. The above results confirm validity of (4.12).

Since, the average density of the Earth is

$$d = M_e / \text{Volume of Earth} = M_e / (4\pi/3) R_e^3,$$

substituting this in (4.12)

$$g \propto [M_e / (4\pi/3) R_e^3] R_e = [K_g / (4\pi/3)] M_e / R_e^2. \quad (4.15)$$

where K_g is a constant.

Eq.(4.15), expresses the force of attraction that the Earth exerts on its surface on unit mass and, quantitatively, leads to a general Newtonian equation for the gravitational attractive force between any two masses, M and m , distant R from each other, and at rest with respect to the surrounding space:

$$F = [K_g / (4\pi/3)] M m / R^2. \quad (4.16)$$

Comparing (4.16) with Newton's equation (3.5.6.10), which is used to determine the gravitational constant G , it is seen that

$$G = K_g / (4\pi/3)$$

Or
$$K_g = G (4\pi/3). \quad (4.17)$$

From above relationship, it is concluded that the value of G , accepted today, is $(4\pi/3)$ times smaller than what should be its actual value. This corroborates the earlier finding (4.9) in which theoretically derived value of G was seen to be about 4.8 times larger.

Assuming, for the present, that the free-fall acceleration derived earlier is the same as the gravitational field g , the value of G to be used to

calculate Earth's mass will be: $G = (4\pi/3) 6.67 \times 10^{-11} \text{m}^3 / \text{kg s}^2$; and Earth's mass from (3.5.6.12) is

$$M_e = [1/(4\pi/3) 6.67 \times 10^{-11}] \times (9.81) (6.400 \times 10^6)^2 = 1.44 \times 10^{24} \text{ kg}, \quad (4.18)$$

which is 4.15 times smaller than the accepted figure to day. The mass of Earth calculated in Section 3-10, from the considerations of its orbital stability, was also found to be 2.66 times less. Taking average of the above two values, it can be concluded that the Earth is about 3.4 times lighter than what it is presently considered to be; its average density will be about 1.62 g/cm^3 , which is close to the average density of the Earth's crust, rather than 5.5 g/cm^3 as now believed.

Because of increase in the magnitude of G , mass of the Sun will be $4\pi/3$ times less (Appendix, Table 1) than the present value. Here again, it is assumed that free-fall acceleration of the Sun (3.5.3.3), calculated from its space-vortex, is the same as its surface gravity.

It appears that Newton's equation on universal gravitation, with corrected value of G , may be applicable only for those cosmic bodies that do not have axial rotation.

4.3 *Gravitational Effect on the Universal Space*

The continuity of the medium of space is broken at the centers of the innumerable electrons (and positrons) created due to space-circulation. These particles further assemble cosmic matter (discussed later). The additional volume of these independent voids increases the overall expanse of the universal space. In this sense, a finite universe of the substantial space of vast expanse and imagined to be spherical due to symmetry-consideration, does expand in its overall volume with the creation of cosmic matter and shrinks back in volume due to annihilation of electrons and positrons.

4.4 *Inter relationship between Light and Gravity*

Consider an electron oscillating about its center with displacement dR as shown in Fig.4.3. At a point P at a distance R from the electron center, where the gravitational field from (4.6) is, $G_e m_e / R^2$, the gravitational potential energy is:

$$U = G_e m_e^2 / R. \quad (4.19)$$

The oscillation of the electron changes the distance R of P by dR on its either side, due to which the potential U undergoes cyclic changes in its magnitude. The effect of the changes (increase and decrease) of potential starts from the interface of the electron, and transmits to P at speed c. It is this process of ‘time varying potential’ at a point in space, resultant due to the oscillation of electron or atom (analyzed in detail in the later chapter), that produces light. From (4.19)

$$dU / dR = - G_e m_e^2 / R^2 = - G_e m_e (m_e) / R^2. \quad (4.20)$$

Expressing m_e (in bracket) in terms of r_e and c from (2.6); substituting: $k / 4 \pi c$ for G_e , from (4.3); and $R = r_e$ to determine the potential gradient at the interface

$$dU / dR = -(k / 4 \pi c) m_e [(4\pi/3) r_e^3 c] / r_e^2 = -k (m_e c r_e) / 3c.$$

Or
$$dU/(dR/c) = k (m_e c r_e)/3. \quad (4.21)$$

The quantity, dR/c , is the time duration for the transmission of the potential changes across dR , and can be written as, dt . Multiplying and dividing right hand side of (4.21) by $4/5$,

$$dU/dt = k (4/5) m_e c r_e (5/4)/3. \quad (4.22)$$

The quantity, $(4/5) m_e c r_e$, is the angular momentum (L) of electron (2.15) derived earlier; its numerical value is found by substituting the known values of m_e , c , and r_e :

$$L=(4/5)(9.108 \times 10^{-28} (3 \times 10^{10} \text{ cm/s}) 4 \times 10^{-11} \text{ cm}) = 0.88 \times 10^{-27} \text{ erg s.}$$

The dimensions of L are the same as that of Planck constant; also, the numerical value of L for electron, calculated above, is about 7.5 times smaller than the Planck constant, $h = 6.62 \times 10^{-27} \text{ erg s}$. However, Planck constant was determined in experiment with thermal radiation produced due to atomic vibration, and not with the oscillation of free electron¹ being

¹ It is shown further that rotation of electron in atomic orbit is not the basic cause of radiation (production of light).

analyzed here; therefore, close numerical agreement of the values of L and h are not expected. Under these considerations, it is defined that at a point in space, “time varying gravitational potential” due to oscillation of an electron, produces energy proportional to the Planck constant. Substituting: $h = (4/5) m_e c r_e$, in (4.22), gives the basic equation on the inter relationship between gravity and light:

$$dU/dt = (5k/12) h. \quad (4.23)$$

4.5 Planck Constant in Thermal Radiation

The basic-relationship (4.23) can be checked, by analyzing the vibration of a single atom. Let us choose an atom of average atomic weight, say 120 times the proton mass. Its mass:

$$m_a = 120(1.67 \times 10^{-24} \text{ g}) = 2 \times 10^{-22} \text{ g}$$

which from (2.12) becomes

$$m_a = 2 \times 10^{-22} (8.6 \times 10^6 \text{ cm}^4 / \text{s}) = 1.72 \times 10^{-15} \text{ cm}^4 / \text{s}.$$

The volume of this nucleus is

$$V_a = (4\pi/3) r_n^3$$

where r_n is the radius of the nucleus of the atom.

Mass-equation (2.6), though applicable to electron in a strict sense, can also be used for the nuclear structure because, as explained later, density of distribution of electrons and positrons in all nuclei is the maximum. Therefore, from above

$$V_n = (4\pi/3) r_n^3 = m_a / c,$$

and

$$r_n = (3 m_a / 4\pi c)^{1/3}.$$

Substituting the value of m_a derived earlier,

$$r_n = [3 \times 1.72 \times 10^{-15} \text{ cm}^4 / \text{s} / 4\pi \times 3 \times 10^{10}]^{1/3} = 2.39 \times 10^{-9} \text{ cm}. \quad (4.24)$$

The gravitational potential energy at the surface of the nucleus

$$U = G m_a^2 / r_n. \quad (4.25)$$

Substituting known value of G, and of m_a and r_n computed above,

$$U = 6.67 \times 10^{-8} \text{ g}^{-1} \text{ cm}^3 \text{ s}^{-2} (2 \times 10^{-22} \text{ g})^2 / 2.37 \times 10^{-9} \text{ cm} = 11.156 \times 10^{-43} \text{ erg}. \quad (4.26)$$

Supposing that the average period of oscillation of an atom as 10^{-15} s, the duration (dt) of the change of the gravitational potential at the nuclear surface is $(1/2) 10^{-15}$ s. Substituting in (4.23) the above value of dt and of U computed in (4.26)

$$dU / dt = 11.156 \times 10^{-43} \text{ erg} / (1/2) 10^{-15} \text{ s} = (5 / 12 \text{ s}^2) h.$$

From above, $h = 5.36 \times 10^{-27} \text{ erg s}. \quad (4.27)$

The above result, theoretically obtained, compares close to the experimental value ($6.62 \times 10^{-27} \text{ erg s}$) of h, thus proving that the *light-effect at a point in space is produced due to time-varying gravitational potential at that point.*

4.6 *Electromagnetic Energy*

A free electron is not a force-free particle, because, even when imagined to be free from external influences, it has inwardly directed gravitational and acceleration fields; these fields which can be named as “structural fields” can keep the electron’s interface stationary due to their symmetrical distribution. However, when interacted with the fields of other matter, the electrons and particles/atoms constituted by the electrons (positrons) are invariably in motion/oscillations around their centers (Fig.4-4). These vibrations, as discussed above, produce in space, pulsations of potentials associated with the vibrating particles, thus, producing the effect of light without any reduction of their structural energy. The electromagnetic energy (light) at a point in space is the effect from the *already-existing potentials* at that point. In this sense, it is not the basic form of energy, because, but for the gravitational potential created by the atoms (neutral), light-effect¹ will not exist.

¹ Discussed in Chapter 8.

Universal Constants

5.0 *Speed of light and Electron Radius*

The Gravitational constant, speed of light, Planck constant, and elementary charge, are considered, presently, fundamental constants in physics. In addition, mass, dielectric constant and permeability constant of vacuum have also been found to be the fundamental constants through this work. The Planck's constant, which plays a central role in quantum physics, has been shown (4.23, 4.27) to be a *derived* quantity; one applicable to the electron, and the other for the atoms. Planck' constant for electron is proportional to c , r_e and m_e . The mass and charge of electron (2.6, 2.4) have been expressed in

terms of c and r_e in mass and charge equations—most fundamental relationships, not yet found in the contemporary physics. The dielectric constant for vacuum (3.1.1.2), permeability constant of vacuum (3.1.1.5), and gravitational constant (4.3) are shown to be inversely proportional to c .

The Planck constant, as a derived quantity, has serious implications on the applicability of Heisenberg uncertainty principle and, consequently, on the very foundations of quantum theory, in which h has been used as a fundamental constant. This will lead to the revival of the “deterministic” approach, presently abandoned by the quantum mechanics. Further, as stated above, since “mass” and “charge” have been derived with the use of the universal constants c , and, r_e , the mystery as to why the electron’s charge and mass have certain definite values, stands explained. The modern physics recognizes all the above constants *independent of each other* because of the obscurity on their origins and, hence, their interrelationship remains unexplained.

5.1 *Fine Structure Constant*

There is also a dimension-less number—the “fine structure constant”, expressed as

$$\alpha = q_e^2 / 2 \epsilon_0 h c \approx 1 / 137. \quad (5.1)$$

This dimension-less constant is presently considered to be central to the theory of quantum electrodynamics. Expressing the constants in (5.1) in terms of c and r_e as per the fundamental definitions to these constants given earlier in this work

$$\alpha = [(\pi/4) (4\pi r_e^2 c)]^2 / 2 (\pi/2c) (4/5) (4\pi/3) r_e^3 c c r_e c = (15/16) \pi^2 \approx \pi^2. \quad (5.2)$$

From (5.2) it is seen that the “fine structure constant” reduces approximately to π^2 rather than 137, showing, thereby, that there is no special significance of the number 137, except that it could be a cumulative experimental errors in the experimental determination of the various constants in (5.1).

5.2 *Lande g-Factor*

The Lande g -factor (quantum mechanics) is a dimensionless- constant, which for a static electron (not in orbit) has a magnitude of two. It is expressed as

$$\mu = -g (q_e / 2 m_e) j. \quad (5.3)$$

In (5.3), μ and j are the magnetic moment and angular momentum of a static electron due to its charge and intrinsic spin. Substituting the value of j from (2.15), and μ from (2.16), in (5.3)

$$g = (3/4) q_e c r_e / (4/5) m_e c r_e (q_e / 2 m_e) = 1.875. \quad (5.4)$$

It's the coefficients in the expressions of charge equation, magnetic momentum and the intrinsic angular momentum of electron that determine the numerical 1.875. Any other special meaning of the no.2 for this constant is most unlikely.

5.4 *Universality of Limiting Angular Velocity of Space*

The limiting angular velocity of space, ω , as the ratio of the speed of light c , and the radius r_e of the central void in electron structure, is the universal constant of the underlying universal substratum that unifies all other fundamental constants as explained above. In physical terms it can be stated that the limiting velocity gradient (ω) in the nonmaterial fluid space, when the same is in circulation, and the transmission of fields and potentials at a constant speed (c) relative to it, are the only two absolute properties that the universe possesses. Though, the universality of the speed of light is *partly* recognized classically as the speed of transmission of light *with respect to* the absolute vacuum; the postulated limit to the *flow* of the absolute vacuum itself at speed of light is the new aspect of this theory.

An interconnection between Faraday's law of induction and Ampere's laws of electrodynamics was established (1846) through the works of Weber¹, whose expression for a force between two current elements had a constant that had the dimensions of velocity, and value of about 3×10^{10} cm/s; Kirchhoff too discovered that a perfectly conducting aerial wire conducted disturbance at the same speed as that of light in vacuum. The value of a constant used in Maxwell's equation also turned out to be the same as those of Weber's and Kirchhoff's. This led Maxwell to conclude that light is an electromagnetic effect. In a somewhat similar way, as detailed in Sec.2-4, the formulation of the definition of electron charge (2.4), in which speed of

¹ Sir Edmund Whittaker; "A History of the Theories of Aether and electricity"; The Classical Theories. Thomas Nelson and Sons Ltd. New York.

light is a factor, got confirmation from the experimentally determined value of the electron charge and, thereafter, the Coulomb constant, dielectric constant, permeability constant, were easily derived and shown proportional to the speed of light.

Chapter 7

On Motion of Electron

6.0 Magnetic Field

The electron has an axis of rotation at right angles to which is the diametrical plane of its space vortex (Figs.2.2, 2.3). The observed pattern of the circular magnetic field distribution around a current carrying conductor, though of representative nature, yet, gives an indication that the natural motion of an electron in an electric current flowing in a conductor is along its axis of vortex rotation, because, the streamlines of the fluid-space in the electron vortex are concentric with the electron axis. Keeping this similarity, between the velocity-field in the space vortex of an electron and the magnetic field produced due to its motion (relative to space), in mind, the fundamental nature of the magnetic field associated with a moving electron has been determined as follows.

In Fig.6.1a, an electron is shown moving along the X-axis uniformly at velocity v relative to space, passing through a transverse plane Y-Z. At each point of the circle of the interface, cut by the plane Y-Z, tangential velocity u of space is $c \sin \theta$; whereas, in position-1 (Fig.6.1b), when P coincides with the origin, $u = 0$, since the radius of the circle, cut by the interface and the plane Y-Z, is zero there. The maximum value of u is in position-2 (6.1c) where Y-Z plane coincides with the diametrical plane of the interface, and

half of the interface has passed through Y-Z. Thus, when the spherical interface passes through the plane Y-Z up to a horizontal length r_e , a circle enclosing a void opens up in the Y-Z plane with its center coinciding with O, during a time interval r_e / v . Looking from a point on $-X$ axis, the interface of the electron imparts clockwise-spin to the circle of intersection, C, due to which it possesses circulation varying from zero in position-1, to a maximum of, $2\pi r_e c$, in position-2 during the period r_e / v . Starting from the instant of position-2, a reverse process starts, when the circulation imparted by the interface to the successive circles of intersection continuously reduces from the above value to zero in time interval r_e / v , (6.1d).

Referring to Fig.6.1a, a point P_1 at the intersected circle has the tangential velocity, $c \sin\theta$, and the radius of rotation, $r_e \sin \theta$; the velocity moment, $(c \sin\theta) r_e \sin\theta$, varies from zero in position -1, to a maximum, $(c \sin \pi / 2) r_e \sin \pi / 2$, that is, $c r_e$, in position -2, during time interval r_e / v . During the uniform motion of the electron, the tendency of its interface to impart circulation to the circles intersected by the Y-Z plane is reacted by the fluid-space as a “counter spin impulse”, which manifests as a concentric circle with magnetic field at each point of the circle, and the effect transmitting out radially at speed c (Fig.6-2).

During the time interval, $2r_e / v$, which is the time required for the interface to pass through the Y-Z plane, the “radial spread” of the “counter spin impulse” in the Y-Z plane will be, $c (2r_e/v)$, since the field and potential effects are transmitted in space at constant speed c ; this “radial spread” is to be taken as the “radial width” of each circular magnetic field line (Fig.6-2). Along half the radial width, which is, $c r_e / v$, the “velocity moment” varies from zero to $c r_e$, and then decreases back to zero. The maximum gradient of the velocity moment within half of the radial-width of the magnetic field line is: $c r_e / (c r_e / v)$, that is, v ; which is defined as the magnetic field vector B , acting at each point of the interface-circle intersected by the Y-Z plane. If the electron moves at speed approaching c , then, a circle of radius r_e , coinciding with the interface in the plane Y-Z, will have at each of its point tangential magnetic field B , now approaching c in its magnitude. Since the circulation, $2\pi r_e c$, creating the B vector around a circle with perimeter $2\pi r_e$ initially, is distributed on successive circles with increasing radii, the magnetic field B at a radial distance r from the origin and in the Y-Z plane, for the electron moving at velocity v relative to space, will be

$$B = v r_e / r. \quad (6.1)$$

The “counter spin impulse”, as the reaction from space, causes the direction of the B vector opposite to the interface spin (Fig.6-2). As seen from (6.1), *an electron, with zero velocity relative to space, will have no magnetic effect.*

6.1 *Ampere’s Law*

From Ampere’s Law, the lines of magnetic induction for a straight wire carrying a current i , are concentric circles centered on the wire. At a radial distance r , B is given by

$$B = \mu_0 i / 2 \pi r, \quad (6.2)$$

where μ_0 , the permeability constant, is derived with the use of charge equation (2.4) as follows.

The electric current i due to a single electron is:

$$i = dq / dt = q_e / dt. \quad (6.3)$$

An electron in linear motion at velocity v crosses a transverse plane (discussed in Section 6.0) in time duration, $2r_e / v$. Substituting this quantity in place of dt in (6.3), and expressing q_e in terms of r_e and c from (2.4)

$$i = (\pi/4) (4\pi r_e^2) c / (2r_e/v) = \pi^2 r_e c v / 2. \quad (6.4)$$

Rearranging the terms in (6.4)

$$v = i (1/ \pi r_e) (2 / \pi c) (2 / 2) = i (4 / \pi c) (1/2\pi r_e). \quad (6.5)$$

From (6.1), when $r = r_e$, $B = v$; substituting in (6.5), B in place of v , and r in place of r_e ,

$$B = i (4/\pi c) / 2\pi r. \quad (6.6)$$

From (3.1.1.5), $\mu_0 = 2 / \pi c$; substituting this in the above equation

$$B = 2 i (\mu_0 / 2 \pi r), \quad (6.7)$$

which is Ampere’s Law, except for the coefficient 2, which could appear due to axisymmetric charge distribution in electron vortex, rather than the assumed spherical symmetry of the point-charge.

