International Journal of Engineering Research & Management Technology
ISSN: 2348-4039
Volume 9, Issue-6 November-December- 2022
Email: editor@ijermt.org www.ijermt.org

HISTORY AND PHILOSOPHY OF SPACE-TIME (AETHER) : A REVIEW STUDIES

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Abstract

The Bhagavat Gita coins the word kham (aether) as one among the eight component of creation. Aether is a subtle stuff that fills the entire space (absolute vacuum) to make it a physical vacuum. It is a matter of fact that everything appears and disappears in space. Then we have a strong reason to believe that each element of space is endowed with an imperceptible fluid (aether) which is subtle state of everything (matter). The condensation of aether is matter and evaporation of matter is aether. In that sense the reality of space is due to the presence of aether which forms the basis of creation and dissolution. Therefore, the proposed name of the thesis is Aether and Reality. The idea of aether has been so frequently addressed in Vedic literature so that, it seemed to inspire the great minds like Aristotle, Descartes, Newton, Einstein etc., to concoct their own theories of aether. It is a common misunderstanding that Einstein discarded aether theory, but it is not true, which is evident from his following quotations: "According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether, and "space without aether is unthinkable". Therefore, it seems as if Einstein inwardly supported the aether theory, but hesitatingly he discarded its necessity in concocting a mathematical theory of space-time. This resulted an incompleteness of the modern theory of space and time. Now, many scholars like Roger Penrose have felt the need of incorporating the term consciousness (cetana) in physics for its completeness. In fact, Newton hinted about the consciousness in his Principia as 'animal sensation' while explaining the physical reality of space elements (aether). The term consciousness is the central point of discussion in Vedic scriptures. For instance, Bhagavad Gita proclaims that the consciousness is a prime attribute of the Supreme(God) in all beings.

Key words : Bhagavat Gita, space, Vedic scriptures

Introduction:

The Bhagwat Gita coins the word kham (aether) as one among the eight component of creation. Aether is a subtle stuff that fills the entire space (absolute vacuum) to make it a physical vacuum. It is a matter of fact that everything comes out from and dissolves in space. Then we have a strong reason to believe that each element of space is not completely void. It is endowed with all an imperceptible fluid that makes the substratum of the space and basis of creation and dissolution of the visible and invisible things in the form of imperceptible matter or dark energy. It is also known as Abyakta or Pradhana or Maya. The condensation of aether is matter and evaporation of matter is aether which is addressed in modern physics as annihilation of matter and materialization of energy. All these changes (manifoldness of name and forms appear and disappear) occur by the raft of another inscrutable power of the Supreme called Time narrated as"Amongst all that controls I am Time". In Indian metaphysics time is regarded as the vital power of God (kala-sakti). In Bhagwat Gita Lord proclaims that "I am mighty Time" to annihilate the worlds. That brings out all the changes in space in the form of motion (rotation,

translation and vibration) in everything in the space. As the time is endowed with the motion of each point of space, the physicists prefer to call aether as space-time. In Bhartrhari's philosophy the Time(Kala-sakti) is considered as the determining factor of each and every action, exercising a supreme control over the activities of all other powers known as Kalas (time) and it controls the cause of different phenomena of the world in temporal succession. It seems as if the great minds like Aristotle, Descartes, Newton, Einstein etc., presented their own theories of space-time in their own way within the scope of the measuring devices available at that time. In the pivotal year of 1887 aether wind was measured to be 8.8 km/s during moon day observations and 8km/s during evening relative to Earth in Michelson-Morley aether experiment. Unfortunately, that was considerably less than the 3km/s which would be expected due to the earth's orbital motion about the sun. This was at first appeared to be an anomalous finding and was downgraded over the years citing a "null-result" without any justification. This led Einstein to concoct his theory of relativity avoiding the pre-existing concept of aether. He substituted the physical description of aether of space by a mathematical model of spce-time curvature. As a result, he could not unify the gravitation with electromagnetic forces by avoiding the aether theory. In 1920, in a historic lecture in Leiden university he confessed the validity of aether as an unavoidable physical stuff to explain everything in the nature. Hence the general belief that Einstein discarded the presence of aether in space is evident in his historic lecture as "according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether, and "space without aether is unthinkable".

