
A BRIEF STUDY OF VORTEX HYDRODYNAMICAL MODEL OF STRUCTURE OF SPACE-TIME

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Abstract:

The Vedic aether is considered as an element of space filled throughout the creation. The structure of modern aether (space-time) is based upon the structure of a quanta of light emitted during the annihilation of particle-antiparticle pair. The structure of space, that is, a photon unit was presented by de-Broglie, Harold Aspden etc, as a sea of revolving electron-positron dipoles based upon Dirac's idea. The hydrodynamic model of space is attributed to many philosopher scientists such as Pythagoras, Descartes, Kepler, Huygens, Bernoulli Maxwell etc. Each elementary particle-anti particle pair is comprised of two quantum vortices created simultaneously in the space just like the production of two equal and opposite whirlpools in a turbulent flow at the site of an obstacle. The underlying principle of the photon units are discussed in terms of rotating electron-positron dipole units moving in the space. As a result, the path traced by each particle is a helix and that of the photon unit is a double helix. This model was suggested by de-Broglie, known as half photon unit. The rotating dipole model was also adopted by Harold Aspden. However, a cubical array of electron-positron model of Prof. Simhony is also described. The fallacy of annihilation of matter is discussed by using all these models in addition to hydrodynamic models.

Key words: Aether, space-time, quantum vortex, hydrodynamics

Introduction:

The ancient concept of aether is renamed as space-time according to many modern scientists which is evident from the statement of Stanford professor which reads as "The modern concept of the vacuum of space confirmed every day by the experiment is a relativistic aether"[1]. The idea of aether dates back to prehistoric Vedic era which was followed by the ancient Greek philosophers like Pythagoras who lived two centuries before Aristotle. [2] Pythagoras considered aether as a fifth element, cold aether as air, dense aether as water and soul as a part of cold or dense aether [3]. Aristotle, Plato, Descartes, Boyle, Kepler, Newton, Faraday, Maxwell etc, developed the theory of aether in their own way. It seems inappropriate to explain everything by using the idea of aether because aether is regarded as *fifth element* of material nature among the total eight elements (such as *earth, water, air* etc.,) which is proclaimed by Vedic literatures such as Bhagvat Gita, Srimad Bhagavatam etc.,[4] and also quoted by Greek philosophers like Aristotle, Plato etc.[5]. Therefore, space-time is comprised of other elements of nature (such as mind, mind stuff and I-ness, consciousness, soul or spirit or atman etc.) as everything remains in space and changes

with time. The modern and ancient view of quantum consciousness can also be incorporated with an ethereal concept to concoct a more efficient theory in order to explain all possible interactions and activities involved in all living and nonliving entities such as animal sensation as narrated in Principia book-3 [6,7]:

“And now we might add something concerning a certain most subtle Spirit which pervades and lies hid in all gross bodies; by the force and action of which Spirit the particles of bodies mutually attract one another at near distances, and cohere, if contiguous; and electric bodies operate to greater distances, as well repelling as attracting the neighboring corpuscles; and light is emitted, reflected, refracted, inflected, and heats bodies; and all sensation is excited, and the members of animal bodies move at the command of the will, namely, by the vibrations of this Spirit, mutually propagated along the solid filaments of the nerves, from the outward organs of sense to the brain, and from the brain into the muscles. But these are things that cannot be explained in few words, nor are we furnished with that sufficiency of experiments which is required to an accurate determination and demonstration of the laws by which this electric and elastic Spirit operates.”

This article starts with the history of vortex nature of aether (space-time) expounded by Descartes, Kepler, Bernoulli, Dirac to the present day scientists. Space-time is the basis of both matter and radiation as both of them are generated in space-time. The radiation is basically electromagnetic in nature and generated by electric charges. On the other hand, the matter is comprised of atoms and molecules; each atom has electrons, protons, neutrons. The protons and neutrons are subdivided into electrically charged quarks. Thus matter is ultimately made of charged particles which can produce electric and magnetic effects. Now a question arises, what is a charge and how is it originated? To understand the basic nature of space-time we need to understand both matter and radiation, which is centered on the above basic question. To answer this question we need to take a sole refuse in the hydrodynamic theory which states that two opposite fluid vortices are generated at a time and they are connected by a stream lines, the amount of fluid that is pumped into the vortex called sink and equal amount of fluid emerges out of the other vortex called source. Following this hydrodynamic theory the positive and negative charges are treated as the sources and sinks in electricity. Thus, the structure of space-time (aether) can be explained as a sea of positive and negative charges in the form of tiny vortices of undisturbed space-time (aether). In other words, this paper explains the electric and magnetic forces *via* photon theory by a suitable hydrodynamic method of tiny quantized aether vortices.

Historic Development of Vortex Aether Theory

Descartes imparted a physical sense to the empty space by proposing that the space is not really empty and it is filled with an ultrathin imperceptible matter (aether) which is filled with innumerable tiny vortices. The matter is a condensation of imperceptible aether caused by the centrifugal effect of the aether vortex due to the increased pressure at the periphery of the vortex. Newtonian gravitation was first time imagined as an inward force originated by the outward pressure gradient of the Cartesian rotating fluid (aether)[8].

Following the basic interpretation of vortex theory of Descartes Christian Huygens presented “first mathematically supported theory for gravitation”. According to his theory, the centrifugal force increases with increasing radial distance. The increasing pressure causes greater concentration of matter near the outer part of the vortex forming a fine matter (aether particles). Following Newton’s inverse square law of gravity Huygen modified the theory so that the velocity decreased with increasing radial distance [9]. Kepler derived his laws based upon the assumption that there exists a vortex of aether around each object, far beyond Pluto etc. The rotation of aether

produces a torsion effect which is the cause of circulation of planets around the sun according to Kepler's third law [10]. The pressure gradient in the vortex was predicted as the cause of Newtonian gravitation.