6.2 *Constancy of Electron Mass*

As discussed earlier (Sec.3.3) an electron in motion relative to space is associated with velocity field that endows electron with momentum and kinetic energy. As long as the speed of electron does not reach c , the fluid-space gets displaced at the same speed as the moving interface of the electron; however, when the speed of electron approaches c , the flow of space ahead of the electron reaches the limiting-speed and breaks down into sub micro voids that may form stable electrons. If a beam of charged particles, say, electrons or protons, accelerated at speed close to c , collides with an oppositely moving beam of the same particles, the collision will create out of the kinetic energy of the particles in the beam, several additional particles (stable as well as unstable), starting *invariably* with electrons and positrons. In such experiments of particle collisions, the additional particles formed are created from the velocity field (space-circulations produced on impact between particles) associated *externally* with the colliding particles, and are not necessarily the particles expelled from their internal structure. *The mass of the particles moving either with the space, or relative to space, does not change with speed.* What happens, however, is the *reaction from space* on all moving matter, which becomes noticeable at speeds close to c when particles are accelerated in particle accelerators.

An electron is shown moving uniformly (Fig.3.2a) at velocity v relative to space at right angles to the plane Y-Z. At point P, due to tangential velocity, $v \sin\theta$, an inward acceleration: $a_r = v^2 \sin^2\theta / r_e$ is produced. The maximum value of a_r is, v^2/r_e , when $\theta = \pi/2$.

Fig.6.3 shows an electron moving relative to space at uniform velocity v along X-axis under a vertical magnetic field B . Consider the interface-circle C, cut by the Y-Z plane, and the points A and D where the Y-Y axis meets this circle. The inward acceleration, a_r , acts radial on each point of C, and creates a force:

$$F_m = m_e v^2 / r_e = m_e (v^2 / c^2) (c^2 / r_e), \quad (6.8)$$

acting inwards on the points A and D. In addition to these mechanical forces arisen due to electron motion relative to space, there is also the magnetic force:

$$F_B = q_e v B, \quad (6.9)$$

which is produced due to B acting on the magnetic field created by the moving electron. Looking from the $+X$ -axis towards the approaching electron, this field will have clockwise direction, opposite to the anticlockwise direction of the interface-spin (Fig.6-3b). The magnetic force on the electron will be in the direction shown, due to which its trajectory in the X - Y plane will be as shown in Fig.6-3a. Expressing q_e in (6.9) in terms of r_e and c , from (2.4),

$$\begin{aligned} F_B &= (\pi/4) (4\pi r_e^2 c) v B = (\pi/4) (3/r_e) [(4\pi/3) r_e^3 c] v B. \\ &= (\pi/4) (3/r_e) m_e v B \end{aligned} \quad (6.10)$$

where the quantity within the bracket, from mass equation (2.6) is m_e . The net force on the electron is, $F_B - F_M$, at point A, causing the electron to move in a trajectory of radius r . The centrifugal force on the electron to oppose the above deflecting force is

$$m_e v^2 / r = F_B - F_M. \quad (6.11)$$

It is seen from (6.8) that F_M is directly proportional to v^2 / c^2 , whereas, from (6.9), F_B is directly proportional to v . Therefore, at $v \ll c$, there is hardly any reduction in the net force due to F_M , however, at speeds nearer to c , the increased value of F_M will reduce the net force appreciably (6.11), thereby, making the trajectory of the electron flatter, as observed experimentally.

Substituting F_B from (6.10), and F_M from (6.8) in (6.11)

$$m_e v^2 / r = (\pi/4) (3/r_e) m_e v B - m_e v^2 / r_e$$

from which,

$$r = 4 v r_e / (3 \pi B - 4 v) \quad (6.12)$$

whereas, classically,

$$r = m_e v / q_e B. \quad (6.13)$$

Expressing m_e and q_e in (6.13) in terms of r_e and c from (2.6) and (2.4)

$$r = [(4\pi/3) r_e^3 c] v / (\pi/4) (4\pi r_e^2 c) B = 4v r_e / 3\pi B. \quad (6.14)$$

A comparison of (6.12) and (6.14) shows that for the same values of v and B , the radius of trajectory r , calculated from classical expression (6.14), is smaller than the value computed from (6.12) in which reaction from space is taken into account. Therefore, with the increase in v , the value of r from (6.12) will increase at a faster rate than from (6.14). If electron is moved at speed c , then from (6.1), B will have maximum value c when $r = r_e$. Substituting c for both B and v in (6.12), $r = 4 r_e / (3 \pi - 4)$; and from (6.14), $r = 4 r_e / 3 \pi$; the ratio of these two values is: $(4r_e / 3\pi - 4) / (4r_e / 3\pi)$, which is: $3\pi / (3\pi - 4) \approx 1.738$. Thus, at speed approaching the speed of light, the radius of trajectory of an electron moving transverse to a magnetic field of the highest strength, will be 1.738 times larger than the value obtained from classical physics, on account of the reaction from space (generation of additional inward acceleration field on the interface); and not because of the increase of its basic mass, as concluded by relativity theory. *The mass-equation (2.4) is independent of the speed of electron relative to space.*

6.3 Orientation of electron in Electrostatic and Magnetic interaction –the Physical Aspects

The distribution of velocity-field in the space-vortex of electron, as discussed earlier, is a maximum within the diametrical plane at right angles to the axis of rotation. These circular streamlines in the vortex, during its motion relative to space, are converted into magnetic field lines (Section-6.0), such that at a particular instant, points on these streamlines have either steady velocity-field (producing electric field), or *varying magnitudes* of velocity-field, that produce magnetic field. The magnetic field is the *effect* of the *decreasing magnitude* of the velocity-field, which is the *cause*. The magnetic attraction between parallel-moving electrons (relative to space), and magnetic repulsion between an electron and a positron in parallel motion, develop maximum at right angles to their motion because of the above mentioned configuration of the magnetic field with respect to the line of motion of the electron (Figs.6.4, 6.5). Free electrons (considering two of them), assumed *static* and in close range, will reorient their vortices through the mutual action of their velocity fields, so that these fields become unidirectional in space in-between them; and thus create an attractive electrical force; similarly, two electrons in close range, assumed to be in parallel motion, will have such directions of the velocity fields in their

vortices so that the magnetic field in-between them are in opposite directions; and thus create magnetic attractive force (Fig.6.5).

It is a known fact that the direction of an electric current is conventionally taken opposite to the flow of the electrons. Applying the “corkscrew” rule (Fig.6.6), an anticlockwise direction of the magnetic field around a current carrying conductor, signifies the current direction up the paper; and therefore the electrons in the current will flow down the paper. And, since the direction of the magnetic field around the current carrying conductor has to be opposite to the velocity field in the electron vortex (Section 6.0), the down ward moving electrons should have clockwise direction in their vortices. An electron moving away from an observer (A) will be seen by A to have clockwise vortex as it proceeds forward. There appears to be a *preferred* direction of motion of electron governed by the rotation of space in its vortex, when it moves in its *natural* mode as electric current. That explains the reason for the emission of only *negative* beta particle (electron) from all the beta-active elements existing in nature; because, under the force of expulsion within the nucleus, the particle – either electron or positron (oppositely oriented electron)— released and projected from the nucleus, gets oriented with the clockwise vortex-spin similar to the electron for onward motion.

6.4 *Annihilation of Electron and Positron*

Under the attraction (Fig.2-5b) due to the unidirectional velocity field in between the particles (electron and positron), they rotate as their vortices roll over moving around each other till annihilation takes place (Fig.8-1). Inward acceleration field c^2/r_e , acting externally on the interfaces, provide the crushing force that brings the particles closer till the vortex fields of each particle superpose; and being equal and opposite in direction to each other, are nullified leading to annihilation. (Fig.2.5a, shows repulsion between two electrons due to oppositely directed velocity fields in between the particles, whereas, quantum mechanics wrongly postulates this repulsion due to the exchange of virtual photons.)

6.5 *Orbital Electrons*

Another example of rotational motion of electrons is in the vortices of the atoms. In Fig.7-5, the simplest atom of Hydrogen is shown. The nucleus,

in this case is a neutron enclosed within a space- vortex, which gives it the properties of electric charge, and also another name, proton. The neutron is a dynamic assembly of electrons and positrons because of the natural constraint in the creation of only electron as the stable fundamental particle. The oppositely directed velocity fields of the electron and proton nullify each other in the region external to the atom, thus endowing it with the property of overall neutrality. The nuclear vortex (proton vortex) makes the region in the neighborhood of the nucleus filled with energy – the velocity and acceleration fields—that carry the electron around and impart it with the kinetic energy in case of its ejection due to external interaction, if it is of the required strength as it happens in the photoelectric effect with larger atoms. The prevailing ideas on the existence of emptiness around the nucleus, makes the continuing orbital motion of the electron an impossible fact. In a larger atom, the nos. of electrons and positrons in the nucleus depend upon its mass, whereas, the nos. of the orbital electrons are determined by the electric charge of the nuclear vortex to be neutralized.

The electron vortex, bound with the proton vortex through the common velocity field in between them, rolls over and circles it ceaselessly, there being no loss of energy from either of the vortices (discussed further) due to the non viscosity of space. In quantum mechanics the electromagnetic attraction between the orbital electrons and the positively charged protons in the nucleus is attributed to the exchange of mysterious (virtual) mass less particles, photons, because it is unimaginable as per the tenets of the contemporary physics that the space-circulation can produce electric charge and a real force on the particles.

6.6 *Electric Current*

The electric current in a conductor is a process of motion of orbital electrons of the atoms in between the neighboring atoms under an *attractive* force. This explanation is in contrast to the prevalent concept, as per which, the electrons constituting a current are *forced* by the electromotive force applied across the conductor, to move in a circuit against the repulsive forces in between them. Consider three atoms, A, B, C, located adjacent to each other in a conductor of electric current. Let a positive polarity (P) of a generator, created due to shortage of electrons there, come in contact with the atom A. On contact with P, A will lose some of its orbital electrons due to the attraction from P, and would thus become positively charged; and consequently, the velocity field in its vortex being no more nullified, will

pull out the orbital electrons of B in equal numbers that it has lost to P. Now B, having been positively charged, pulls out the orbital electrons of C and, this way, the process of flow of electrons, from atom to atom, continues in the whole circuit. Though, work is done by the space-vortices of the atoms in pulling the electrons from the neighboring atoms, there is no loss of structural energy from the atoms, that is, no depletion of the strength of the velocity fields in the vortex structure of either the atoms or the electrons due to the non viscosity of space. An experimental proof of this lies in the fact that in a super-conducting ring, electric current once set up persists indefinitely without any depletion, though it has no external source of energy to maintain the current.

The continuation of current in a normal conductor connected across a dc generator, however, requires continuous presence of voltage at the positive and negative terminals of the generator; for which the generator has to be run by a prime mover. The electromotive force (EMF) is generated by the interaction of the magnetic field with the generator's rotating conductors when the electrons are detached from their orbits and pushed to the negative terminal of the dc generator. We can consider a thought-experiment: Let us suppose that the dc generator we choose is an ideal machine with zero input towards no-load losses (friction, windage), then, the only power required to be given to the generator is dc excitation to produce magnetic field. On no-load, though EMF is induced with rotation, the excitation of the generator does not produce reaction on the prime mover, and the excitation power can be kept constant on no-load as well as on load; it remains as heat-energy while maintaining the magnetic field in the excitation system. Thus, unlike the prime mover, which requires additional power, from no-load to loaded conditions, the exciter does not draw additional input on load. To conclude, the production of EMF does not require any energy in an ideal friction less generator, since the excitation power is not consumed and is available in the exciter as heat. Now, the question arises—and this is the crux of the issue—that if the generation of EMF did not consume any power in the ideal generator, how can work be done by the EMF (which did not take any energy for its production) in pushing electrons against their repulsive forces to maintain the load current, since, as stated before, it is conventionally believed that the energy of EMF is responsible to maintain the current in electric circuits? We thus see that the current in the circuit is maintained, as said before, by the attractive electric force between the charged atoms and the released orbital electrons available at the negative terminal of the generator.

The reaction against the prime mover on account of power generation occurs when the generator is loaded, because, the voltage induced in the conductors of the generator has, as per Lenz's law, such polarities that the direction of the armature current (load current) and its associated magnetic field, interacting with the exciter's magnetic field, create torque in opposition to the prime mover. This torque can be reduced by suitably designing the configuration of the generator conductors and the exciter's magnetic field such that, while the direction of the armature current is still as per the Lenz's law, the armature reaction is considerably less as described below.

6.7 *Space Power Generation*

A new system of electrical power generation that defies the law of energy conservation has come to light recently¹.

Fig.6-7a shows a rotating cylinder of magnetic material with an electric coil rigidly mounted on it. Depalma in his experiments used permanent magnets as well as electromagnet similar to this system (N-Generator). Adam Trombly's closed path homo polar generator, basically, is as shown in Fig.6-7b. The electromagnet's coil mounted on the core is energized with dc power through slip rings. The experiments show that a dc EMF is induced between the periphery of the core and the shaft, even though the electromagnet's field of uniform strength passing through the magnetic cylinder may be thought to be rotating along with the metal of the cylinder as per the current understanding that a rotating magnet may carry its field. Since the induced EMF is observed, as per Faraday's law of induction, there should be change of magnetic flux in the cylinder. But the uniform magnetic field through out the cross section of the cylinder cannot change in time with rotation of the core and the electric coil. It is explained below as to why the EMF is induced though the electric coil rotates with the cylinder.

In Sec.6.0 it was explained that an electron in motion relative to space carries its vortex field, while its interface leaves behind at the tail-end the magnetic field— concentric circles of space reaction to the circular velocity field of the electron vortex created around the line of motion—which gets fixed in space with no relative motion with it. In other words, the magnetic

¹ Late Bruce Depalma, former lecturer at MIT, USA, had written to me in 1978 that he finds induced voltage in a co-rotating system of magnetic field and conductor. Michael Faraday had carried out similar tests (Faraday's diary, December 26, 1831). Depalma also observed that in such systems out put electrical power can exceed the corresponding input. Adam Trombly, too, experimented with a closed path homopolar generator.

field created by the electron in a plane transverse to its line of motion does not move with the electron. Similarly, the magnetic field in the cylindrical core, created by the electrons constituting the current in the electromagnet's coil, is fixed in space, irrespective of the fact whether the electric coil on the cylinder rotates with it or is stationary with respect to space. Thus, the stationary magnetic field parallel to the axis of the cylinder cuts through the radial elements in the circular cross section of the cylinder as it rotates. The above conclusion that the magnetic field remains fixed in space is partially different from my earlier thinking discussed in an article "Rotation of Magnetic Field of a Rotating Magnet".¹

Consider a magnetic field line, stationary with respect to space, and passing through the inter-atomic spaces and the structures of the atoms of the core, being traversed at right angles by the atoms in the rotating core. Since the atoms in their structure have independent voids of electrons, while sweeping through the magnetic field, they will introduce reluctance in the path of the magnetic field (because void medium within electrons in the atomic structure cannot sustain any field), thus varying the magnetic field strength for an infinitesimal duration (electron diameter/velocity of atom) in inverse proportion to the rotational velocity of the atoms, and thereby EMF is induced at all those points where atoms interact with the magnetic field line. However, the net strength of the magnetic field remains constant because though it enters the atomic structures at certain locations, it also comes out of the atoms on other points at the same instant, thus keeping the total reluctance and therefore the magnetic field constant. Though the changes in the magnetic flux remain imperceptible to measurements, nevertheless the EMF is induced.

Faraday's experiments can be described through Figs.6-8a, 6-8b, 6-8c. In Fig.6-8a the magnet is rotating but the EMF in the conductor is not induced, because the conductor is not rotating. In Fig.6.8b the magnet is stationary but the EMF is induced because the conductor is rotating. Fig.6.8c shows a co-rotation of the magnet and the conductor, in which EMF in the disc conductor is induced. In Fig.6.7a, the flux return path is through the air and, therefore, doubt arises whether the stationary lead of the voltmeter used to measure the voltage at the periphery of the rotating cylinder is being cut with the return-flux² to show voltage in the instrument. Such a problem exists with the voltage measurement also in the system shown in Fig.6.7-b.

¹ The Journal of Borderland Research, Vol. XL VIII, No.4, July-August 1992.

² Return flux should be stationary with respect to space, as concluded above, however to remove any doubt a new set up was devised.

To overcome this problem, a scheme (Fig.6-9a), in which the return flux is confined to a stationary magnetic path, was adopted.

The EMF induced followed the relation:

$$V = (1/2) \omega B R^2 / 10^4 \quad (6.15)$$

where B is the magnetic field in the core, in Tesla; ω is the angular velocity of rotation, 2π rps; R is the radius of the cylinder in cm; V is in volt. This relationship is easily found as follows.

Consider an element of circular area $2\pi r dr$ in the circular cross section of the cylinder at a radius r. Flux through this element is: $d\phi = B (2\pi r dr)$. It was shown above that the flux remains fixed in space even if the cylinder rotates. Duration of change in the flux through the elemental area in one revolution is: $dt = 2\pi/\omega$. Therefore,

$$d\phi/dt = [B (2\pi r dr) / (2\pi/\omega)] = B \omega r dr.$$

Integrating from $r = 0$ to R,

$$V = (1/2) B \omega R^2. \quad (6.16)$$

The source of voltage is pinpointed through an alternative approach also as shown in Fig.6-9b. It is noted through this experiment that the non magnetic ring welded to the inner core and passing through the air gap also develops voltage in opposition to the voltage induced in the core, due to which the measured voltage between the brush and the shaft is now reduced from what it would be had the voltage between the surface of the inner core and the shaft been taken.

Fig.6-10 shows a model of space power generator (SPG) coupled to a variable speed dc motor (DM). The electromagnet EM, rigidly mounted on the core, is fed with dc power through a slip ring to produce the magnetic field B in the core, that passes through an air gap-3, outer stationary magnetic yoke, airgap-1, outer stationary yoke, air gap -2, and back to the core. An insulated conductor is laid in the iron core between the power slip rings, PSR-1, PSR-2, that have the sliding brush contacts as the output terminals. A radial hole in the core accommodates the U-shaped portion of the conductor (C_1, C_2), while the remaining portion passes through the core as shown. It is the appropriate layout of the portion of the conductor (L) that

is crucial to enhance the efficiency of the machine as discussed further. More parallel conductors similar to the above can be laid and connected between the power slip rings.

The conductor A-A₁ is static with sliding brush contact fixed at A. The magnetic fields, produced by the load current I flowing through C₁ and C₂ in opposite directions, cancel each other, thus producing zero torque, whereas, the remaining portion of the rotating part of the conductor (L) also produces magnetic field due to load current which interacts with the magnetic field B, creating a torque in *opposition* to the prime mover. The static portion of the conductor (A-A₁) in the air gap does not develop voltage and creates no torque. (Late Dr. S. Marinov¹ had pointed out to me, through a theoretical analysis², that the conductor A-A₁ will create zero torque; and this has now been proved through my subsequent experiments. Thus my earlier articles³ will require partial revision in the sense that my own stand then was that a radial conductor in the core creates zero torque, while the static conductor in the air gap will produce torque. The calculations of the efficiency of the generator in these articles, however, remain unaltered). Thus, only that portion of the conductor L that is embedded in the core produces armature reaction, which can be minimized by placing it as much parallel to the magnetic field B in the core as practicable in order to minimize reaction. A specific layout of L within the circular zone (Fig.6-10) has produced over unity efficiency of power generation (discussed further below).