Classical and Vedic Concept of Aether (Space-Time):

Since ancient times aether (kham) has been the subject of deep interest in science and philosophy. To resonate with the vedic view Aristotle believed that (the region beyond the sphere of the moon) are made of a fifth substance called aether. Unlike the other four substances (earth, fire etc.), aether being the stuff of space cannot be transformed in to the others; so it is unchanging and indestructible. Aether may be an inclusion of Pradhana is undecaying; which may explain why no decay product of DM has thus far been detected. Since ancient times aether (kham) has been the subject of deep interest in science and philosophy. Ancient and medival philosophy and science regards aether as quintessence (fifth element), that is, a material that fills the space of the universe. The idea of aether was used to explain the phenomena of light and gravitation by Newton, Boyle and others. The word aether in Indian philosophy is narrated as Kham(space element).In Greek mythology aether is described as clear sky, pure air the gods breathed just like the air breathed by mortals on earth. It is also glorified as a personification of a Greek deity just like the personification of other elements of creation such as water,fire,air and earth. In Indian or Vedic cosmology we have the deity of Water (Varun), Fire (Agni), Air(Marut or Vayu),Earth(Prithvi or Dharti).The embodiment of each basic component of creation thus could be attributed to a particular deity in worlds most ancient philosophies such as Indian and Greek philosophy. The concept of cosmos in medieval philosophy delineates aether as the stuff of celestial(pure)is comprised of innermost core containing the terrestrial objects and the outermost region surrounding the terrestrial sphere

Western philosophers ranging from Aristotle, presented their views of aether. Vedas and Vedic literatures (such as puranas) talk about the notion space (aether) and time. Nikola Tesla advocated the Vedic ideas of all pervading aether as a subtle essence filling the space which forms the basis of all phenomena of creation and dissolution. He regards the matter as a condensation of aether which is evident in his own words;

"The primary substance, thrown into infinitesimal whirls of prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance".

Pre-Newtonian concept of space-time:

The Greek philosopher Plato in his doctrine called Timaeus adopted a classical system of four elements (earth, air etc.). However, he left a special place for aether as an all permeating stuff, a almost translucent kind of stuff in the cosmos. His student Aristotle, accepted the idea of aether from his mentor. He introduced aether in his "On the a new "first" element to the system of the classical elements. According to his view, the other four elements move linearly nad subject to change wit time. However, he emphasized upon the fact that the aether should be glorified as the first element as a substratum of space. This first element (aether) of Plato was reserved for the filling stuff for the celestial objects capable of its intrinsic circular or rotational motion in and around the heavenly bodies. On the other hand, he noted the qualities of other four elements to be terrestrial the qualities of hot or cold, wet or dry etc. On the contrary, he tried to establish this first element aether as attribute less devoid of hotness, coldness etc., unlike the other four elements. There after the total elements were extended from four to five including aether as a special s(unique) one. The later philosophers, however, referred the newly concocted element aether as fifth element instead of the first element of Plato. It is an interesting fact that the later philosophers named the first element of Aristotle as aether. The uniqueness of aether lies in the fact that it differs from the other four terrestrial elements in many ways. One of the most significant qualities is its natural or intrinsic circular motion. The notion of circular motion was predicte by ancient Greek philosophers like Plato and Aristote and supported by many noted later scientists like Keplar, Boyle and Newton. Thus, the vortex theory of aether evolved as a strong alternative theory which was greatly advocated and developed by much modern scientists. The main idea behind the circular motion of translucent aether lies in the fact of circular motion and spin of the planets and spherical shape of stars and planets.

Medieval philosophers granted aether another quality, that is, to changes of density, by the virtue of which the bodies are denser than the surrounding medium. In 18th century, the development of physical science gave some physical models known as "aether theories" made use of a similar concept for the explanation of the propagation of electromagnetic and gravitational forces expounded by Newton and Maxwell. In initial stage (early 1670s), Newton borrowed the idea of classical aether and refined the aether theory on basis of his observation of motion of planets to obey certain mechanical rules of his physics. The refinement of classical aether theory by Newton made it scientifically more practical and agreeable by the science community of that time. the support of aether theory to explain the universal gravitation and light propagation by Newton had been the major subject matter of his great books of Principia and Optics. Newtonian aether had very little common with the classical aether. These aether theories continued up to 1905 till the theory of special relativity expounded by Einstein showed that Maxwell's equations donot require the finest medium for light propagation as initially suggested by Maxwell in his aether theory (hydro-dynamical vortex method) while developing his electromagnetic theory of light. Thus the gradual ascent of the development of aether theory encountered a turning point by the advent of special theory of relativity. However, Einstein himself was not inwardly fully satisfied with his mathematical model of space-time as a replacement of physical aether. This enforced Einstein to proclaim the fact that "space without aether is unthinkable". Einstein himself noted that his own model which replaced these theories could itself be thought of as an aether, as it implied that the empty space between objects had its own physical properties.