In the conventional generators, the magnetic field producing the EMF is kept at right angles to the armature conductor so as to induce maximum voltage; this results in the maximum armature reaction too, since the conductor length in which the EMF is induced is the same that produces the armature reaction. In space power generator (SPG), the voltage of only conductor C₁ is made use of, while the voltage of C₂ induced within the radial hole, as well as the voltage induced in L are reduced to zero by bringing L down close to the shaft; this enables larger potential difference between the power slip rings. As stated above, due to the nullification of the magnetic fields of the conductors in the radial hole, the armature reaction there is reduced to zero; hence, while the portion of the conductor L

¹ Dr. Stefan Marinov, Niederschocklstr.62, A-8044 Graz, Austria.

² Deutsche Physik, Volume 2. No. 6, April—June 1993; and 1(4),41 (1992); East West Publishers, Graz, Austria

³ Space Power Generation, Magnets in your future, Vol.1, No.8, August 1986; L H Publishing Agency, Post Box 250, Ashflat, Arkansas,72513.

Rotating Magnets—Space Power Generator, Explore, Vol.3, No.4, 1992; Post Box 1508, Mount Vernon, Washington 98273.

produces armature reaction, the radial length C_1 produces voltage. Any change in the layout of L to reduce reaction on the prime mover does not influence the EMF induced in C_1 as long as the conductor L it is brought down closer to the shaft.

As explained in Sec.6.6 the flow of electrons constituting the load current in the external circuit between the out put brushes is not *forced* by the presence of EMF between the generator terminals; on the other hand the electrons in the current are attracted by the charged atoms in the circuit intermittently. Thus, the force for the flow of current in the external circuit as well as through the internal resistance of the generator is provided (work is done) by the atomic vortices without any depletion of the strength of the velocity field in the vortices of either the atoms or the electrons. The heat produced in the circuit is due to the vibration of the atoms, disturbed by the electrons in the current; and in this process, as discussed in Sec.4.6 and also later, the atomic vortices do not lose any energy from their structure. Hence, the requirement of additional power to the prime mover, over and above the no load power requirement, is only due to the armature reaction on the generator conductors. Over-unity efficiency in electrical power generation is achieved by placing the conductor L such that the force of interaction of the magnetic field produced by its current, with the magnetic field B that induces EMF in the generator, is the minimum.

Since work is done by the indestructible space vortices of the atoms and electrons through an attractive force in the current, and the efficiency exceeds unity in this new phenomenon due to reduced armature reaction, the generator is named “space power generator” basically to *re establish* the substantiality of the space medium, and not that power is tapped through the generator conductor of this generator direct from the space medium, like the prevalent concepts of zero-point energy, neutrino sea etc.

6.7.1 *Efficiency of the Space Power Generator*

The efficiency of a conventional generator is the ratio: output/ input. At no load, the input consists of no load losses, mainly windage and friction that remain fixed at a constant speed. In addition, excitation power is also required.

$$\text{Efficiency} = \text{Output/ Input} = \text{Output}/(\text{Output} + \text{losses}) \quad (6.17)$$

where $\text{Input} = \text{output} + \text{losses} \quad (6.18)$

If losses are taken as zero, the maximum possible efficiency from (6.17) is 1. This follows from the law of conservation of energy, without specifying, of course, the basic nature of energy and the mechanism that ensures equality between the input and output. From (6.18), an increment in input power over that required for the fixed losses produces an equal output, that is, the maximum incremental efficiency in conventional generators cannot exceed 1. This is entirely due to the armature reaction, which creates a counter torque on the prime mover of magnitude equal to the generated power. However, since in the SPG the armature reaction is reduced, the incremental efficiency is more than unity. Thus, the efficiency relation for a SPG is a modified form of equation (6.17):

$$\text{Efficiency} = \text{Output}/[(\text{output}/n) + \text{losses}] \quad (6.19)$$

where n is the incremental efficiency.

Several experimental models tried out by the author confirm that an incremental efficiency of a suitably designed SPG can be more than 250%, while none of the conventional generators can exceed 100% limit. The following is the test result from one of the latest models of SPG.

A variable speed dc motor (DM) is coupled to a SPG and run at 2700r/m. The input to the DM-SPG towards windage and friction: $W_0 = 2943$ W. The SPG is given excitation power of 650 W, which produces no load EMF: $E = 3.41$ V, dc. No load input remains almost constant while giving excitation. (The excitation power can be appreciably reduced by suitably designing the magnetic circuit.) The SPG is loaded through load resistors to restrict the load current (I), which is measured through shunts. Load current, $I = 3438$ A dc. The speed is kept constant at 2700 r/m, which is the no load speed. When SPG is loaded, the input W_0 increases to: $W_1 = 8620$ W. The rise in input (W_r) from no load to the loaded condition is:

$$W_r = W_1 - W_0 = 8620 \text{ W} - 2943 \text{ W} = 5677 \text{ W}. \quad (6.20)$$

Total $I^2 R$ produced in the electrical circuit, comprising of internal resistance of the SPG, brush contact resistance, and load resistance:

$$W_E = E \times I = 3.41 \text{ V} \times 3438 \text{ A} = 11724 \text{ W}. \quad (6.21)$$

From (6.20) and (6.21),

Incremental efficiency of DM-SPG together

$$\eta_{\text{incremental}} = 11727 \text{ W} / 5677 \text{ W} = 2.066. \quad (6.22)$$

Total I^2R can also be calculated by the measurement of the voltage drops across the power slip rings, brushes, and load resistor; and multiplying the summation of these voltages with the load current.

The incremental efficiency of the SPG alone is found as:

$$\eta_{\text{incremental SPG}} = 2.066 / 0.83 = 2.49 \quad (6.23)$$

where the efficiency of DM is 0.83.

From above it is seen that the input of 8620 W to the DM-SPG set, when it is running loaded at 2700 r/m, produces 11724 W of electrical output, while also consuming 2943 W, out of the input power, towards windage and friction. Here, is a clear case of violation of the principle of conservation of energy when applied to the phenomenon of electromagnetic induction. This violation has taken place because the incremental efficiency (6.23) of the SPG far exceeds unity. The Lenz's law that determines the sign of the induced voltage is the equivalent of the law of energy conservation in mechanics. But the above inconsistency shows that the electrostatics stands apart from the mechanics, except of course at the structural level of the electron.

The possibility for a perpetual system does exist if efficient converters or utilized to feed back power to the prime mover of a SPG designed for voltage ratings around 12 V dc.

Atomic Structure

7.0 *Basic principles*

The limitation on the creation of only one size of stable void in the space vortex, that produces stable fundamental mass and charge as basic units, very much simplifies the theory of atomic structure. It follows that stable particles will possess mass in exact multiple of electron mass – there being no difference between the rest- mass and the relativistic-mass. Further, no *stable* particle with mass, less than electron mass, shall ever be found, either, naturally, or, created through artificial means in laboratory. The *unstable* particles with mass larger than the electron mass are the “intermediate stages” in the formation of stable particles like neutron and proton; and do not merit considerations as the building blocks of *stable* particles.

The stable particles that show the property of electric charge, like proton, alpha particle, etc. are enclosed within space-vortices, which create stable charges on them. The unstable particles, showing charge property, will also be enclosed within space vortices of varying strengths for their lifetime duration. A neutral particle, like a neutron, does not possess space vortex around it and hence, without an electric charge, it remains neutral.

All stable particles, neutral or charged, will have their spin-axes of rotation. The charge of a particle, from charge equation, will be in direct proportion to its surface and the maximum speed of space-circulation in its vortex.

An electron and a positron in close range will undergo annihilation, unless, the particles are translating *relative to space* and, thereby, producing magnetic force of repulsion between them.

Just as an electron is subjected to an “inward acceleration field” on its interface, all charged particles and nuclei, with space-circulation around them, will have “inward acceleration field” tending to crush the particles. This new inward force, arisen due to space-circulation around the charged particles and nuclei, is unknown in classical as well as quantum physics.

With the above guiding principles, the possible structure of the nuclear particles is outlined below.

7.1 Neutron

In Fig.7.1, an assembly of two electrons and two positrons is shown. The velocity fields of the particles are in opposition in the region external to the assembly and, therefore, this assembly (named as ‘primary unit’) will show overall electrical neutrality. The particles repel diagonally due to similar charges, whereas, there is attraction between the adjacent particles due to dissimilar charges. In addition, if the particles are also spinning around a center as shown in the figure, there will be a radial force, $m_e v^2/r$, which will reinforce the diagonal electrostatic repulsive force F_r . If the component of F_r balances the attractive force F_a due to attraction between the electron and the adjacent positron, the primary unit will be stable. The forces in the primary unit are computed as follows.

The particles rotating at speed v will be subjected to an outward centrifugal force, $F_c = m_e v^2 / r$; with the minimum spacing between the dissimilar particles as $2r_e$; the diagonal between similar particles is $2\sqrt{2} r_e$. Supposing that the maximum possible rotational speed of the particles is c , then, $F_c = m_e c^2 / \sqrt{2} r_e$. The component of F_c in opposition to F_a will be, $F_c \cos 45 = (m_e c^2 / \sqrt{2} r_e) / \sqrt{2}$; from (2.6), expressing m_e in terms of c and r_e ,

$$F_c \cos 45 = [(4\pi r_e^3 c/3) c^2 / \sqrt{2} r_e] / \sqrt{2} = (2\pi/3) r_e^2 c^3. \quad (7.1)$$

The electrostatic attractive force F_a between an electron and the neighboring positron from (3.1.1.3)

$$F_a = (c/4\pi) q_e^2 / (2 r_e)^2.$$

From (2.4) and, also, assuming spherical charge distribution on electron's interface, $q_e = 4\pi r_e^2 c$. Substituting for q_e from this relationship in the above equation

$$F_a = (c/4\pi) (4\pi r_e^2 c)^2 / 4r_e^2 = \pi r_e^2 c^3. \quad (7.2)$$

The electrostatic repulsive force between the electrons and also between the positrons, diagonally located,

$$F_r = (c/4\pi) (4\pi r_e^2 c)^2 / (2\sqrt{2} r_e)^2 = (\pi/2) r_e^2 c^3.$$

The component of F_r in opposition to F_a is

$$F_r \cos 45 = (\pi/2\sqrt{2}) r_e^2 c^3. \quad (7.3)$$

From (7.1) and (7.3), total force in opposition to F_a is

$$F_c \cos 45 + F_r \cos 45 = (2\pi/3) r_e^2 c^3 + (\pi/2\sqrt{2}) r_e^2 c^3 \approx \pi r_e^2 c^3 \quad (7.4)$$

From (7.2) and (7.4) it is seen that the attractive force between the neighboring particles is equal to the repulsive force between the similar particles in the primary unit; and this is achieved by rotation of the particles around their central axis; but for rotation, annihilation of the particles will take place.

Fig.7-4 shows primary-units enclosed within space vortices—clockwise (unit-1) and anticlockwise (unit-2). *These vortices provide electric charge and an inward acceleration-field on the surface of the primary units, thus making them stable building blocks of matter in the core of the neutron.* Just as the electrons and positrons assemble primary units, these units, charged positively and negatively, assemble the neutron core.

Refer Fig.7.3 showing two primary units under electrical attraction. The inner radius of vortex enclosing each unit is: $r_{pu} = 2.42 r_e$. Maximum velocity field in the vortex is: $u_{pu} = (r_e / 2.42 r_e) c = c/2.42$, because the velocity field falls inversely as the radius in an irrotational vortex. The electric charge of the primary unit

$$q_{pu} = (\pi/4)(4\pi r_{pu}^2 u_{pu}).$$

Substituting the values from above

$$q_{pu} = (\pi/4) 4\pi (2.42 r_e)^2 c / 2.42 = (2.42)\pi^2 r_e^2 c. \quad (7.5)$$

Consider a spherical assembly of equal nos. of electrons and positrons with a total of n particles. The radius of this assembly:

$$r_n = (n)^{1/3} r_e. \quad (7.6)$$

If this assembly is of neutron, its known mass is 1839 m_e . Since neutron is a neutral particle, it will possess equal nos. of electrons and positrons, because, the superposition of the velocity fields of equal nos. of these particles will bring an overall neutrality. Therefore, neutron should have 919 nos. of electrons and equal nos. of positrons. The radius of neutron

$$r_n = (1838)^{1/3} r_e \approx 12 r_e. \quad (7.7)$$

Fig.7-4 shows the primary units, closely located, such that their vortices, in-between, are superposed. The radial length EF can be taken as 1/3 of the radius OE. (Volume of space in a sphere with radius OE, when spread around the surface of this sphere, will have a shell-width equal to 1/3 of OE). The separation between the centers of the primary units is 5.64 r_e . Coulomb force of electrical attraction between two primary units is:

$$F_{pu} = (c/4\pi) q_{pu}^2 / (5.64 r_e)^2. \quad (7.8)$$

Substituting for q_{pu} from (7.5) in (7.8)

$$F_{pu} = (c/4\pi) [(2.42) \pi^2 r_e^2 c]^2 / (5.64 r_e)^2 = (0.046) \pi^3 c^3 r_e^2. \quad (7.9)$$

A neutron, with total 1838 nos. of electrons/positrons, will have 1838/4, that is, about 460 nos. of primary units, held under strong electrical force (7.9) of attraction between the neighboring units. The electrical repulsive force between the primary units, diagonally placed, is two times less because the diagonal spacing is $\sqrt{2}$ times greater than OO_1 . The neutron should therefore be a highly stable particle but for the fact that it is known to have angular momentum; which signifies that it undergoes rotation. If the rotational speed at its surface is v_n , then, a primary unit at the surface, with mass $4m_e$, and at a

radial distance of $12r_e$ (which is neutron radius), will develop outward centrifugal force, given by:

$$F_{\text{cen}} = (4m_e) v_n^2 / 12r_e. \quad (7.10)$$

The speed of rotation v_n , at which outward force on a primary unit becomes equal to eject a primary unit from the structure of the neutron, is found by equating (7.9) and (7.10):

$$4m_e v_n^2 / 12 r_e = 0.046 \pi^3 c^3 r_e^2.$$

Expressing m_e in terms of r_e and c from (2.6)

$$4(4\pi/3) r_e^3 c v_n^2 / 12 r_e = 0.046 \pi^3 c^3 r_e^2.$$

Or
$$v_n = (1.02) c \approx c. \quad (7.11)$$

It is seen that if neutron rotates on an axis through its center at speed c at its periphery, which will account for its maximum possible angular momentum, a primary unit or its constituents (electron / positron) may be dislodged due to outward centrifugal force and emitted out. This explains as to why neutron has a short half-life of about 15min.

Consider one of the primary units located at the surface of neutron (Fig.7.4). As calculated earlier, maximum space-circulation around it is $c/(2.42)$; inner radius of the vortex is $2.42/r_e$; this creates an inward acceleration field $(c/2.42)^2 / 2.42 r_e$, which is, $c^2 / (14.17) r_e$. All primary units at neutron surface have this high inward field at each point; this makes neutron a highly penetrating particle.

7.2 Proton and Hydrogen Atom

The structure of proton contains a neutron enclosed within a space-vortex (Fig. 7-2), which accounts for the charge of proton and, in addition, creates an inward acceleration field. In proton structure, the inward acceleration field on the neutron's surface makes proton an ultra stable particle. Similar to the electron, the proton too has its maximum velocity field confined within the diametrical plane at right angles to the axis of rotation; and therefore its electromagnetic interactions with other particles will take place in this plane.

From (7.7), radius of neutron (core of proton), $r_n = 12 r_e$; from (2.2) for an irrotational vortex: $ur = \text{constant}$. Therefore, maximum tangential velocity of space at the surface of the neutron in the diametrical plane is found from: $u_p r_n = cr_e$, where c is the tangential velocity at the interface of electron of radius r_e . From this

$$u_p = cr_e / r_n = cr_e / 12 r_e = c/12. \quad (7.12)$$

The electric charge of proton due to u_p is computed from relationship similar to charge equation (2.4), as

$$q_p = (\pi/4) 4\pi r_n^2 u_p = (\pi/4) 4\pi (12 r_e)^2 c/12 = 12 \pi^2 r_e^2 c \quad (7.13)$$

which is 12 times the electron charge. The reason as to why a Hydrogen atom (Fig.7.5), which has a proton and an electron, shows neutrality is due to the cancellation of their magnetic moments as shown below.

The orbiting electron is that far located so as to reduce its velocity field to the same value as at the surface of the proton core.

$$cr_e = (c/12) r_n$$

Or $r_n = 12 r_e \quad (7.14)$

where $2r_n$ is the radius of the electron orbit.

The magnetic moment of the orbital electron is due to its intrinsic spin (2.16) and also its orbital velocity v_{orb} . Total of magnetic moments is

$$\mu_e = (3/4)q_e c r_e + q_e v_{orb} (12r_e + 12 r_e) / 2 = q_e r_e [(3c/4) + 12 v_{orb}]. \quad (7.15)$$

Intrinsic magnetic moment of proton, from an expression similar to the electron (2.16), is:

$$\mu_p = (3/4)[q_p (c/12) 12 r_e].$$

Substituting, $q_p = 12 q_e$, from (7.13)

$$\mu_p = (3/4) [12 q_e (c/12) 12 r_e] = 9 q_e c r_e. \quad (7.16)$$

Equating the magnetic moment of electron (7.15) with the magnetic moment of proton (7.16), in order to achieve neutrality of the Hydrogen atom

$$q_e r_e [(3c/4) + 12 v_{orb}] = 9 q_e c r_e,$$

which gives $v_{orb} = 0.69c.$ (7.18)

In Hydrogen atom, the radius of electron orbit is $24r_e$, that is, about 10^{-9} cm; and its orbital velocity is 69 % of speed of light. With this high rotational speed the electron completes one orbit in a time duration of: $(2\pi) 10^{-9}$ cm / $(0.69) 3 \times 10^{10}$ cm/s, that is, 3×10^{-19} s, providing an outer shield to the atom with its spinning interface that can not be penetrated through. The binding force provided by the velocity fields of the oppositely spinning vortices of the orbital electron and THE proton maintain the assembly with no energy loss from the system, since the vortices are formed in non-viscous space.

The nucleus of Hydrogen atom (neutron within proton vortex) has an inward acceleration field of strength: $(c/12)^2 / 12 r_e$, that is, $(1/12)^3 c^2 / r_e$. This inward field, which is $(1/12)^3$ times less than the maximum possible field (c^2 / r_e) on the interface of electron, makes it a highly stable particle as stated before.

7.8 *Nuclei of Atoms larger than Hydrogen*

So far, there has been uniformity in the systems followed in the assembly of neutron and proton: namely, two electrons and two positrons assemble a primary unit; and, two primary units and two anti-primary units assemble a neutron which, when enclosed within a space-vortex, becomes a proton. On similar lines, we can conjecture that two protons and two anti protons, enclosed within an overall space-vortex, assemble an alpha particle— Helium nucleus. And further on, with several alpha particles, assembled with four in each unit (similar to the assembly of primary units in neutron structure), and enclosed within an overall vortex, all nuclei of atomic mass higher than Helium can be built. This process requires that nuclei should have equal nos. of neutron and proton, which, however, is not the case. For instance, ratio of the neutrons to protons in Uranium nucleus is 1.586. This leads to the conclusion that in addition to the alpha particles, neutrons too are present as required by the atomic masses of nuclei beyond Sulfur.

The emission of alpha particles from radioactive nuclei provides a solid proof of their existence within nuclei in an *independent* condition. Similarly, beta particles radiation from nuclei, confirm presence of electrons

and positrons there, since, as explained before, electric charges of these particles are nullified within the primary unit itself and the electric charge of a nucleus is determined by its overall space-vortex.

For simplicity of analysis of nuclear structure, one can assume that protons and neutrons exist independently in a dynamic assembly, and each proton exerts repulsive force on the rest of the protons in the nucleus, that is, within an overall space-vortex enclosing the nucleus. Consider a nucleus, with maximum possible atomic mass, to have n nos. of protons, and let the ratio of nos. of neutrons to protons be slightly greater than the known ratio of 1.586 in Uranium atom, say, $1.6n$. If r_n is the radius of a compact spherical assembly formed with these particles and held stable within a space vortex enclosing the nucleus, we have

$$4\pi r_n^3 / 3 = n (1+1.6) (4\pi/3) (12 r_e)^3$$

where, from (7.14), $12 r_e$ is the radius of neutron and also of proton core. From above

$$r_n = (2.6)^{1/3} n^{1/3} 12 r_e. \quad (7.19)$$

The above calculation takes into account only the volumes of the cores of protons and neutrons, leaving no space medium for the velocity fields in the vortices around protons. But for the space vortices, electric field of protons that causes their mutual repulsion cannot be created. For sustaining the electric field and allowing for a definite pattern of distribution of protons and neutrons, the radius r_n derived above is doubled as an approximation.

$$r_n = 2 (2.6)^{1/3} 12 r_e. \quad (7.20)$$

The electrostatic repulsive force acting on a proton located on the surface of this nucleus is

$$F_r = (c/4\pi) n (12 q_e) (12 q_e) / [2(2.6)^{1/3} 12 r_e]^2. \quad (7.21)$$

The space-vortex enclosing the nucleus creates maximum inward force acting at each point on the nucleus in diametrical plane at right angles to the axis of rotation of the nucleus; it is given by

$$F_a = m_n u_n^2 / r_n \quad (7.22)$$

where m_n is the mass of the nucleus, and u_n is the tangential velocity of space at nuclear surface in transverse diametrical plane. Since m_n is

proportional to the volume of the nucleus, $m_n \propto r_n^3$. Also, from (2.2), $u_n \propto 1/r_n$. Therefore, the inward force (7.22) developed on the nuclear surface,

$$F_a \propto r_n^3 (1/r_n)^2 / r_n = \text{constant}, \quad (7.23)$$

which is a constant quantity independent of mass, spin, and radius of a nucleus.

In the fundamental vortex of electron, inward acceleration field being c^2/r_e ,

$$F_a = m_e c^2 / r_e, \quad (7.24)$$

which, from (7.23), has the same value as for any other nucleus. Thus, electrical repulsive force (7.21) due to presence of protons, tending to disrupt the nuclear assembly, is opposed by an inward force (7.24) on the nuclear surface; and irrespective of the nos. of protons in the nucleus, the inward force remains constant.

Equating the two opposite forces, F_r and F_a , to determine the maximum nos. of protons that are possible in a limiting nuclear assembly

$$F_r = F_a$$

which, from (7.21) and (7.24), becomes

$$c n (144) q_e^2 / (4\pi) 4 (2.6)^{2/3} n^{2/3} 144 r_e^2 = m_e c^2 / r_e.$$

Expressing q_e and m_e in terms of r_e and c , from (2.4) and (2.6),

$$c n 144 (\pi^2 / 16) 16 \pi^2 r_e^4 c^2 / 2304 \pi (2.6)^{2/3} n^{2/3} r_e^2 = [(4\pi / 3) r_e^3 c] c^2 / r_e,$$

from which,

$$n \approx 70. \quad (7.25)$$

The assumption made earlier was that for the creation of electric field in the nucleus, the nuclear radius needs to be doubled (7.20); and with this assumption, the heaviest possible stable nucleus should have about 70 protons only (7.25). It is, however, known that Curium nucleus has 96 protons. The discrepancy could be in the assumption of *doubling* the nuclear radius; for, if the nuclear radius (7.19) is increased by 2.11 times rather than

2, the nos. of protons in the limiting nucleus will increase to 90. Further, the additional force not accounted in the above calculations is the magnetic force that the protons will develop in case they rotate around the nuclear center; this magnetic force will be attractive and in opposition to Coulomb's repulsion between the protons; and, therefore, will strengthen the inward force F_a produced by the space-vortex enclosing the nucleus. It thus gets evident from the above analysis that stable nuclei with protons more than, say 100, cannot exist in the universe.

The less the nos. of protons in a nucleus, the higher is its stability; because as shown above, the inward force on the nucleus produced by the space-vortex remains constant for all the nuclei.

7.9 Stability of Atomic Nuclei

The stability of a nucleus, as discussed above, is maintained by an inward acceleration field, u_n^2 / r_n , that produces force (7.22) against the repulsive electrical forces of protons within the nucleus. Since the maximum velocity field, u_n , in the space-vortex varies inversely as the nuclear radius, therefore, with increasing radius, from the above relationship, acceleration field acting *inwardly* on the nuclear surface will fall *inversely as cube of the radius*. The electrical repulsive force within the nucleus *falls inversely as the square of its radius*. It is thus seen that the inward force- field on the nucleus reduces faster compared to the outward repulsive electrical force as the nuclear radius increases in size with more of nucleons. The rise in the nos. of neutrons in the nucleus is faster compared to the nos. of protons with the increase in the atomic weights; and thus lesser than half the volume of the nucleus is occupied by the protons. This, decreases the outward repulsive force compared to what would have been had the whole nuclear volume would have been filled by the protons. The nuclear stability is maintained for the non- radioactive elements, when the strength of the inward force due to space circulation is greater than the outward repulsive force in the nucleus. In critical assembly of nuclei, the outward and the inward forces may just balance (radioactive elements); in such cases, any further penetration of external neutrons in the nucleus will increase its radius and, thereby, by decreasing the speed of space circulation around it, will reduce the inward force field, thus making it to fission.

Quantum physics postulates existence of force-carrying particles to achieve attraction between protons and neutrons inside a nucleus. Such a speculation is made to provide an agency to oppose the repulsive forces

between the protons, because, reality of the substantiality of space around the nucleus, that can provide inward force on it for stability, is inconceivable under the concept of the void-space postulated by relativity and continued in quantum physics.

7.9 *Physical Picture of Atomic Structure*

The physical picture of atomic structure, as conceived by the quantum physics of the 20th century, is best expressed in the following quotation¹: “A hydrogen atom with its electron revolving in a circular orbit about its nucleus, can be regarded as a wheel. It is a peculiar kind of wheel, since it has no spokes and the rim is vacant except for the small region occupied by the electron, but it possesses the major property of a wheel: angular momentum”. The concept that there are “no spokes and the rim is vacant” in the above quotation is the result of the inheritance from Newtonian philosophy of void-ness in cosmic space, reconfirmed by negation of ether by Einstein’s special theory of relativity. In the void ness of space around the nucleus, there cannot be a space vortex (Fig.7-5) enclosing the nucleus; in the absence of the space vortex, the orbital electron cannot remain in a fixed orbit; neither can there be an inward force on the nucleus to maintain stability against Coulomb’s repulsive force within the nucleus. Further, there is also a presupposition in the above quotation that “the small region occupied by the electron” is not vacant. The electron structure (Fig.2.2) has a central void, unrecognized by the quantum theory. Continuing the above quotation: “The electron, besides revolving around the nucleus, possesses an angular momentum of its own, and we link it therefore to a wheel. It may be visualized as a rigid body spinning upon its axis, but this is a rather dangerous analogy, for it leads one to inquire what the angular momentum of electron is, and no one has ever been able to answer this question—indeed, it is very likely unanswerable”. The derivation of angular momentum of electron (2.15) from the electron structure precisely answers the above question.

The problem arose due to a misconception that electron is a point-mass. Indeed, how can a point—a dimensionless entity—have radius, rotation, and angular momentum! But the angular momentum of orbital electron is required by the quantum theory (whether the electron is a point-mass or has a fixed radius) to explain emission of light from the vibrating atom, which again is based on an equally serious misconception (Sec.4.4)

¹ The Quantum Theory, Karl K. Darrow, Scientific American, March 1952, Vol.186, No. 3, 47-54.

that the orbital electron, if not *forbidden* to remain in a fixed orbit, will radiate off energy at a frequency determined by the frequency of the orbital electron's circulation and, therefore, will fall on to the nucleus. Planck's constant came handy to express the angular momentum of the circulating electron, because it has the right dimension of angular momentum; and so the angular momentum was also quantised because the electron can occupy only certain fixed orbits (Niels Bohr). Jumping of electron from higher to a lower energy level orbit was explained to emit energy as photon of light. However, in the further development (Erwin Schrodinger) of the quantum theory, which did remove some of the ad hoc assumptions in Bohr atom, "the electron is not to be considered as encircling the nucleus in a circular orbit but instead it is spread out in a way that is totally unpicturable classically".

The postulate that the electron can emit photon is evidently based on a premise that it is packed right up to its center with some kind of entity, named energy; it is precisely this belief that leads to the postulation of quarks in electron structure. Since the electron has been shown to have a void-center, which alone explains the genesis of basic universal constants and explains all the physical phenomena, emission of energy/photon from the structural energy of electron is considered impossible and the concept of quarks within electron is certainly erroneous. Further, Planck's constant has been shown to arise from the time-varying gravitational potential and hence it cannot determine the angular momentum of the orbital electron, though, it so happens by coincidence that the intrinsic angular momentum of electron is indeed close to the Planck's constant (2.15) calculated in Sec.4.4.

To assert that only mathematical language can explain the quantum phenomena, and physical aspects cannot be pictured classically is indicative of the lack of fuller understanding of electron structure, spatial reality, and their interrelationship.

On Light

8.0 *Fundamental nature of light*

With the discovery of positron (1932), a new phenomenon of annihilation of electron and positron was observed. During this process, the spherical interfaces of the particles can be imagined to finally superpose each other (Fig.8-1); thus stopping the oppositely directed space-circulations around their interfaces, and leading to the collapse of their central voids. In this process light is produced. It is evident that the *void-interiors* of the electron and positron, being energy-less, cannot *emit* any kind of energy (photon). The energy (velocity and acceleration fields) in the vortex structure of these particles pervades the whole universal space before annihilation; and following annihilation, the process of *dying* (reducing to zero) of the electromagnetic and gravitational potentials of these particles, initiating from their superposed interfaces, is seen as a *pulse*, or a single *shell* of light (Fig.8-2).

When the interfaces of the particles superpose, there is only one spherical-void common to both; space flows radially at its maximum speed c into the void (Fig.8-2); the duration of collapse, $\Delta t = r_e / c$. During this period, a shell of radial width, $\Delta t c$, that is, $(r_e/c) c = r_e$, is formed, and transmitted outward at speed c relative to space. The transmission of the

shell is a process that de-energizes the space medium, erasing for all the time the gravitational and electrostatic potentials that were created at the time of creation of the (now non existent) electron and positron. *The spherical shell produced due to dying of potentials—a process of de-energizing of space substratum consequent to the electron/positron annihilation—is the fundamental light.*

The gravitational field of electron is radial and uniformly distributed on its interface. Therefore, the effect of light due to dying-gravitational-potential will have spherical symmetry. Whereas, the maximum electrostatic fields of these particles, is confined mostly to the diametrical plane at right angles to the axis of rotation; hence, maximum effect of light produced due to dying-electrostatic-potential will be confined within this plane.

8.1 *Wavelength and Frequency*

The wavelength of annihilation light (Fig.8.2) is equal to the electron radius. *This light, with a single shell, does not have the concept of frequency applicable to it.* In case there are several annihilations taking place at a point one after the other *without absolutely any time gap between the successive annihilations*, then the frequency can be defined as nos. of shells formed in unit time. Also, if the time for the formation of a *single shell* is Δt , then frequency f can be defined as: $f = 1/\Delta t$, keeping in mind, however, that this mathematical operation does not mean that the single-shell-light has the property of frequency as per the conventional definition of frequency. In case of light produced due to atomic vibration (Fig.4.4)), the frequency of light is determined by the nos. of atomic oscillations in unit time, assuming that the oscillations are continuous. The shells of light produced in annihilation as well as atomic vibration have their centers fixed with the source (assumed stationary relative to space), while the wave front with a fixed radial distance within each shell (wavelength) expands at speed c relative to space. In the modern concept of light, the photon, postulated as a “packet of energy”, is understood to have its center moving at speed of light relative to the source. How is the modern concept of frequency related with a photon? Does it wobble transverse to its line of motion a number of times say, f , in a unit time, while traversing the space at speed c relative to the source? And, if that is the case, then, f will have meaning for a photon only after it has traveled for a unit time. Again, what characteristic of photon determines its wavelength? Though, it is well known that the classical concepts of wavelength and frequency are inapplicable for a photon in quantum physics, in the absence of a physical picture, there appears to be

serious conceptual errors, leading to mathematical discrepancies in the very basic relationship between energy and frequency in the Planck energy equation as analyzed below.

8.2 *Planck Energy Equation*

Based on the concepts of Maxwell-Hertz, that electromagnetic (light) energy is *given off* from electrical oscillators, Plank believed that the orbiting electrons inside the atoms of a glowing solid-emitter radiated electromagnetic waves in different quantities, the frequency being determined by the vibration of the oscillator. The classical picture was revised by Plank based on his observed experimental fact when he assumed that an oscillator, *at any instant*, could have its total energy (potential, kinetic) only as an integral multiple of the energy quantity hf , where h is a universal constant (experimentally determined) and f is the frequency of vibration of the oscillator. Thus, the light energy can be absorbed or emitted in an *indivisible* quantum of magnitude hf . Planck energy equation is:

$$E = h f. \quad (8.1)$$

It can be also written as

$$E / f = h. \quad (8.2)$$

It is seen from (8.2) that “ h ” is the energy associated with one oscillation of the vibrator, on the following basis. It has been shown (4.27) that one shell of light produced due to atomic vibration does have energy close to the experimentally determined value of h . Though Planck believed that the oscillator emits its own energy (kinetic, potential) that it possesses structurally, by deriving h from the gravitational potential in space external to the oscillating atom, a new fact has been brought to light that the “least energy” produced (in each shell of light) is “ E / f ”. Therefore, the quantity “ $h f$ ” is, actually, the energy contained in f numbers of *successive* light-shells produced by the oscillator in unit time, and can no more be an “indivisible quantum” available at *an instant*, which Planck assumed.

Further, as stated earlier, the structures of the oscillators, either electrons or atoms, are not suited to *absorb* or *emit* energy—a serious misconception continuing since Maxwell’s theoretical conclusion that oscillations of electric current leads to a *loss* of energy from the system in

the form of electromagnetic waves. The concept that heat and light energy get *detached* from the oscillating atoms is corroborated in the following: “¹...the collisions between atoms and molecules in a gas are said to be perfectly elastic. Although this is an excellent approximation, even such collisions are not *perfectly* elastic; otherwise one could not understand how energy in the form of light or heat radiation could come out of gas.” But such a concept is basically wrong and, as seen later, has misdirected the postulation at the very basic principles of quantum physics. Even in an oscillating electric current the electrons cannot part with their structural energy (the velocity field in the vortex), barring the phenomenon of annihilation.

An expression similar to Planck energy equation was derived (2.15) from the vortex structure of electron. The Planck constant for electron was shown to be different (Sec.4.4) from the Planck constant for the atoms (Sec.4.5). Its value from the relationship: $h = (4/5) m_e c r_e$, was found to be 7.5 times less than the Planck constant. However, for an average atom, Planck constant computed (4.27) was close to the experimental value determined by Planck.

The dimensions of h determined by Planck are that of angular momentum—same as the angular momentum of electron derived above. Though the angular momentum of electron (2.15) is 7.5 times smaller than the accepted value of the Planck constant, the nearness of the two values may lead to a guess that the orbital electrons in the atoms are indeed the electric oscillators that produce light, as imagined by Planck and others, and as is also the prevalent concept. In this conjecture, however, following difficulty arises. An atom shows overall electrical neutrality in the region beyond the orbital electrons, where only the gravitational field of the atom should exist. On account of this, h has been computed (4.27) theoretically with the considerations of the time-varying potential of gravitation alone. This is not to say that a charged atom will not produce light; rather the value of h obtained from an assembly of charged oscillating atoms should be different, and so also the nature of light (frequency, wavelength) produced.

Since the structure of light consists of successive shells, it can be said that light energy exists in quanta, where quanta is defined as “energy in each shell”; whereas, the kinetic energy of a moving body, which is proportional to the velocity of the body that can continuously vary, can not have quanta of energy. Any generalization coming out of Planck energy equation, and

¹ The Feynman Lectures on physics, Feynman, Leighton, Sands; Vol. 1, page 10-9

leading to the concept that all forms of energy occur in quanta, is therefore erroneous.

8.3 Explaining Photoelectric Effect – Einstein's Error

In the vortex structure of atom (Fig.7-5), the vortices of the orbital electrons, interlocked with the velocity fields of the atomic vortex, are carried round the nucleus as explained earlier. As is well known, the outer orbital electrons, if interacted with light of appropriate wavelength, are released in photoelectric effect. It is now believed that the photo- electrons *absorb* energy from the incident light for their release, and also for the kinetic energy that they possess. On this phenomenon, the following new aspects are to be taken into account.

As stated before, absorption of energy by an electron is, structurally, impossible. The orbital electron, already in circulating motion, possesses kinetic energy due to the velocity field of the atomic vortex. This energy is computed: The nuclear radius of an average atom (4.24) is, $r_n = 2.37 \times 10^{-9}$ cm. Like an electron, the nucleus too has its axis of rotation and, hence, the maximum electrostatic field is confined in a circular vortex in a plane (more or less), at right angles to the axis of rotation. In the irrotational vortex, space-circulation velocity falls inversely as the radius of rotation. From (2.2), in the electron vortex, $c r_e = \text{constant}$. Applying this relationship also on the nuclear surface,

$$c r_e = u_n r_n \quad (8.3)$$

where u_n is the maximum tangential velocity of space on the nuclear surface in the diametrical plane at right angles to the axis of rotation. Substituting in (8.3) the known values of c , r_e , and $r_n = 2.37 \times 10^{-9}$ cm, we have

$$u_n = (3 \times 10^{10}) 4 \times 10^{-11} / 2.37 \times 10^{-9} = 5 \times 10^8 \text{ cm/s.} \quad (8.4)$$

This velocity, as stated above, falls in the atomic vortex (around the nucleus) inversely as the radius of space rotation. Assuming the radius of rotation of the outermost orbital electron to be 10^{-8} cm, the space circulation-speed, which is also the tangential-velocity of the orbital electron, will be

$$v = u_n (2.37 \times 10^{-9} \text{ cm}) / 10^{-8} \text{ cm} = (5 \times 10^8 \text{ cm/s}) 2.37 \times 10^{-1} = 1.2 \times 10^8 \text{ cm/s.} \quad (8.5)$$

The kinetic energy of the orbital electron is

$$E_{\text{kin}} = (1/2) m_e v^2 = (1/2) 10^{-27} (1.2 \times 10^8)^2 = 7.2 \times 10^{-12} \text{ erg.} \quad (8.6)$$

The experiments show that the kinetic energy of the photoelectrons is about 8×10^{-12} ergs, which is so very close to the value obtained above (8.6). It is thus seen that Einstein mistook the *source* of the kinetic energy of the photoelectron, thinking that it came from the incident light source; whereas, the reality is that the *velocity field in the atomic vortex projects the electron after the incident light has triggered its release*, as explained below.