Even though the early modern aether theories were dominated by the theory of relativity, some stalwarts of aether model like Sir Oliver Lodge, Herald Aspedon etc., inspired few modern scientists to continue their attempts to reintroduce the concept of ether in order to address the deficiencies of the current physical models and some

noticeable limitations of theory of relativity in view. Eventually, the modern aether model had to emerge bearing some new names such as space-time, dark energy in the honour of quintessence dark energy has been named "quintessence" by its proponents, in honor of the classical element.

This idea relates to the hypothetical form of dark energy postulated as an explanation of observations of an accelerating universe. It has also been called a fifth fundamental force.

Descartes believed in a continuous fluid aether responsible for mediating gravitation, electric and magnetic forces by means of a system of vortices. So, the 18th century Cartesian model of the universe is a vortex aether model associated with the objects ranging from spinning stars and planets to the atoms etc.

He referred aether as the second matter or second element comprised of a "subtle minute spherical vortices" that could govern all rotational motion and revolution of the celestial bodies.

Newtonian Aether (Space-Time):

Initial View: Newton seems to follow Boyle's and Descartes' philosophy of aether. According to Descartes a universal rotating ethereal medium is ultimately responsible for all phenomenon such as gravitation, cohesion, electricity, magnetism along with the sensible properties of living entities. Newton did not attribute "aether" with the originator of sensible qualities in living organism. Newton needed two more categories such as "aether" and "God" in addition to the mathematically reducible quantities such as space, time and mass (of Einstein) to understand and explain the riddles of nature (both living and nonliving). Newton accepted the fact about aether from Descartes' philosophy that the aether being the subtlest of all, condenses to form the visible bodies and possessed qualities undeducible from extension, and proceeds to concoct his philosophy of aether; In his words, "Perhaps the whole frame of nature may be nothing but various contextures of some certain ethereal spirits or vapors, condensed as it were by precipitation, much after the manner that vapors are condensed into water, or exhalations into grosser substances, though not so easily condensable ; and after condensation wrought into various forms, at first by the immediate hand of the Creator, and ever since by the power of nature, which, by virtue of the command, increase and multiply, became a complete imitator of the copy set her by the Protoplast". If we assume Newton's aether as the Einstein's energy and the condensation of aether as the condensation of energy, Einstein's concept of mass-energy concept seems to be a replica of Newtonian aether and its condensation. In other words, "At least the electric effluvia seem to instruct us that there is something of an ethereal nature condensed in bodies". Boyle's ether (made of subtle particles) supplied two different functions. First is to supply the power of propagation of motion of bodies across distances in space. Secondly this ether possesses qualities which accounts for the action of electricity, cohesion and magnetism. The action-at-a distance theory developed at that time was inconceivable for Newton to explain all interactions. Newton, by that time expounded the corpuscular theory of light and hence needed another quality in the aether "which could help the light to propagate through it, called a luminiferous ether". Robert Hooke's experiment on vibration convinced Newton to think of a luminiferous aether "which was susceptible to vibration"

Space-Time Model of Harold Aspden

British physicist andengineer refers the expression of electrostatic potential energy of electron stored outside of the electron, as derived by the discoverer of electron, Sir. J. J. Thomson given himself, as

$$U=e^2/2b \text{ ----------} \quad (1)$$

where b=radius of the electron. If the radius tends to zero for a point electron, U will be infinite which leads to a problem in classical electrodynamics. Therefore, we prefer to make the electron finite sphere of radius b and find the internal energy stored in it given as

$$U=e^2/6b \quad \text{----------} \quad (2)$$

The last expression can be derived by assuming a uniform pressure inside the electron but not uniform volume charge density. When we sum these two energy terms up we have the total energy possessed by the stationary electron as

$$U=2e^2/3b \quad \text{----------} \quad (3)$$

When the electron is moved with a constant velocity much small than speed of light the dynamic electric and magnetic field energy measured from ground frame can be given as

$$U=ev^2/3\,bc^2 \quad \text{----------} \quad (4)$$

Comparing the classical equation of the kinetic energy

$$K=mv^2/2 \quad \text{----------} \quad (5)$$

of the electron, the mass of the electron can be given as

$$m=2e^2/3\,bc^2 \quad \text{----------} \quad (6)$$

Using (3) and (5), we have the relation between the mass and energy, given as

$$U=mc^2 \quad \text{----------} \quad (7)$$

This famous mass-energy formula was first derived by JJ Thomson but unfortunately most of the people attribute it to Einstein which is unacceptable. If the electron increases its momentum from zero to mv,

where $m=U/c^2$ ---------- (8)

Therefore, the change in momentum dP of the electron is related with its change in energy dU as

$$vdP=dU \quad \text{----------} \quad (9)$$

Putting $U=mc^2$ and $v=P/m$ in the equation (9) and simplifying the factors, we have

$$PdP=c^2mdm \quad \text{----------} \quad (10)$$

When $m=m_0$(rest mass) momentum P=0,when m=m, P=P. Then integrating both sides of the last equation and simplifying the terms, we have

$$m=m_0/\sqrt{1-\frac{v^2}{c^2}} \quad \text{----------} \quad (11)$$

Again this famous equation of variation of mass with density has nothing to with Einstein!!

These derivations are illustrated by Dr Harold Aspden, an electrical engineer and a prominent expounder of aether theory of 20th century in his book Physics without Einstein. He argues that the magnetic energy is a frame dependent energy, is in fact, the kinetic energy of the electron. Thus, his aether theory is based upon some fundamental points, on among the following points.

1. The mass of an electron is purely electrical in origin.
2. Magnetic energy is negative of the kinetic energy given to the charge and hence numerically equal.
3. The moving charge has a dynamic electric field in addition to a static electric field which is numerically equal to the magnetic field.
4. Then the net energy of the moving electron is equal to its electrostatic energy which is inversely proportional to its radius b. Using the equations (6), (8) and (11) we can find that the radius also varies with speed as

$$b=b_0/\sqrt{1-\frac{v^2}{c^2}} \quad \text{----------} \quad (12)$$

which is a length contraction formula and we need not depend upon Einstein.

Then, the speed of the charge particle increases the radius b decreases and more space is allowed to store energy in order to increase the energy of the charge particle.

5. In order to solve the long standing problem of self-reaction and origin of mass he took a bold step to declare that the accelerating charge does not actually radiate energy. It is the surrounding space or aether from which energy is released by the work done by the external agent in accelerating the charge from rest to certain velocity.

6. The electrons are immortal having the average life time of 10^{26} years against 10^{12} years of the present universe.As we know the quarks, protons and photons have the life time much more than that of the electrons. Therefore, it does not matter how many particles appear and disappear in the form of hypothetical virtual particles. However, to make the physical vacuum of zero charge, it is comprised of equal number of electron and positron moving in circular orbits in the form of aether vortices to make the vacuum as a plasma of electron and positrons in the form of energy vortices, termed as photon unit.

7. The rotating electron-positron pairs generate spherical dipole waves. He assigned a rotational and vibrational frequency of the photon units by using the Heisenberg's uncertainty principle and Bohr-Einstein equation E=hf, where f=Planck's constant and f=frequency of oscillation = Compton frequency.

No frequency can be detected beyond this frequency.

8. Aspden hypothesized two reference frames such as electromagnetic and inertial reference frame. Former is fixed with earth (laboratory reference) and the latter is fixed with the aether (absolute space-time).

Harold Aspden dwelt by the side of Newton, Sir Oliver Lodge, Boyle, Thomas Young and Hooke and had a great contribution to the aether theory. He raised many important questions which could not be answered properly by the space-time mathematical model (General Relativity) of Einstein. However, he proposed suitable methods based upon aether to explain how mass-energy equivalence of Einstein was actually attributed to Newton and J. J. Thomson. He raised the greatest puzzle of self-reaction of an accelerating electron (point charge) which arises from the Maxwell's proposal that an accelerating charge must radiate electro-magnetic energy. Dr. Aspden gives an undeniable logic that since the accelerating (circulating) charge (electron) in an atom does not radiate energy, the notion of "radiation of an accelerating charge" should be corrected by aetheral idea that an accelerating charge will never radiate energy which is quite interesting and unprecedented.