Production of light due to oscillation of an atom has been discussed before (Sec.4.4, 4.5). We shall analyze here the displacement of an atom during its oscillation, and the radial flow of the surrounding space (Fig.4-4). An atomic nucleus, composed of independent electronic voids, closely packed, approximates to a “spherical hole” in space, central with the atom. The atom, during displacement equal to its diameter, leaves a “hole” in its previous location. This “hole” is filled due to the flow of space at speed c , radial through the light’s first wavelength λ , which gets formed as discussed earlier. The time taken for this flow across the wavelength is λ/c ; and the acceleration of space is $c / (\lambda/c)$, which is c^2/λ . Each successive wavelength, formed due to the oscillations of the atom, possesses the above acceleration field across it (radial). Now suppose that the spherical wave front of one of these shells, during its transmission, meets an orbital electron of an atom. The orbital velocity v of this electron, is derived from the atomic vortex which subjects it to an inward acceleration v^2 / r , where r is the radius of its rotation. The electron is held by electrical force, created by the above inward acceleration towards the nuclear center. The acceleration field c^2/λ , within the wavelength of the light-shell that meets the orbital electron of the atom, is also inward, that is, towards the light source. For the electron to be released from the atomic vortex, the above two acceleration fields must be equal and opposite. Thus,

$$c^2 / \lambda = v^2 / r \quad (8.7)$$

Or $\lambda = c^2 r / v^2.$ (8.8)

Substituting the values: $v = 1.2 \times 10^8$ cm/s obtained above (8.5); $r = 10^{-8}$ cm; $c = 3 \times 10^{10}$ cm, the value of λ comes to, 6.25×10^{-4} cm, which corresponds to the cutoff frequency of, $3 \times 10^{10} / 6.25 \times 10^{-4}$, that is, $0.48 \times$

10^{14} cycles/s. (For metallic sodium, the threshold frequency is about 5×10^{14} sec^{-1}). Considering the approximate nature of the assumptions on the orbital radius of electron, and the radius of an *average size* of nucleus, with which the space-circulation velocity around the nucleus and the orbital velocity of the electron were calculated; any better result from (8.8) to conform to the experimentally obtained value of threshold frequency is unlikely. For, the orbital radius of the electron, if supposed to be 10^{-9} cm, rather than 10^{-8} cm, the threshold frequency calculated from (8.8) will be closer to the experimental value.

The additional information given by Eq.8.8 is as follows. In atomic vortex, the velocity field falls inversely from the nucleus center; and therefore, the inner orbital electrons will have higher speed of rotation. On release by the incident light shell, these electrons will possess higher kinetic energy. It is seen from (8.8) that for higher value of the electron's speed v , the wavelength λ is smaller. It is thus concluded that with higher frequency of the incident light, the photoelectrons released will show higher kinetic energy. This is an experimentally observed fact.

The above analysis shows that the concept of the photon-nature of light, with the *indivisible quanta* of energy possessed by each photon, is a case of the most serious *misconception*, which led Einstein (who was a believer in the *emptiness* of space, as evident from the formulation of special theory of relativity) to wrongly treat light-energy, hf , as the *instantaneous* value (when in reality, this energy is produced and accumulated in *unit time*); because this way, the kinetic energy of the photoelectrons, as observed experimentally, could be explained without going deeper into the structure of the atom (that became known later about 1912 through Rutherford's experiments) to determine whether the photoelectrons have any other source in the atomic structure that imparts kinetic energy to them at the time of their ejection from the atoms.

Though, Planck *integrated* together the energy of f nos. of shells erroneously, he still believed that light energy is distributed uniformly over an expanding set of wave fronts. In contrast, Einstein conceptualized that the energy of light is not distributed evenly over the whole wave front, as the classical picture assumed; rather it is *concentrated* or localized in discrete small regions. With the help of both these energy integration and concentration operations, the right order of magnitude of the kinetic energy of the photoelectrons, as observed experimentally, could be achieved in the quantity hf .

For better understanding of the physical significance of the "indivisible quanta", we take the following example: Consider the case of a

light source producing successive spherical wave pulses or spherical shells of light with frequency f , say $10^{15}/s$ and wavelength $3 \times 10^{-5} \text{ cm}$. In *one second*, the energy produced by f nos. of shells will be hf , that is $6.62 \times 10^{-27} \text{ erg s} \times 10^{15}/s = 6.62 \times 10^{-12} \text{ erg}$. Now, if it is desired to make the energy “ hf ” *indivisible*, then the independent shells produced successively in one second become indistinguishable, and the new imaginary wavelength of this light will become: $\lambda f = (3 \times 10^{-5}) \text{ cm} \times 10^{15} = 3 \times 10^{10} \text{ cm}$; while the frequency will be one, that is, only one wavelength of this large width of $3 \times 10^{10} \text{ cm}$ will be produced in one second. The quantum physics will accept the energy of this new shell of light as calculated above, but not the new wavelength and frequency. It will accept the energy content of this new shell of light for explaining the photoelectric effect; and will reject the wavelength and frequency because the hidden inconsistencies in the photon model will come to the fore.

Without any physical picture, clarity and meaningful explanations, some of these ambiguous conceptions on the fundamental nature of light laid foundation to the quantum physics.

8.4 *Shortest Wavelength of Light*

As is known, in positronium, the electron and positron circle each other, till annihilation; this happens due to interaction of their vortices. At the final instant preceding annihilation, the rotation of the particles will reach the limiting speed c , because this is the speed that space has on the interfaces of the particles. In Eq.8.8 the value of v will be equal to c . Also the distance between the centers of the particles being $2r_e$, the value of r in (8.8) will be $2r_e$. Substituting these values in (8.8), the shortest possible wavelength of light is

$$\lambda_s = c^2 (2r_e) / c^2 = 2 r_e = 2 (4 \times 10^{-11} \text{ cm}) = 8 \times 10^{-11} \text{ cm}. \quad (8.9)$$

The shortest wavelength of light in the universe is produced consequent to the annihilation of electron and positron.

8.5 *Interaction of X-rays with Atoms*

High-speed electrons, projected inside a vacuum tube and stopped by its walls produce X-rays. Here, each electron on impact and almost instantaneous-rebound leaves a “spherical hole” of the size of electron-void

at the point of its contact with the wall, to be filled in with the space flowing nearly at speed c . This process is somewhat similar to the light produced during annihilation because, here too, the potentials in space associated with the electron at the instant of impact, die away, producing (which is seen as) X-rays. From each point of electron's contact with the wall, a spherical shell of light expanding at speed c will arise. Though the energy distribution on the wave front of the shell will fall inversely as the radius of the expanding shell; yet, this shell after transmitting for some distance and with depleted energy density on its wave front, on meeting an atom of a metal, releases an electron possessing kinetic energy almost equal to the kinetic energy of the first electron that produced the X-ray pulse. Indeed, the principle of energy conservation cannot explain this phenomenon because the same is not relevant here. Recognizing that light has the nature of successive shells, and in each shell, across the wavelength, exists an "acceleration field" of constant magnitude independent of the energy density in the wave front; the release of the electron, as discussed earlier in the case of the photoelectric effect, is attributable to this acceleration field, rather than to the energy density in the X-ray's wave front. If however, the explanation is sought with the idea of energy exchange between the X-ray and the ejected electron, this effect is most puzzling. In the words of Sir William Bragg: 'It is as if one dropped a plank into the sea from a height of 100 feet, and found that the spreading ripple was able, after traveling 1000 miles and becoming infinitesimal in comparison with the original amount, to act upon a wooden ship in such a way that a plank of that ship flew out of its place to a height of 100 feet.' Yet this effect was not utilized to support the wave nature of light. It was argued that the X-rays when passed through a gas, ionize only few molecules, and had the rays had the wave-property many more molecules should be ionized since the wave will meet all the molecules. This argument does not hold good with the shell nature of light; because, the acceleration field in the X-ray shell has to be in opposition to the acceleration field of the orbital electron, that is, both the opposing acceleration fields must be in line for effective nullification of the electron's bond in the atomic vortex; which requires that the orbital electron, at the instant when it meets the light-shell (wave front), should be moving tangential to it. Obviously, such a disposition of the light shell and the electron can be only in rare encounters and, hence, the numbers of the ionized molecules with one shell of light are expected to be limited. Thus it is seen that wave nature (or more precisely shell nature) of light can explain the ionization of gases by the X-rays satisfactorily.

8.6 *Nature of Heat*

In an atom, the nuclear electrons and positrons, as well as the orbital electrons, create gravitational potential in space, while the electrical potentials are neutralized exterior (beyond the orbital electrons) to the atom, as stated before. Consider a solitary atom A, with its radial gravitational field spread uniformly and symmetrically on the spherical nuclear surface (neglecting the gravitational field of the orbital electrons that, compared to the nucleus, have negligible mass), on account of which it is not a force – free entity. The inward gravitational field will hold the atom stationary, in the absence of any other atom and its gravitational field in the neighborhood of A. Suppose that for an instant, some external disturbance has upset the balance of the fields of A, by partially *reducing* the *inward* field on its right side, due to which it tends to move to its right from the mean position. This displacement will be opposed by the *remaining* inward field on the right of A (inertial effect arisen as the atom is being moved from rest), forcing the atom to return back to the mean position; which may be surpassed due to inertial effect because of the velocity field (space motion) associated with the moving atom. The displacement of A, now to its left, repeats the similar process as described above. The atom has now been set into oscillation not by giving energy to it; but by *reducing* the already existing gravitational field on one side of it. Thus, despite any energy input, the atom continues oscillation indefinitely creating “acceleration field” in its close vicinity, due to the directional changes of the velocity-field accompanying the oscillatory motion of the atom. The “acceleration field” associated with the oscillating atom A is the basic state of energy, presently known as “heat”. The medium of space, being non-viscous and mass less, does not retard the oscillation of A by reducing either its frequency or amplitude (in the absence of all other interactions). There is no energy exchange between a *single* oscillating atom and the surrounding space. The modern view that an oscillating electron radiates off energy and therefore its oscillations slowly die down does not seem to be correct.

The atom A, during the displacement to its right, will create a half spherical shell of light on its left, transmitting out at speed c relative to space (Fig.4-4). Now, suppose there is another atom B in the neighborhood and on the left of A. The shell of light produced by A will meet (not strike as conventionally understood) the atom B. The inward acceleration field in this light-shell produced by A, will upset the balance of the inward gravity fields of B, which will be displaced to its right, sending a light pulse to its left, and

a ‘shell’ with *increased* acceleration field to its right; this latter shell (can be termed as “gravitational” shell) will nullify the next light shell that A will send towards B, when A is displaced again to its right having reached the extreme position of oscillation to its left. Also, the atom A, having reached the extreme position of oscillation to its right, and while moving to its left, also creates a “gravitational” shell that transmits towards B and nullifies the light shells produced by B and transmitting towards A. Through this process, the atom A sets B also in oscillation; and B, through its own light and gravitational shells, that are in phase opposition to the similar shells produced by A, retards the oscillations of A till equilibrium for both the atoms is reached. If A is surrounded by more atoms similar to B, the system will reach equilibrium faster; because there will be more shells at a time (one from each atom) to retard the oscillations of A. Though the atom A, which initially started oscillating without intake of any energy, has not *emitted* (parted with) any of its structural energy, yet through the interactions of its light and gravity shells, the stationary atom B has been set into oscillation creating its own kinetic energy locally; and finally, this system of two atoms has been brought to the same temperature without absorption of any energy of A by B in its structure. As per the contemporary physics, bodies in a state of equilibrium absorb as much energy as they emit. Whereas, the above analysis shows that a hot body *emits* neither the kinetic energy associated with its constituent vibrating atoms, nor their structural energy; so also, a cold body does not *absorb* energy in the structures of its constituent atoms, though, when interacted with light shells, its constituent atoms produce oscillating motion, creating kinetic energy in their vicinity due to the imbalance of their own structural forces. However, the atoms of the colder body send radiation pulses to retard the atomic vibration of the hotter body, thus cooling the hotter body, and raising its own temperature.

Whether light from oscillating atoms falling on matter creates a net pressure, is discussed below:

Fig.8-3 shows a free atom, A, in oscillation, whereas, the atom B is held at the surface S of a metal plate. The lines of action of the inward gravity field F_A of A, and F_B of B are also shown. One of the inward gravity field-vector of A has been extended and shown at B (F_A). Similarly, one of the inward field vector of B is extended and shown at A (F_B). The atom B is held on the surface due to inter atomic forces F of its neighboring atoms in the plate except at the surface S where F_A interacts with the field F_B of B. The resultant gravity field $F_B - F_A$ acts at B at S. With the oscillation of A, when it is displaced to left, a light pulse (shell) described earlier starts from A, and after a time R/c reaches S, causing a decrease in the strength of F_A

there; thereby, increasing the magnitude of $F_B - F_A$, which results in an additional force on B arisen due to its own inward gravity field F_B . During the next displacement of A towards right, through a similar process as described above, the magnitude of F_A increases (as A comes closer to B), which decreases the magnitude of $F_B - F_A$, and thus leads to the reduction of the force on B. The intermittent pressure pulses on B, which is held at the surface S by inter-atomic forces F, set it under oscillation creating electromagnetic pulses also from B. It is thus seen that the atom A, without imparting momentum to B through any physical contact, sets it in oscillation through the light pulses produced due to its mechanical oscillations.

In a hollow cavity (black body radiation), the equilibrium distribution of electromagnetic radiation energy, experimentally obtained, shows that at low frequency the energy is proportional to f^2 , while at high frequency there is an exponential drop. Whereas, the theoretical energy distribution as per Rayleigh-Jeans law gives excessive energy for higher frequencies, such that if integrated over all frequencies the total energy becomes infinite. Though, the classical mechanics places no limit to the frequency of the mechanical oscillators (atoms), a limit to the oscillator's frequency is imposed by the motion of the fluid space submerging the atomic vortices (oscillators). The displacement of the atoms from their mean positions displaces space, which has a limiting speed c . If an average radius of atoms is taken as 1.5×10^{-8} cm, the displacement of an atom on either side of its mean position up to a length equal to the radius will involve total displacement relative to space as 3×10^{-8} cm. Time required for the fluid space to move up to this length at its maximum speed is: 3×10^{-8} cm / $(3 \times 10^{10}$ cm/s) = 10^{-18} s. The nos. of light shells produced in one second due to this atomic oscillation will be 10^{18} /s, which is the frequency of the light produced. Thus, the maximum frequency of the oscillators in *thermal* radiation, excluding X-rays and gamma, should be limited to about 10^{18} /s. It can therefore be inferred that the exponential fall of energy distribution in a cavity at higher frequencies is due to the reaction from space at higher oscillation frequencies. The classical concept that to determine the total energy within a cavity (blackbody radiation), integral has to extend over all the frequencies is based on a misconception that atoms oscillate in the *void ness* (reaction less) of space and hence there can be no limit to their frequency of oscillation.

8.7 *Bohr's Theory on Atomic Radiation*

As per classical electromagnetism, electric charges in acceleration will radiate energy, and hence the orbital electrons in the atom will lose energy due to which the emitted radiation should continuously change. However, the existence of sharp spectrum lines, are not in accord with the above prediction of the classical theory. As a solution to this problem, Bohr postulated different ‘energy states’ for an atom, such that when it falls from a higher to the lower energy state, it emits a photon with energy hf as per Plank’s energy equation.

As discussed before, in the space vortex structure of the atom and electron, the orbital electrons have already their fixed orbits. These electrons, carried by the vortex around the nucleus, can neither lose any energy (structural, potential or kinetic) due to orbital motion, nor change their orbits due to strong bond created by the velocity fields in between the nucleus and the electrons; because ‘losing energy’ by an electron signifies ‘losing part of its vortex structure’. Further, these electrons make negligible contribution to the gravitational potential of the atom that, as seen before, produces light due to its time variation. Moreover, the basic error of Bohr lies in the application of the concept of Plank’s *indivisible* energy quanta hf , in equating the same with the differential energy between the two energy states, composed of the sum of the kinetic energy of the orbital electron and the electrical potential energy of the proton-electron system; this is because the energy ‘ hf ’ is the quantity produced in a *unit time*, whereas, the energy released due to difference between two energy states of Bohr (even if the energy states are supposed to exist) is *instantaneous*.

8.8 *The Compton- Effect*

Compton’s experiments are said to confirm that photon is a *concentrated bundle* of energy. The experiment consisted of a beam of X-rays of known wavelength falling on graphite block. He measured the intensity of the scattered X-rays with respect to their wavelength. His conclusion is that the X-rays are not waves but several photons each with energy, “ $h f$ ”. A photon, in his experiment, collides with a “free” electron in the graphite block, like the collision of billiard balls. He treats in his mathematical analysis the “free electron” as the one, which is not bound with the atom of the graphite block, and is at rest. The collision of photon, assumed with a *free* electron, has the following implication.

As is well known, X-rays can damage molecules and ionize gases; and like in photoelectric effect, will extract electrons bound in atoms. In the

latter case, even if the outermost orbital electron is released, its own kinetic energy in the atomic vortex, as discussed before, will be about 10^{-11} erg (8.6). By *assuming* the collision of the X-ray with a “stationary” electron, the initial kinetic energy of the electron prior to its release from the atom has been *neglected*. In any case, one cannot assume that the X-ray interacts only with a “free and motionless” electron. This kinetic energy of about 10^{-11} erg will be larger for the inner orbital electrons, which rotate at greater speed. For, an inner orbital electron, with an average speed of three times the speed of the outermost electron, will increase the above kinetic energy to about 10^{-10} erg. The quantity of energy, accounted in Compton’s experiment against the kinetic energy of the recoil electron, is about the same order of magnitude; the concept behind is that the electron’s recoil energy comes from the energy of the incident X-ray photon. If an X-ray of frequency 10^{17} is used during the experiment, its energy as per Plank energy equation will be; $hf = 6.6 \times 10^{-27} \times 10^{17} = 6.62 \times 10^{-10}$ erg, which is not far from the above figure of the kinetic energy of the ejected electron that it would have had in the vortex of the atom due to its rotation prior to the release. On account of neglecting the initial kinetic energy of the released electron, and matching this figure with the indivisible energy quanta, Compton’s conclusions on the photon nature of X-rays become erroneous. The misinterpretation of Compton experiment –that X-rays is not of wave but photon-nature—led to a misleading picture of photon, both qualitatively and quantitatively.