Super-field Vacuum Theory (SVT):

Fusion of Bose-Einstein Condensate (BEC) theory with the Wheeler vacuum foam theory generates a more general theory called super field vacuum theory or BEC vacuum theory. In this theory the space is physical and viewed as a non-removable super fluid. In 1951, P.A.M. Dirac published two papers where he tried to establish a wave function of the all possible states of the flow of aether in the form of quantum fluctuations in the space.The background aether wave field as a superfluid was described asthe stress-energy tensor in Einstein's field equation. The exact micro-structure in SVT is unknown and there is a potential scope of research in this field which could unify all interactions. Moreover, it could answer the unresolved issues of physics like the origin of charge, mass spin etc. In SVT some other hypothetical particles like Higg's bosons for mass generation, gravitons for gravity waves, planckeons for quantum fluctuations in deepest core of space-time etc.,are the subject of deep theoretical research for grand unification theory. In SVT the quantum phonons are regarded as photons by some recent theorists like Fedi et al who proposed the theory of everything by super fluid approach. This theory predicts the quantum behavior of both matter and energy particles as depicted in the following figure. The attraction, repulsion and electromagnetic interaction can be imagined as two-way flow of particles in space-

time. The speed of the particles such as photons and fermions donot decrease in practice when they move through the free space. So, the space (aether) could be a superfluid.

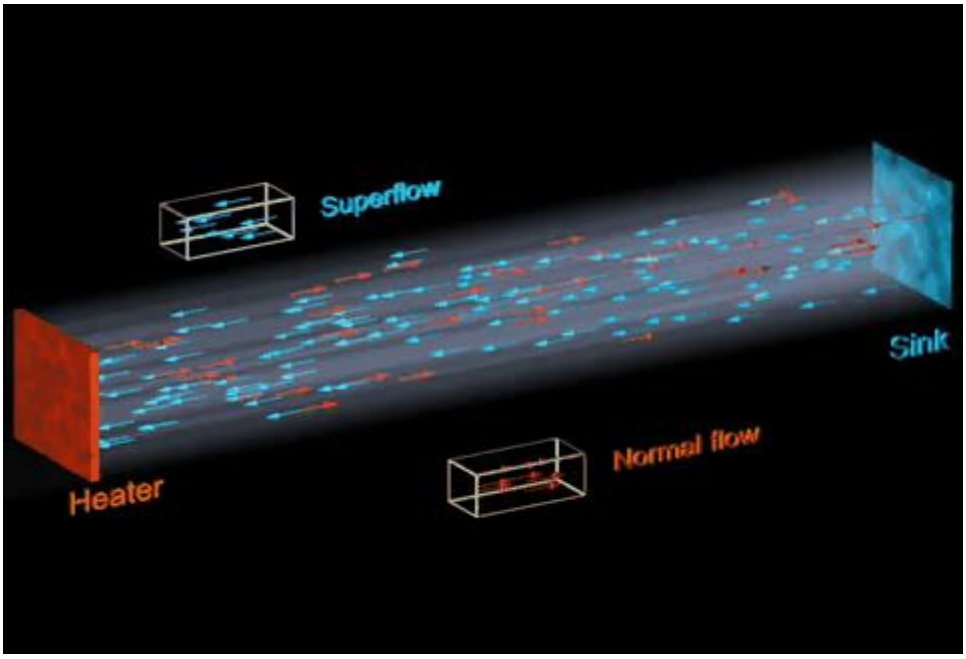

Fig-1-Two dimensional quantised flow of particles in space-time

Conclusion

Thus, the present cosmologists and astronomer should locate the center of the universe which could serve as our absolute reference frame. As the universe, expands like a balloon, its center of mass will not move at all, if we treat it as a closed system and not been acted by any other force from outside due to the possibility of other universes. Einstein dwelt by the side of the first relativist Galileo and Lorentz who modified Galilean relativity. Keeping the merits of the inclusion of aether in view, the present generation of scientists from all branches of science and engineering to undertake a combined research adopting the existence of one physical vacuum, that is, the "modern aether" and including the consciousness in mainstream science. Sir Roger Penrose, a noted Nobel laureate, is an advocate of quantum consciousness who proclaims that consciousness is the root cause of everything and, in my view aether (physical vacuum) should be the secondary cause of everything. Jacobson et alhas a great hope on the aether theorists for advancing for concocting the theory of everything in near future. This modern aether theory is re-named as Einstein aether theory, also called aetheory. It is a covariant modification of GTR which describes a space-time endowed with both a metric and a unit time like vector field named the aether. There are two main purpose behind various aether theories; one is the proposal of a universal medium endowed with a space-filling substance or field. as a transmission medium for the propagation of electromagnetic and gravitational forces. The second purpose of the aether theory is to find a proper basis of unifying all forces. The aether theory had been declined after the development of Einstein's STR.

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