Another misconception in the above experiment is to believe that a bullet-like photon after striking an electron rebounds with a reduced frequency. Evidently Compton believed that a single photon has a frequency; that it oscillates, perhaps, across its line of motion. As stated earlier, frequency for light would be meaningful only if it is defined as the numbers of waves, photons or shells, produced per unit time. (There is, though, an implied meaning of frequency for a single wave or shell of light, in the sense that the inverse of frequency means the time duration for the formation of each wave/shell). But, in case of a single photon, its wavelength is not known in a physical way except for the mathematical expression c / f , which leads to an imaginary large wavelength of 3×10^{10} cm, and a single frequency, described earlier. Compton’s interpretation of his experiment together with the basic concept of relativity that all kinds of energy should have mass, made photon to possess *hypothetical* mass, momentum and inertia, while the most fundamental cause for its observed uniform motion at the constant speed of light remained unknown.

From the relevant literature, it is seen that Compton’s arguments to assign momentum to a photon run as follows: As per the classical wave

theory of light, if a body fully absorbs the energy E from a parallel beam of light, then a linear momentum E/c is transferred to the body. Based on this he, using Planck Energy equation $E = h f$, derives momentum, p , for an individual photon

$$p = E / c = h f / c = h / \lambda. \quad (8.10)$$

But the “radiation pressure” on a body is otherwise explainable (Sec.8.6) by the interaction of light shell with the gravity field of atom without absorption of light energy. The classical physics is equally wrong in the concept of *absorption* and *emission* of light energy. Further, the use of Planck Energy equation makes a single photon to possess enormous energy, that is, 10^{16} times the actual energy, if we use light of frequency 10^{16} /s, because in reality, the energy of a single shell of light is, 6.62×10^{-27} erg, as determined by Planck Constant.

It is seen that the concept of “energy quanta” misguided Compton too (after Einstein and Bohr) in the interpretation of his experimental results.

8.10 *Matter Waves*

Louis de Broglie, guided by certain symmetrical aspects that nature presents, speculated (1924) that, since, light shows dual behavior of particle and wave, matter too could perhaps have particle and wave-like properties. The discussions on photoelectric and Compton effect have, earlier in this chapter, shown several fundamental aspects as to why the very concept of photon, carrying indivisible quanta of energy and its particle-like behavior are misconceptions. Therefore, to associate material particles with wavelike behavior appears, at the very face of it, to be an equally misunderstood idea. However, considering the fluid nature of space medium, and the structure of the electron as a vortex of space, the association of certain wave-aspects with an electron in motion relative to space has a distinct possibility.

An electron, with its central void enclosed within the spherical interface, while in motion, accelerates space in the plane transverse to its motion as explained below. Refer Fig.6-2. During the displacement of the interface equal to its radius, its spherical surface displaces space non-uniformly, thus creating radial outwards acceleration field, which reaches maximum in the Y-Z plane when half of the interface is displaced. This field is symmetrical around the circle formed with the intersection of the interface with the Y-Z plane. If v is the linear velocity of the electron, the acceleration

field will spread out to a length of $(r_e / v) c$, since all fields are transmitted in space at c . When half of the interface passes over the Y-Z plane, the acceleration field becomes downward in direction till the interface passes fully through the plane. Thus, in each plane, transverse to electron motion, such acceleration fields are produced and destroyed. Denoting l as the length of the acceleration field

$$7 \quad l = r_e c / v. \quad (8.11)$$

Multiplying and dividing the right hand side of (8.11) by $(4/5) m_e$

$$l = (4/5) m_e c r_e / (4/5) m_e v$$

which from (2.15) becomes

$$l = (5/4) h / m_e v. \quad (8.12)$$

The Eq.8.12 is similar to de Broglie equation:

$$\lambda = h / m v, \quad (8.13)$$

except for the following major differences:

The quantity ‘ h ’ in (8.12) is the angular momentum of electron; and the quantity ‘ l ’ is not the wavelength of light that gets produced during *oscillatory* motion of electron (here linear motion of electron is under consideration). Even a high-speed linear motion of electron will produce light due to spatial readjustments of the magnitudes of the gravitational potential at each point, as the electron changes its position relative to space. This effect too is different from the matter wave of de Broglie.

The quantity ‘ $m v$ ’ in de Broglie equation (8.13), was understood by him as the ‘photon momentum’, whereas, ‘ $m_e v$ ’ in (8.12) is the momentum of electron.

The Eq.8.11 is independent of mass and charge of particles; therefore, this ‘length’, produced due to acceleration field on account of particle motion, is associated with only moving particle; and has little to do with the propagation of light, whether of photon or shell nature. The shortest ‘length’ is associated with electron motion, and is equal to its radius when its speed approaches light speed, as it follows from (8.11).

The Eq.8.11 is more fundamental equation for de Broglie wave, because from this, (8.12) has been derived to show the actual physical meaning and limitation of de Broglie equation.

8.11 *Diffraction of Electrons*

When electrons are shot through small slit, the pattern of their distribution on a screen on which they fall is similar to the one created by a wave, if the same is made to pass through a slit. In a parallel beam of electrons, the space vortex structure of electron creates magnetic attraction between them, falling inversely as the distance between the electrons. And at closer range, electric repulsion between the particles, which falls inversely as the square of the distance, is effective. In addition, the ‘accelerating space’ of de Broglie wave, discussed above, acting in planes transverse to the motion of each electron, would keep the particles separated. While entering the constricted slit the electrons are *choked* and compressed closer against the above repulsive-forces and the interaction with the de Broglie wave. Immediately after emergence from the slit, the particles are separated due to their mutual repulsion on account of the above forces that are stronger than the magnetic attraction, which prevents dispersal of the particles. The ring pattern of electron diffraction obtained on the screen is due to the above repulsive forces that are symmetrical around each electron.

8.12 *Constancy of the Speed of Light in S T R*

Einstein postulated that different observers, moving at uniform velocities relative to each other and to a source of light, should find their measurements of the speed of light to be the same, provided they use a defined reflection procedure. Let us suppose that light consists of several *particles* of energy (energy—as conventionally interpreted *today*, such that there is little difference at quantum level between matter and energy) say, electrons with properties of mass and momentum, being projected from a light source at random in all directions so as to form a uniform spherical distribution. The observers can choose any of these particles for the test. A particular observer, moving in the same direction as his chosen particle, will find its speed different from the measurement of the other observer who is moving against the motion of the particle, as per classical relativity. Similarly, if light is imagined as a swarm of photons, each with mass, momentum and kinetic energy, being emitted from the source at random

without any *constant interval* between the two successive photons from the same atom, the Galilean relativity will indeed be applicable, similar to the above-cited example of the shower of electrons; and the two observers will measure different velocity for the same photon. But, as shown before, the structure of light is that of successive shells of mass-less energy with a constant time interval between the fronts of the adjoining shells emitted from *each* atom, as determined by the atom's vibration. It's the time-interval of emission between the successive shells that determines the frequency of light; whereas, in the earlier example of the photon-model of light, the frequency of light is a mere mathematical quantity, E/h , having no relationship with the timings of emission of the two successive photons from the same atom. It is this *haziness* on the physical picture of the frequency and wavelength of a photon that leads to misinterpretations of the results of several experiments devised to check the above postulate of STR. The following simple analysis, almost trivial, supports constancy of light-speed measurements by different observers in relative uniform motion postulated by Einstein.

In Fig.8-4, a source of light S (stationary with respect to space) from which a single spherical shell of light, produced consequent to the annihilation of an electron and a positron located in S, is transmitted at a constant speed c relative to the medium of space. When the wave front of this shell meets the eye of an observer O, who is also stationary relative to the static space, let him record this instant assuming that his time is the same as that of any other observer (universal time) who may even be in motion relative to space. Let him also record the instant when the tail end of the shell passes away from him. If λ is the radial width of this light-shell (wave length of this shell of light is r_e , equal to the electron radius), then, from the ratio of λ and the time difference between the above two instants, say t_1 , the observer can calculate the speed of light from the relation

$$\text{Speed} = \text{wavelength} \times \text{frequency}$$

$$\text{Or} \quad c = \lambda (1/ t_1) = \lambda / t_1 \quad (8.14)$$

because light-effect is postulated to be transmitted *within* the wavelength at speed c relative to the stationary space. Let S produce similar shells in succession such that the tail end of a shell coincides with the front of the following shell. If the nos. of shells received by O in unit time is f , he will calculate the distance covered by f nos. of shells in unit time as $f\lambda$, and time

duration as ft_1 . With the ratio of these two quantities he will get the value of c , same as before. It is seen that the measurement of the light velocity across one wavelength is the same as across any of the successive wavelengths, provided the successive shells are *similar* with *no interruptions* in between. Now let O move with a uniform velocity v relative to the static space towards S , and record his timings across only one shell. Because his velocity relative to the light shell now is $v + c$, time elapsed across one shell will be

$$t_2 = \lambda / (c + v) \quad (8.15)$$

which is shorter than t_1 measured earlier. The moving observer's eye interacts with the light within the shell for a shorter duration now and, hence, he sees the wavelength as:

$$\begin{aligned} \lambda_m &= \text{length through which the light effect is transmitted in time } t_2 \\ &= c t_2 = c \lambda / (c + v). \end{aligned} \quad (8.16)$$

The nos. of shells meeting the eye of the observer in unit time from (8.15) will be

$$f_m = 1 / t_2 = 1 / [\lambda / (c + v)] = (c + v) / \lambda. \quad (8.17)$$

The moving observer can now determine the light speed from (8.16) and (8.17) as:

$$\text{Speed of light} = \lambda_m f_m = [c \lambda / (c + v)] (c + v) / \lambda = c. \quad (8.18)$$

From (8.14) and (8.18) it is seen that the observer, in moving as well as stationary states, finds that the speed of light is constant; and he reaches this conclusion without sacrificing the traditional concept of time.

In the well-known experiment of Sagnac, a beam of light is split into two halves that travel around closed identical paths (reflected through mirrors) in opposite directions, and combined again in a detector to examine their interference pattern. The rotation of the apparatus produces shift in interference fringes as a function of the angular velocity. From (8.16) and (8.17) the reflecting mirrors along one path, rotating opposite to the light beam, will 'see' shorter wavelength and, proportionately, more of light-shells in unit time (frequency); while the mirrors rotating in the same

direction as the light beam in the other path, will see longer wavelength and lesser nos. of the light-shells in the same time interval. On account of this, the wavelength as well as the frequency of the two beams reaching the detector will be different and, consequently, a shift in the interference fringes will occur. The product of the wavelength and the corresponding frequency for each path of the beam remaining the same, the mirrors placed in the two paths (observers) will find the same value of the velocity of light. Therefore, on rotation of the apparatus, appearance of the shift in the interference fringes in Sagnac's experiment should not be taken to mean that the light has different speeds (relative to space) along the two paths.

The above interpretation of Sagnac experiment can be confirmed by increasing the nos. of the reflecting mirrors in each path; in which case the shift in the interference pattern should increase.

The effect of light at a space point involves creation of light shell there from the already existing gravitational potential at that point, and its further transmission. This process repeats continuously as the light shell traverses each point in space. In the various experiments, set up to determine the light speed, only transmission aspect of light is taken into account, neglecting the process of the formation of the wavelength—the radial spread of light. That is why a “ray” of light, continuously issuing forth from the source, is supposed in experiments such that it has instantaneous reflection from a mirror, and also instantaneous interaction with the eye of the observer; as if the wavelength is zero. Due to this misconception, it does not become apparent that a moving mirror reflects light of wavelength different from what it receives; and a moving observer too sees light of wavelength different from what he sees the same light to be, when stationary.

In the treatment of STR, in the moving frame of reference (with respect to the stationary one) the reflecting mirror too, located at the X- axis, should be moving at uniform velocity like the observer; the ray of light from the origin of the axes towards the +X axis in this frame of reference will be reflected by the moving mirror at an *increased* wavelength as shown above; and the observer, because of his motion opposite to the reflected ray, will find the wavelength of this light *decreased* to the original value. In the stationary frame of reference, the stationary observer receives the reflected ray of the same wavelength as that of the ongoing ray. Thus, the observers in both the reference frames find the reflected ray having the same wavelength. Since their time is the same as the universal time, the nos. of shells per unit time, that is the frequency of the light ray, will be equal for both of them; hence, they get the same velocity of light irrespective of the motion of the moving observer.

Fresnel, around 1820, postulated ether-drag in a moving material medium and increase in light velocity on account of this. His ether-drag is close to the velocity-field that gets associated with the moving molecules of matter—responsible for momentum. Transmission of light along the motion of the medium will increase the wavelength, whereas, its opposite direction will decrease it. As the respective frequencies will proportionality change, the velocity of light in both the directions of light will remain the same. This subtle aspect that despite changes in wavelengths, the speed of light will be the same had not been taken note of. Fizeau's experiment to measure speed of light in flowing water detected changes in speed because he based his conclusion on fringe-shift, which, as shown above, is an erroneous inference.

In the assumed void-ness in space of current physics, speed of light has no medium to be referred to; in fact in a medium of nothingness, neither fields nor light can exist. Therefore, if the velocity of light measured by different observers in uniform relative motion with respect to each other has to be the same as postulated in STR, the spatial reality and the shell nature of light require recognition. With this conceptual shift on the basic nature of the absolute vacuum and the nature of light, the relativistic concepts involving changes in length and time dependent on the motion of the observers will become redundant.

8.13 *Light speed is Independent of the Motion of the Source*

Consider an electron with its vortex structure. At any point in space, the velocity field and its radial distance from the vortex center will determine the magnitudes of its gravitational and electrostatic potentials. As discussed earlier, a displacement of the electron's center will produce changes in the potentials; such changes will occur during electron's motion, either uniform or accelerating. The equalization of potentials due to self-action of space takes place at speed c with respect to space. Therefore, considering motion of electron at *ordinary* velocity, it can be assumed that the field structure of electron retains its original symmetry of distribution as before (in static state).

Let an electron and a positron, moving together at ordinary speed, under go annihilation. After collapse of the electron void during annihilation, it loses mass, charge, and its existence; but the light shell produced continues its transmission relative to space with the point of annihilation as its center, independent of the speed of the particles prior to

the instant of their annihilation, since the point of annihilation and the surrounding field structure get fixed relative to space subsequent to the annihilation. On similar arguments it will be seen that light produced during atomic vibration is transmitted at speed c relative to space due to self-action of space to equalize the potential gradients. Further, since light shells are mass less entities, not emitted from *within* the electron or atom in the light source, they cannot carry momentum of the light-producing particles (atoms, electrons, in the constitution of the moving source of light).

8.14 *Time Dilation*

The traditional concept of time was revised in STR. Though it has been shown in Sec.8.12 that with the shell nature of light, the postulate of STR on the invariance of the speed of light in different frames of reference is supported, the following thought experiment reveals the fallacy of the often-quoted arguments¹ in support of time dilation.

Fig.8.5 shows a platform in uniform motion with two observers A and B on it, and another stationary observer C on the ground. The relativist's view is that ' if the observer A lights a match stick creating a flash, the observer B sitting opposite to him will think that the flash has directly come to him along the route PQ, whereas, the observer C will see the path along PQ¹, since, during the time the flash has reached him, the platform has reached to a new location P¹ Q¹ R¹ S¹. The path of the flash does not look the same to the two observers B and C. Since the flash is *moving with* A, it seems to B taking a longer path; and if the speed of light is to remain the same, the longer path must seem to take longer time: time must pass faster for C'. The misconception on the nature of light in the above statement is the presupposition that "the flash is moving with A". But is the flash really moving with the observer A? In Sec.8.13 it was shown that the speed of light is independent of the motion of the source. Hence, the uniform motion of A cannot be imparted to the flash of light that he creates by striking a match. To further pinpoint the relativistic misconception on the motion of the flash along with A, let us suppose that A has with him an electron and a positron that undergo at some instant annihilation. As explained in Sec.8.13 the point of annihilation will get fixed in space, while the observers A and B will move on. Assuming that B can see the point of annihilation even prior to the instant when the light shell consequent to annihilation has reached him, he will see that the point P is shifting to his left due to his own motion on the

¹ The Clock Paradox, Dr. J. Bronowski, Scientific American, February 1963, Vol. 208, No.2. pp. 134-144

platform to the right; and by the time B reaches Q^1 he will see that the light shell has taken the route PQ^1 to reach him; PQ^1 is the same length as seen by C. Therefore, the assumption of the relativist that the flash of light is *moving with A* is erroneous. Further, if the stationary observer C stands at D, where $PQ^1 = PD$, the light shell will reach both B and C at the same instant. The new concepts of the ‘time dilation’ and ‘simultaneity’ are clearly superfluous in STR, since invariance of the speed of light in different frames of reference in relative uniform motion follows otherwise from its very basic nature.

On creation of cosmic matter

9.0 Expanse of the Substantial Space of the Universe

The universal space could be infinite or finite in its expanse. In the latter case, a sphere of dynamic space can exist in an infinite extension of nothingness beyond its distinct boundary (Fig.9.1); and this leads to the possibility of infinite nos. of the spherical universes of substantial space

existent eternally in the end-less void extension beyond our own universe. In a finite universe of dynamic space, the galaxies that are presently observed to be moving away from each other at increasingly higher speeds, will retard under the action of their own inward gravity field, or more correctly, their inward free-fall acceleration, when they reach closer to the universal boundary. The galaxies on their motion away from the universal center will possess spiraling motion due to the radial motion of their constituent matter obtained at the time of creation and projection from the universal center (next Sec.9.1), as well as the circular motion of the universal space that constantly interacts with the galaxies. Thus, when the radial motion of the galaxies is reduced to zero, they still describe circular motion in addition to some complex motion that the electrical attractive and repulsive forces among the galaxies may produce. The distribution of the galaxies towards the universal center (creative zones) being more than those towards the boundary, the electrical attractive forces may force the galaxies to return towards the universal center in due course. During this motion, as the distance in between any two galaxies decreases, a reorientation of the directions of the velocity fields in their enclosing vortices may be caused by electrical attractive forces, which will finally lead to their collisions and annihilation of matter in the final stage— annihilation taking place in the basic units of electron and positron.

An estimate on the radius of the finite spherical universe of the substantial space can be hypothesized such as: Since it is an observed fact that the universe has cosmic matter, an electron shot radially out at velocity c from the universal center, retarded by its own inward gravity field, should have zero velocity in close vicinity of the boundary of the universe, lest it loses its existence if it meets the region of void ness at the interface of the substantial-space boundary and the infinite nothingness beyond. Applying the classical law of motion for the radial motion of the electron

$$v^2 = u^2 - 2fs$$

where the symbols have their usual meaning.

Substituting, $u = c$, $v = 0$, $f = (k/4\pi c) m_e / r_e^2$, from (4.6), in the above equation

$$s = c^2 r_e^2 / 2 (k/4\pi c) m_e.$$

Expressing m_e in terms of c and r_e from mass equation (2.6), and $k = s^{-2}$, from (4.2)

$$s = c^2 r_e^2 / (2 s^{-2} / 4\pi c) (4\pi/3) r_e^3 c = (3/2) (c^2 / r_e) s^2. \quad (9.1)$$

Substituting the values for c and r_e

$$s = (3/2) [(3 \times 10^{10} \text{ cm/s})^2 / (4 \times 10^{-11} \text{ cm})] s^2 \approx (3.3) \times 10^{31} \text{ cm}. \quad (9.2)$$

The *minimum* depth of the substantial space of the universe should be 3.3×10^{31} cm. If the universe is assumed to have an infinite expanse of the substantial space, the meta-galaxies in it should be far-spaced so as to have negligible electrical and gravitational interaction between them.

Alternately, the radius of the spherical universe can be determined by computing the gravitational potential energy of an electron in the universal space. The difference between the creation energy of electron (2.14) and its electrostatic energy in space (3.1.2.2) resides as gravitational energy, given by

$$E_{\text{grav}} = (4/5) m_e c^2 - (\pi / 10) m_e c^2 \approx (1/2) m_e c^2. \quad (9.3)$$

In Fig.4.1a, a spherical shell with constant shell width r_e and of radius r , which gravitationally energizes the universe following void creation, is shown. Since the shell width r_e is much smaller than r , the volume of the shell is taken as: $V = 4\pi r^2 r_e$. To simplify the calculation of gravitational energy due to mass of electron in the universe, we determine the “equivalent mass” of the above volume (if the same is converted into mass by void creation) of the shell from mass equation (2.6):

$$\text{mass}_{\text{shell}} = (4\pi r^2 r_e) c. \quad (9.4)$$

From (4.6), inward gravity field, $(k/4\pi c) m_e / r^2$, on each point within the shell, acts on the above mass (uniformly distributed in the shell); and work is done in transmitting the shell up to the boundary of the universe. The work done is stored in space as gravitational energy of the electron. Energy required to transmit the shell to a radial length R , where R is the radius of the substantial space of the spherical universe, is:

$$E_{\text{grav}} = \int_0^R m_{\text{shell}} (\text{gravity field in the shell}) dr.$$

$$E_{\text{grav}} = \int_0^R (4\pi r^2 r_e) c (m_e s^{-2} / 4\pi c r^2) dr = s^{-2} m_e r_e R.$$

From (9.3)

$$(1/2) m_e c^2 = s^{-2} m_e r_e R$$

Or
$$R = (1/2) (c^2 / r_e) s^2, \tag{9.5}$$

which is 3 times less than the radius in (9.1). The depth¹ of the universe presently imagined is 10^{29} cm, which is 330 times less than the radius derived in (9.2).

9.1 *Creation of Cosmic Matter*

We can imagine inherent motion in the substantial space of the spherical universe of the radius derived above (Fig.9.1), distributed as circulating motion around an axis through its center, such that the planes at right angles to this axis contain space circulations—their centers coinciding with the axis. This describes the most basic state of the universe prior to creation of any matter. The space circulation at the universal center will have to be at speed c to enable creation of cosmic matter. The meta-galaxies and galaxies observed in the universe are fundamentally localized space- vortices initially derived from the basic universal space motion. The nuclei of matter for the galaxies might have been obtained, to start with, from the universal center; where continuous creation of electrons and assembly into atoms will take place (due to limiting speed of space) and whirled into outer space at speed of light. In addition to the creation of matter at the universal center, the galaxies will create their own matter as shown below.

In our galaxy, the solar system exists at a distance of about 2.62×10^{22} cm from the center of the galaxy, revolving around it at speed of 220 km/s. Assuming that similar to the derivation for the solar vortex, in the galactic vortex too the space-circulation in the diametrical plane at right angles to the axis falls inversely as the square root of the distance from the center of the galaxy

$$v = k_g / \sqrt{r} \tag{9.6}$$

¹ The Feynman Lectures on Physics, Volume 1, page 5-9.

where k_g is a constant and r is the distance from the galactic center. Substituting the values of v and r as given above in (9.6), we get

$$k_g = v \sqrt{r} = (220 \times 10^5 \text{ cm/s}) \times (2.62 \times 10^{22} \text{ cm})^{1/2} = 3.56 \times 10^{18} \text{ cm}^{3/2}/\text{s}. \quad (9.7)$$

From (9.6) and (9.7) the distance R_g at which the space circulation in the galactic vortex reaches the speed of light is:

$$R_g = [(3.56 \times 10^{18} \text{ cm}^{3/2}/\text{s}) / (3 \times 10^{10} \text{ cm/s})]^2 = 1.408 \times 10^{16} \text{ cm} \quad (9.8)$$

which is about 203000 times more than the solar radius.

Within the central zone of galaxy, a nearly spherical volume of radius 2,03,000 times the sun's radius is the region of continuation creation of matter starting from the electrons/positrons. With violent motion of these particle at speed of light, the electrons will magnetically attract and electrically repel, thus coming to close ranges, and creating neutrons, protons and hydrogen atoms, projected out from the galaxy's central zone as beams of hydrogen at speeds approaching light speed. The electrons with opposite spins (positrons) will have chance-encounters with electrons leading to annihilation and thus producing gamma radiation. Therefore, all those galactic centers, that are pushing out jets of hydrogen and are sources of intense gamma radiation, are located in the active region of the universe, continuously creating matter and thereby increasing mass of the galaxies and dispersing matter in space for the formation of stars. The creation of matter should be a distinct possibility at the centers of the stars as well, as seen below in the analysis pertaining to the sun.

The mass of matter within the creation zone of the galaxy is found as follows: The volume of the creation zone, $V_g = (4\pi / 3) R_g^3$; and mass of the galaxy, $M_g = V_g c$, since the entire volume of space in the creation zone circulates at c . Substituting the value of R_g from (9.8), $M_g = (4\pi/3) (1.408 \times 10^{16} \text{ cm})^3 (3 \times 10^{10} \text{ cm/s}) = 3.5 \times 10^{59} \text{ cm}^4/\text{s}$. Converting cm^4/s into gram from (2.12), $M_g = (3.5 \times 10^{59}) \text{ g} / 8.6 \times 10^6 = 3.49 \times 10^{52} \text{ g}$.

9.1.1 *Creation of Matter at Sun's Center*

For solar space vortex (3.5.2.7), the constant k was determined (3.5.6.6) as: $k = 11.52 \times 10^{12} \text{ cm}^{3/2}/\text{s}$; and the maximum tangential velocity of space circulation in the equatorial plane was determined (3.5.3.2) as: V_{sm}

= 4.367×10^7 cm/s. Consider the case when the sun had no matter, and the solar space-vortex extended all the way up to its center. From the solar vortex equation (3.5.2.7)

$$\sqrt{r} = k / v_t. \quad (9.9)$$

For creation of matter the space circulation speed should reach c . Substituting the values of k given above, and $v_t = 3 \times 10^{10}$ cm/s in (9.9)

$$\sqrt{r} = (11.52 \times 10^{12} \text{ cm}^{3/2}/\text{s}) / 3 \times 10^{10} \text{ cm/s.}$$

Or,
$$r = 1.475 \times 10^5 \text{ cm.} \quad (9.10)$$

In the central zone of the sun, within a diameter of about 2.95 km along the axis of rotation, the medium of space undergoes break down, and matter is created starting from the electrons continuously. It appears that the created matter accumulated within the sun over a period of time leads to intermittent bursts that should account for the observed solar flares. Thus, the stars formed initially from the galactic matter create their own matter.

9.1.2 *Creation of Matter at Centers of Large Planets*

Part of the gaseous matter at the solar surface is constantly whirled in space by the velocity field of 436.7 km/s (3.5.3.2) tangential to the equatorial surface against the inward acceleration field (free fall acceleration) on the sun, as given by (3.5.3.3). This matter is also interacted by the velocity field in the solar vortex as it travels in the planetary plane away from the sun. The planets formation can be supposed to be from the above solar matter. Consider the case of the Earth when its formation began with the solar matter aggregation in space. The tangential velocity of space in the equatorial plane of the Earth in its present formation was calculated (3.5.4.3) as 7.8 km/s with the use of space-vortex equation (3.5.4.1) and space vortex constant: $k_e = 1.987 \times 10^7 \text{ m}^{3/2} / \text{s}$. Using this space-vortex equation (3.5.4.1) and the above value of k_e , the radial distance from the center of the Earth's vortex during its initial formative stage, to determine whether the velocity-field had reached speed of light, is calculated:

$$v_m = k_e / \sqrt{r}.$$

Or,

$$r = k_e^2 / v_m^2.$$

Substituting the values for k_e and v_m from above

$$r = (1.987 \times 10^7 \text{ m}^{3/2}/\text{s})^2 / (3 \times 10^8 \text{ m/s})^2 = 0.0044 \text{ m}.$$

The space circulation at a radial distance of 0.0044m from the Earth's center reaches the limiting velocity, thus leading to the possibility of creation of matter there. Calculations similar to the above indicate that for Jupiter, Saturn and Neptune, radial distances from their centers where the speed of space circulation reaches c , are 1.38m, 0.4m, and 0.74m respectively. It is therefore concluded that the centers of the larger planets possess material creation zones, and this could possibly be the reason for volcanic eruptions on the surfaces of these planets including the Earth.

9.1.3 *Maximum Mass of the Universal Matter*

In Fig.9-2 distribution of space circulation in the universe prior to the creation of matter is shown. Considering the plane YZ at right angles to the X-axis, velocity field c at limiting space circulation creates an electron, which is coaxial with X-axis. From the electron's interface onward the velocity falls inversely as the distance, similar to the velocity variation in an irrotational vortex. All the planes parallel to the Y-Z plane have similar velocity field distribution starting with the limiting velocity c on electron interface and dropping off inversely away from the X-axis. Fig.9-2 shows a spherical shell of inner radius r . From (2.2), A point P at the shell will have tangential velocity u_p (down the paper) given by

$$u_p (r \sin\theta) = c r_e$$

Or

$$u_p = c r_e / r \sin\theta \tag{9.11}$$

which is the velocity of each point in the shell of infinitesimal radial width dr . The shell consists of several rings in planes parallel to Y-Z plane, their axes coinciding with X-axis. The cross section of the infinitesimal ring shown in the figure is: $(r d\theta) dr$, and the volume is:

$$dV = (2 \pi r \sin \theta) (r d \theta dr). \tag{9.12}$$

All the space points in dV have the velocity field u_p given by (9.11). This volume does not have mass because there are no voids in it. However, its equivalent mass, that is, the mass produced if the quantity obtained from the velocity-integral of this volume is (mathematically) converted into mass, can be found. The mass-equation (2.6) was derived from the volume-integral of the limiting velocity c . Therefore, equivalent mass of the infinitesimal ring from (9.11) and (9.12) is

$$dM = dV \times u_p = (2\pi r \sin\theta) (r d\theta dr)(c r_e)/ r \sin\theta = (2\pi c/ r_e)r d\theta dr. \quad (9.13)$$

The maximum possible mass in the spherical universe is the integral of dM from $r = 0$ to $r = R$; and $\theta = 0$ to $\theta = \pi$, or

$$\text{Mass}_{\text{universe}} = (2\pi c r_e) \pi R^2 / 2. \quad (9.14)$$

Substituting the values of R from (9.2), c and r_e

$$\text{Mass}_{\text{universe}} = 1.29 \times 10^{64} \text{ cm}^4/\text{s}$$

which from (2.12) is

$$\text{Mass}_{\text{universe}} = 1.29 \times 10^{64} (\text{gm}/ 8.6 \times 10^6) = 1.5 \times 10^{57} \text{ gm}. \quad (9.15)$$

If we take the farthest depth in the universe where matter has been presently known to exist (Sec.9) to be the universal radius; and the total amount of matter¹ in the galaxies about $10^{-30} \text{ gm} / \text{cm}^3$ if it were spread evenly all through the space, the estimated mass is

$$\text{Mass}_{\text{universe}} = (4\pi/3) (10^{29})^3 10^{-30} \text{ gm} = 4.18 \times 10^{57} \text{ gm}. \quad (9.16)$$

The theoretically derived maximum possible mass in the universe (9.15), which is created from the dynamic space of the universe, is about 2.7 times less than the presently estimated masses of the galaxies that have been observed. The reason for the calculated mass (9.15) to be less than the estimated (9.16) could be due to the value of the universal radius used for the computation of the mass in the universe (9.16), which is the *minimum*

¹ The Steady State Universe, Fred Hoyle; Scientific American, September 1956, Vol. 195, No.3, pp, 157-166

required radius (9.2). The actual radius of the universe, if finite, is perhaps far greater. Indeed, there is no other way but to suppose that the depth of the universal space is greater than 3.3×10^{31} cm.

On the distribution of matter in the universe, refer Fig.9-2. Since matter is created along the axis X and whirled in parallel planes at right angles to the X-axis, the matter dispersed in the planes closer to axial points A and B will reach the boundary and become non-existent; whereas, matter projected in the Y-Z plane and its neighboring regions, unable to reach up to the boundary, will remain existent. Thus, the cosmic matter at the universal scale will have a flat, disc-shaped distribution on either side of the central diametrical plane at right angles to the rotational axis. The distribution of stars in galaxies and the planets in the star systems should also be disc-shaped or planes, in general, because of the dispersal of maximum quantity of matter in their respective equatorial planes at right angles to the axes of rotation.

9.1.4 *Limitations of the steady-state and the evolutionary theories*

Both the above-mentioned modern theories of cosmology start with the basic supposition of the existence of the most abundant element in the universe—hydrogen. But how was the hydrogen or its component parts—neutron, electron and proton—created? It is the right answer to this question that forces recognition to the spatial reality; not merely in terms of *energy* or *energy fields* created and sustained miraculously in the voidness of space as presupposed today; but rather the recognition of the *space substratum* and its absolute properties that enable creation of fields, energy, as well as matter. The relativity and the quantum theories have not produced a plausible and comprehensible theory of matter, which identifies the fundamental matter and reveals its structure; this aspect is clearly reflected in the following comments¹: “How the protons and neutrons themselves were created is a question outside the province of this article (The Origin of the Elements): only men of strong convictions, religious or scientific, have the courage to deal with the problem of the creation”. As per Hoyle too: “²...the creation of matter may seem a queer concept to be invading scientific thought”. Thus, starting with hydrogen and its constituent particles (neutron, electron, proton) as *original* matter, these theories exclude from consideration and

¹ The Origin of the Elements. William A. Fowler. Scientific American, September 1956. Vol.195, No.3, pp. 82-89

² The Steady State Universe, Fred Hoyle. Scientific American, September 1956, Vol. 195, No.3, pp. 157-166

existence the limiting velocity field necessary for the creation of matter in the universe, and also the circulating velocity field in the medium of space that disperses the electrons and hydrogen atoms away from the creative zones (Sec.9.1.3). The evolutionary theory, thus, postulates explosion of an extremely dense neutron core in a primordial “big bang” to explain the apparent expansion of the universe (increasing inter spacing of the galaxies) and the formation of the total quantity of the elements in the universe starting from hydrogen just in few minutes. It is this matter speeding away due to explosion that built in due course the cosmic bodies—galaxies, stars and the planets. “ The steady-state hypothesis³ holds that the hydrogen has been created at a steady rate through out infinite time and is still being created at the same rate today”, while the higher elements are formed inside stars through nuclear reactions. But where does the energy for the continuous creation of matter come from? Recourse to relativity theory and non-Euclidean geometry that the steady state theory takes to explain the above difficulty cannot be considered satisfactory because the dynamic space (Euclidean), which is the very basic seat of cosmic energy for the creation and motion of galactic matter, is neglected by both the prevalent theories. In fact Einstein’s concept that the presence of the cosmic bodies (stars, galaxies) causes *curvature* of the space-time continuum in their neighborhood, is a mathematical description that becomes less meaningful, when the basic existence of the circulating non material space around cosmic bodies is recognized. In this context Dr. Wheeler’s¹ comments on my earlier works, *Beyond Matter*, are highly significant. Having quoted in his letter² a line from my above book, “The universe must be dynamic and possess movement” he remarked: “Isn’t this another way of stating the content of Einstein’s 1917 and still standard geometric theory of gravity, according to which the geometry of space is a dynamic entity, changing from instant to instant according to an utterly simple and beautiful law?” Yes, three-dimensional Euclidean geometry is sufficient to explain gravitation and also the source of energy to account for the creation of universal matter, if the existence of the cosmic velocity field, or the *dynamic* nature of space is recognized.

¹ Dr. J. A. Wheeler, Ashbal Smith Professor and Blumberg Professor of Physics, Center Director, The University of Texas at Austin.

² Dr. Wheeler’s reply (1985) in response to the Author’s letter to him.

Chapter 11

Concept of Time

The most primordial entity in the universe is shown to be the dynamic space as postulated in the Cosmic Principle 3. The merger of space and motion was postulated to avoid the need for an agency to provide the first motion to the space medium. But, postulation apart, if we imagine a state of the universe in which no point of the substantial space possesses motion relative to any other point in it, this state will have zero energy. Since there is no change in the positions of space-points this state of the universe is time-less and energy-less, and yet the motionless space is the most basic entity forming the universal substratum of eternal existence. The phenomenon of creation is applicable to matter, but not to the very substratum of the space.

For the creation of energy and production of matter, the space must circulate; and with this circulation time begins. *Time is borne from the motion of space.*

Descartes postulated that God created the first motion of ether (space); Newton believed that cosmic bodies were moved first by God. These prominent philosophers among the early founders of the western science were not far from the truth. The Vedas assert that Brahman who initially was one, willed to become many; and so the creation in the universe emerged. The sages, during the era of the Upanishads (Vedanta), realized in their transcendental state of consciousness, that the attribute less space (aakaash) is the body of Brahman (Taitreya Upanishad). In metaphysical terms the non-material space of the universe, almost endless in the expanse, is the *conscious* substratum—the Brahman. When Brahman consciously moved vigorously his own expanse of space, time started and cosmic energy was produced thus creating and evolving, since then continuously, the cosmic matter. This starting event is symbolized with “OM”, the primeval cosmic sound due to space-circulation that permeates the universe of space and matter even today. The evolution of the cosmos (including nature) and its dissolution as well, from the medium of aakaash (space) is the basic concept of the Upanishads.

The minimum universal time can be taken as the ratio of the minimum required universal radius (9.2) and the speed of light, that is, $3.3 \times 10^{31} \text{ cm} / 3 \times 10^{10} \text{ cm/s}$, or $1.1 \times 10^{21} \text{ s}$; which is the time of the flight of the fundamental matter at light-speed across the universal radius. During this period the

creation of universal matter takes place. If we assume the same period for the annihilation of the universal matter then the duration of one cycle of cosmic creation and annihilation is $(2.2) \times 10^{21}$ s. As per Purana, a sacred Hindu scripture, duration of one mahakalpa, (one cycle of creation and annihilation of universal matter), is 4.96×10^{21} s, which is about 2.25 times larger than the minimum universal time.

Conclusion

The universal reality, primarily, is the cosmic energy—the underlying dynamic space. It is eternally existent as the energy substratum of the universe. The properties of matter are not possessed by the space medium which has only one *absolute* attribute related with the speed of transmission of light in absolute vacuum; that is, the limiting angular velocity of space-rotation, and transmission of any potential-gradient-effect in it, such as, gravitational, magnetic and electromagnetic, taking place at a constant speed (light speed) relative to it. The Proof of the above has been obtained by deriving *theoretically* all the *basic* universal constants (that have been experimentally determined) from the space-vortex structure of electron, identifying the *fundamental* particle of matter, and showing that the light-speed is the common factor in all the basic constants. The Newtonian space of *void ness*, conceived earlier by Leucippus and Democritus, is a misconception, whereas, the Cartesian space is closer to the universal reality.

The creation of universal matter is a process that converts space-motion of large cosmic space-vortices into submicroscopic space-vortices, created as fundamental particles with the highest speed of space-circulation in their structure. In the creation phenomenon, the space-energy from electron-center is transferred to the universal space as energy-fields: gravitational, electrostatic, magnetic, and electromagnetic. Motion of the fluid-space is the *most fundamental* velocity-field from which all the above energy fields are derived, that is, the *velocity field unifies all the known fields*. This vindicates the earlier concept of *vis viva* (leibniz and others) and the 19th century concept of the underlying single force¹: “Between 1837 and 1844, C.F.Mohr, William Grove, Faraday, and Liebig all described the world of phenomena as manifesting but a single ‘force’, one which could appear in electrical, thermal, dynamical, and many other forms, but which could never, in all its transformations, be created or destroyed. That so-called force is the one known to later scientists as energy.”

Due to the existence of the velocity fields in the whole universe as large cosmic-vortices with independent centers, the cosmic energy resides at each point of the universal space except at the centers of the fundamental particles of matter. This new concept is diametrically opposite to the modern understanding on the seat of energy in the medium of space and structure of

¹ The Essential Tension (Energy Conservation), Thomas S. Kuhn, The University of Chicago Press, Chicago and London.

matter, since, in the absence of matter and its associated gravity and electromagnetic fields, space is supposed to be *energy-less* as per the contemporary convention; whereas, the reality is that the dynamic space is the *first cause* of creation, stability and subsequent existence of cosmic matter and fields.

The possibility exists for infinite universes—each a spherical dynamic-space of almost endless expanse (Fig. 9-1)—in the infinite extension of nothingness. The other possibility is of a single universe of dynamic space of infinite expanse. The creation and annihilation of universal matter is cyclic in nature, repeating endlessly. Time is inherent in space-motion, but for which, the universe, if imagined to be of static space, is timeless.

The speed of light, when analyzed across a *single* wavelength by different observers in relative uniform motion, can be shown to be a constant quantity relative to the medium of space without resorting to “time dilation”, or “contraction of length” as introduced by special relativity theory. The experimental set up meant to determine light velocity use mirrors to reflect a ray or a pencil of light; in case these mirrors move relative to space, the wavelength of the reflected light will undergo change. This aspect is not taken note of, with the result that the interpretation of the experimental results becomes erroneous.

The velocity fields in the space vortices, enclosing the cosmic bodies, account for the inward free-fall acceleration (presently taken to be the same as gravitational acceleration) on their surfaces; this acceleration field also interacts with the acceleration field in the wavelengths of the star light as it passes close to a cosmic body, thereby deflecting the same. The modern supposition that stars attract light *gravitationally* because it possesses mass is not needed.

The conclusion of the modern physics that *absolute space, time, simultaneity, and space filling media* are *discredited* ideas is certainly premature.

There is uniformity in the structural design right from the fundamental particle to the largest cosmic bodies, galaxies and meta-galaxies. The electron has a void-center enclosed within a space vortex; the atom has assembly of electrons (multiple voids) as its nucleus, with an overall space vortex; the Earth has assembly of atoms (with void content) enclosed within a space vortex that carries the satellites; the Sun too has an overall space vortex rotating the planets in the planetary plane through the velocity fields of its vortex. The galaxies also are enclosed within space vortices that carry stars around their respective centers. Therefore, micro and macrocosmic

correspondence is a fact followed by nature, though presently denied by the contemporary physics.

Modern theories on atomic structure have not so far discovered that the electron is the *fundamental* particle. The presence of electron bound in the nucleus was discarded by quantum-mechanical analysis despite the experimental evidence of electron emission in nuclear decay. Collision of high energy particles in particle-accelerators results in creation of high velocity fields (space motion, approaching light speed), associated with the kinetic energy of the colliding particles that give rise to numerous unstable particles; this is considered astonishing because the creative process of the stable particles from the dynamic and substantial space is far from the grasp of the modern principles of physics. Appearance of short-lived particles in high-energy collisions is no proof that all of these particles emerge from the structure of the colliding particles and can form stable nuclei of atoms. Quarks are not the constituents of nucleons. All elements including the radioactive ones; in fact, all matter in the universe has only electron as the stable basic building block. The concept of anti matter, again, is untenable; it's only a matter of the direction of the spinning space, as seen in the structure of the electron.

The problem with the modern nuclear physics is that the *inward* force on the nucleus, in opposition to the Coulomb repulsive force within the nucleus, remains undetected due to the assumed void ness around the nucleus. The atomic vortex which provides the inward force on the nucleus, electric charge of the nucleus, binds and carries the orbital electrons around, has been ignored, with the result that atomic theories are based on ad hoc hypotheses leading to some grave misconceptions. For example: Bohr's atom had *allowed / disallowed* orbits of electrons and different *energy states*; an electron, *jumping* from one orbit to the next nearer to the center, *emits* light energy; electrical repulsive force between two electrons is explained by the exchange of *virtual* photons; electromagnetic attraction between the nucleus and the electrons in the orbits is also believed to be due to the exchange of *virtual* photons; interactions between particles are explained through *force-carrying* particles.

Tied with the above misinterpretations is the assumption that particles and electron can *absorb* and *emit* energy. The electron can gain or lose only kinetic energy in collision with the other particles, or, when accelerated by electric/magnetic fields; the electron has no energy-field at its center to emit photon from there; neither any particle can penetrate the highest velocity field forming its interface, except for its annihilation with positron where velocity fields of opposite directions are superposed on it. Release of

radiation energy from an orbital electron in the atom at a frequency proportional to the rotation of the electron in its orbit, when the same jumps to an orbit closer to center, is not the actual process of production of light. It is mistakenly accepted that the basic source of light is from the orbital electrons. The fact is that the oscillating atoms, only *initiate* formation of light shells in their immediate vicinity; these light-shells are further *produced* by their time-varying gravitational potential already existent at each point in space, and further transmitted continuously. Also, the orbital electron, carried ceaselessly by the non-viscous space vortex of the atom, does not lose its kinetic energy due to circular rotation. So the very question of its *losing* energy and falling on to the nucleus is hypothetical. Bohr had to postulate *fixed* orbits for the orbital electron in the atom because of the above misunderstanding of the classical physics.

It is also not accepted in today's physics that Planck constant can be derived from the time-varying gravitational potential of a *neutral* atom without taking into account the electric charge of the orbital electrons. The concept in the classical physics has been that only an *electrically charged* oscillator can produce electromagnetic wave. Plank derived this constant from thermal radiation phenomenon and, as such, only its relationship with heat and light is proven. Under the concept that all the light from an oscillating atom is produced from the *charged* orbital electrons (now shown to be wrong), the best guess, in past, would have been to assume that the angular momentum of the electron should be equated with the Planck constant because both have the same dimensions and even numerically quite close. And the compulsion to obtain an *indivisible* quantum of energy in one photon, the angular momentum would have been quantised, so as to take the next step in this speculative process to assume the angular rotation of the electron in its orbit proportional to the frequency of light emitted by it; and this way to get the product "hf" and reach the *indivisible* energy quanta—a mistake already committed in the explanation of the photoelectric effect which, as stated repeatedly before, did not take into account the kinetic energy that the orbital electron would possess in the atomic structure prior to its interaction with light. It is difficult to avoid the conclusion that the numerical agreement between the angular momentum of the orbital electron and Planck constant, have led to equating the two quantities in these phenomena that have now been shown to be distinct and least connected in physical aspects.

It followed from the relativity theory that all types of energy, has mass associated with it. Its true that energy has its equivalent mass *mathematically*, but creation of mass requires fulfillment of certain rigid

conditions as shown in the process of electron creation. Since the creational requirements were not known (not known even now), photons were assigned with mass, and even wavelength and momentum through mathematical treatment without the accompanying physical aspects. Compton's effect used billiard-ball-like collision between an electron and X-rays because photon was assumed (wrongly) to have momentum like a particle. Further, the photon was supposed to have a large amount of an indivisible energy quantum, hf , in it without any storage mechanism (concept used in photoelectric effect by a physically impossible process of concentrating energy at a point in the wave front of not only one shell of light but also pertaining to f nos. of shells emitted in unit time) which it transmitted partly to electron *instantaneously* on its collision. Even if it is granted that the photon has a storage mechanism, it will take *one second* to accumulate energy of quantity hf ; how could it then transmit this quantum of energy *instantly* in its random collision with electron? And worst of all, as stated before, the kinetic energy that the ejected electron would have had in its atomic orbit before release was ignored, just the same way as in photoelectric effect. The observed kinetic energy of the ejected electron was, thus, wrongly conceived to be coming out of the photon. It all started with assigning mass and momentum to photon and arriving at its wavelength mathematically.

Following Compton's effect, matter waves were postulated. Louis de Broglie reasoned that similar to light, that shows wave-particle nature, matter too as a particle would have wave behavior. Here was a postulate that originated and rested on false premises that photon possesses mass and momentum like a particle of matter. In a super fluid¹ space, with nonmaterial properties, vortices of matter (particles, charged or uncharged) moving at high speeds will naturally create wave like patterns of velocity field and potentials around the particles. The diffraction of electrons similar to X-rays is on account of such reaction from the fluid space. Matter waves, in close vicinity of particles in motion relative to space, only prove spatial fluidity and its reality, but are no indications that electron is a wave. Further ideas on the standing matter waves and quantization of wavelength became the founding principles for the wave mechanics, which does not permit physical picture of the electron encircling the nucleus in a circular orbit; rather, the orbital electron is 'spread out' in some unimaginable way.

¹ In my first article "The Physical universe", 1974, nonmaterial space was referred as "super fluid". I discontinued its use in my subsequent works since few scientists in India picked up this word and its nonmaterial properties; and published the same with no reference to my work .

The uncertainty principle of Werner Heisenberg appears to be the outcome of his pursuing an idea that the atomic structure need not have a physical picture or space-time representation. The *impossibility* of physical representation of wave-particle aspects of light would have been a crucial factor in his avoiding mechanical details on the orbit of the electrons in the atomic model of Bohr. However, the basic principles on which he proposed the uncertainty principle rested on ‘matter waves’ leading to ‘wave particle’ duality, preceded by ‘photon momentum’ and ‘photoelectric effect’ that brought in particle concept with support from the Planck constant. Naturally, the errors pointed out earlier in the use of these faulty concepts, developed within a short time of two and a half decades of the 20th century, became cumulative and highly complex in uncertainty principle leading to some queer conclusions. For instance, as per this principle only those quantities are real that are measurable; also the motion of an electron cannot be *described* with unlimited precision. True, who can expect *description* of electron motion to an *unlimited* precision when the very structure of electron is little known? The medium of space in which the electron moves is presupposed as empty and void. And how can the radius of electron (if it does have a radius) be measured through experiments? It can only be derived from the experimentally obtained mass and charge with the use of new relationships, just as it has been done in this work. The preciseness of description in a theory depends upon the clarity of the physical picture and the depth to which the analysis has been taken. But the uncertainty principle seems to avoid the unavoidable.

The concept of the classical electrodynamics that an accelerating or oscillating electron gives off energy is based on an implicit understanding that the electron structure is packed with energy all the way up to its center; and such a conclusion is obviously justified under the modern philosophy of *emptiness* of space and *solidity* (energy content) of matter. However, the existence of the central void in the vortex structure of electron, now proposed through SVT, reverses the entire system: firstly, it does not provide for any detachment (emission) of light energy from the electron; and secondly, it gives stability against dissipation of vortex motion. Thus there is no exchange of energy between an oscillating electron and the light produced by it. The other single entity that became a source of error starting from the photoelectric effect in almost all the theories of atomic physics is the *indivisibility* of energy in Planck’s quantum; and this is mainly because of the *obscurity* with respect to its physical content. Mere mathematical expressions in the form of equations do not reveal their detailed physical aspects and may not safeguard their right application.

The situation today in our understanding of the fundamental aspects of space and its relation with matter has not had any appreciable change since the early twenties of the 20th century, when Sir Oliver Lodge, in his paper “The Geometrization of Physics”, summed up: “ In such a system there is no need for Reality; only phenomena can be observed or verified; absolute facts are inaccessible. We have no criterion for truth; all appearances are equally valid; physical explanations are neither forthcoming nor required: there need be no electrical or any other theory of the constitution of matter. Matter is, indeed, a locally constructed illusion generated by local peculiarities of space. It is unnecessary to contemplate a continuous medium as a universal connector, nor need we try to think of it as suffering modification transmitted from point to point from the neighborhood of every particle of gravitational or electrified matter: a cold abstraction like a space-time manifold will do all that is wanted, or at least all that the equations compel.”.... “But notwithstanding any temptation to idolatry, a physicist is bound in the long run to return to his right mind; he must cease to be influenced unduly by superficial appearances, impractical measurements, geometrical devices, and weirdly modes of expression; and must remember that his real aim and object is absolute truth, however difficult of attainment that may be; that his function is to discover rather than to create; and that beneath and above and around all Appearances there exists a universe of full-bodied, concrete, absolute Reality”.

The absence of physical explanations for atomic processes has been a crucial missing link in atomic physics. Aristotle’s principle of *material* and *efficient* causes, was met in Descartes’ Vortex Theory, that had ether for material cause, and circulation in ether vortex, as efficient cause, with which even gravity was attempted for mechanical explanation. Later, despite the introduction of ‘action at a distance’ (Newton), that throws light neither on material nor on the efficient cause, explanations to the effects associated with heat, electricity and magnetism etc. continued to be mechanistic. The 19th century physics adopted more of mathematical systems in the explanations of physical phenomena and, ironically, though Faraday’s concept of continuous field lines and experiments revealing an underlying unity in space, and, also, Maxwell’s assumption of fluid-ether, led to the formulation of his equations; the import of it taken by physics, perhaps, was that the concept of a mechanical ether can not derive the electro dynamics equations; thus, neglecting totally any need for explanations for the *substance* which constructs an entity, and the *origin* of the forces in the structure. It has now been shown that there are relationships for electron mass and charge at more fundamental level than Ampere’s law and

Maxwell's equations. With these new equations, not only Maxwell's equations can be derived but also their flaws if any can be spotted; even an individual-event like electron annihilation, production of a light shell, motion of orbital electron, creation of electron, and similar such effects can be explained with deterministic approach through SVT. Should the quantum physics, then, continue asserting that physical pictures fall within the domain of philosophy rather than physics?

A conceptual reorientation that shifts the modern trend of assuming *outward* nature of forces in material structure to *inward*; that posits *basic* reality to the medium of space, while matter to be the product of space; and admits strict adherence to cause-effect law and deterministic approach, is the needed course of action today, so as to incorporate physical aspects in each phenomenon and, thereby, achieve reconstruction of the ongoing theories—classical, relativity, and quantum physics.

Appendix

Table-1

Some Dynamical Characteristics of Solar System

	Earth	Mars	Jupiter	Saturn	Neptune	Uranus	Pluto	Sun
Space-circulation around the planet, v_s , (km / s)	7.8	3.72	41.8	24.9	16.5	15.18		436.7
Orbital velocity (km / s)	29.8	24.1	13.1	9.64	5.43	6.81		
Resultant velocity, v_o (km / s)	37.6	27.82	54.9	34.54	21.93	21.99		
Radius (km)	6400	3395	71500	60000	24750	25900	1700	6.96×10^5
$v_s R^{1/2} = k$ ($m^{3/2}/s$)	1.987×10^7	6.8×10^6	3.53×10^8	1.93×10^8	8.2×10^7	7.7×10^7		11.52×10^9
Free-fall Acceleration v_s^2 / R (m / s^2)	9.55 (9.78)	4.07 (3.72)	24.5 (22.9)	10.4 (9.05)	11.02 (11.0)	8.9 (7.77)		274 (274)
Surface tangential velocity (km / s)	0.466	0.239	12.7	10.23	2.73	0.16	0.013	1.945
Electrical charge on surface (CGSE)	1.85×10^{23}	2.72×10^{22}	6.4×10^{26}	3.63×10^{26}	1.648×10^{25}	1.05×10^{24}	5.5×10^{20}	0.928×10^{28}
Mass (kg)	2.25×10^{24}	4.71×10^{23}	8.34×10^{26}	6.47×10^{26}	2.3×10^{25}	2.4×10^{25}	1.26×10^{22}	

Note: The ratios of the mass the planets with the new mass of the Earth are: Mars – 0.19 (0.107); Jupiter-337 (318); Saturn-261 (95.1); Neptune-9.3 (17.2); Uranus-9.7 (14.5); Pluto-0.005 (0.002), where the figures within brackets are the presently accepted values.

Table-2

	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Sun
Volume, V, (cm ³)	1.08x10 ²⁷	1.64x10 ²⁶	1.53x10 ³⁰	9.04x10 ²⁹	7.27x10 ²⁸	6.34x10 ²⁸	1.41x10 ³³
V _s , (cm/s)	7.8x10 ⁵	3.718x10 ⁵	41.8x10 ⁵	24.9x10 ⁵	15.18x10 ⁵	16.5x10 ⁵	436.7x10 ⁵
Orbital velocity, v (cm/s)	29.8x10 ⁵	24.1x10 ⁵	13.1x10 ⁵	9.64x10 ⁵	6.81x10 ⁵	5.43x10 ⁵	zero
(V _s + v), (cm/s)	37.6x10 ⁵	21.81x10 ⁵	54.9x10 ⁵	34.54x10 ⁵	21.99x10 ⁵	21.93x10 ⁵	436.7x10 ⁵
Mass= V(V _s +v)/8.6x10 ⁶ (gram)	4.72x10 ²⁶	4.15x10 ²⁵	9.76x10 ²⁹	3.63x10 ²⁹	1.86x10 ²⁸	1.62x10 ²⁸	7.16x10 ³³

gram = 8.6×10^6 (cm⁴/s)

V_s = Maximum velocity field in the space-vortex

v = orbital velocity of a planet is equal to the velocity-field of the solar space-vortex at the orbit

The following to be printed at the back cover page.

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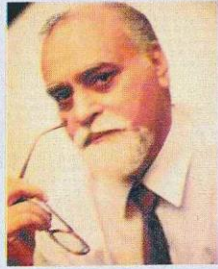
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Abdus Salm

Paramahansa Tewari (b.1937), B. Sc. Engineering, is former Executive Director (Nuclear Projects), Nuclear Power Corporation, India. He framed a hypothesis in mid seventies, on generation of cosmic matter from the medium of space—a unitary theory that now explains: inter relationship between space and matter; origin of mass, inertia, electric charge; fundamental field and fundamental particle; gravity and light; and basic state of cosmic energy. He has lectured worldwide on “**space vortex theory**” and “**electrical power generation at over unity efficiency**”.

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About the Author

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