Newton expounded the laws of universal gravitation by re-introducing the theory of "action-at-a-distance" of gravitational force [11]. In 1675 Newton wrote a letter to Robert Boyle mentioning that gravity is the result of "a condensation causing a flow of ether with a corresponding thinning of the ether density associated with the increased velocity of flow." Newton's universal gravitation can be derived from Kepler's law [12].

In 1694 Jacob Bernoulli considered the space as a sea of whirlpools of aether and derived the differential equation for the flow of aethereal fluid by the help of Euler. Johan Bernoulli (1710-1790) developed a model of aethereal fluid containing innumerable elementary vortices. The elastic property of aether is due to their centrifugal action as each elementary vortex tends to dilate and eventually presses against the other neighboring vortices.

Around 1820 Coulomb, Ampere and others followed the action-at-a-distance principle to explain the electric and magnetic forces between the charged particles and electric currents. Faraday introduced the concept of "lines of force" to re-establish the physical interpretation of space by discarding the Newtonian theory of "action at a distance", as a basic principle in explaining the electromagnetic and gravitational forces and light propagation. The electric and magnetic induction, that is, inductive effect was discovered by Faraday as a common underlying principle behind magnetic action and electric induction [13].

In September 1845 he (Faraday) transmitted a beam of light through a heavy glass placed in between the poles of an excited electromagnet and observed a rotation of the plane of polarization of light along the magnetic field of the electromagnet that established a connection between the light and magnetism. In 1858 Helmholtz began the mathematical study of the vortices and suggested that the tiny vortices in aether are indestructible which encouraged Kelvin to imagine the atoms as an indestructible entity made up of aethereal vortices. Following Faraday's effect, in 1860 Lord Kelvin suggested Maxwell to imagine the magnetic field to have a rotational effect which eventually impressed Maxwell to model the Faraday's magnetic lines of forces as the lines of motion of aethereal vortices in space. It should be noted that Maxwell was apparently unaware of the Helmholtz's theorem for vortex. After the discovery of electron in 1897 by J. J Thomson Larmor proposed that an electron is a structure in the aether and hence a piece of matter is comprised of electrons. In 1905 Einstein's theory of relativity postulated that space is a geometrical curvature which does not need a velocity vector of aethereal fluid assigned to any point of space. Thus the necessity of an aether was denied and the theory of aether was suppressed.

Revival of vortex theory:

It is commonly believed that Einstein abolished the aether theory by introducing a mathematical space-time curvature discarding the physical essence of space. By using the idea of mathematical space he failed unify all interactions (gravity, electromagnetism etc.), and expressed his understanding of light in the following words: "All these fifty years of conscious brooding have brought me no nearer to the answer to the question "what are light quanta?" Now-a-days every Tom, Dick, and Harry thinks he knows it. But he is mistaken" [7].

This means that without properly understanding light (*photon*) we cannot unify all interactions and describe the actual structure of space. The origin of *inertia* and *charge* are hidden behind the knowledge of a light quanta (*photon*). Even though Einstein eliminated the necessity of aether, he seems to be inwardly dissatisfied due to his failure to unify all forces. Therefore, he had a strong feeling of the need of an *aether* for a physical interpretation of space, which is evident from his following statements delivered as a part of his lecture in the university of Leiden in 1920.

“According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time ...”

The word aether became a taboo due to its famous opponents (such as Einstein etc.). However, there is an automatic revival of aether theory in this century due to the failure of Einstein’s theory of relativity in order to concoct a theory of everything and an urgent need to understand the physical properties of space(vacuum). The aether is reintroduced as a relativistic aether, more technically *space-time*, which is evident from the following words of the Stanford professor and Nobel Laureate Robert B. Laughlin:

“The word 'ether' has extremely negative connotations in theoretical physics because of its past association with opposition to relativity. This is unfortunate because, stripped of these connotations; it rather nicely captures the way most physicists actually think about the vacuum. . . . Relativity actually says nothing about the existence or nonexistence of matter pervading the universe, only that any such matter must have relativistic symmetry....The modern concept of the vacuum of space, confirmed every day by experiment, is relativistic ether. But we do not call it this because it is taboo.” [14]

Now the real question is about the most probable structure of space; Retrospection of Bernoulli’s aether theory on Maxwell’s work would be our starting point of research into this matter.ET Whittaker writes,

All space according to young (John) Bernoulli, is permeated by fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighboring whirlpools” [15].

Bernoulli’s aether vortices are the starting point of physical interpretation of lines of force in Maxwell’s 1861 paper “On Physical Lines of force” [16]. The sea of tiny vortices in aether must be endowed with sources and sinks just like the whirlpools in a river. This means that a streamline flow takes place between source and sinks. The sources and sinks can be termed as positive and negative electric particles. Thus Maxwell’s sea of whirlpools can be imagined as a sea of positive and negative electric particles.

Kepler’s laws of planetary motion and Newton’s law of universal gravitation allow us to derive a radial differential equation at a distance, r , from the polar origin: Following polar coordinate system, fixing the center at the Sun, the radial acceleration of the planet is

$$a_r = (d^2r/dt^2 - r\omega^2) = -GM/r^2 .$$

This is transformed to,

$$d^2r/dt^2 = -GM/r^2 + r\omega^2,$$

where $mr^2 \omega = C$; m =mass of the planet and M =mass of the sun. This gives us the differential equation

$$d^2r/dt^2 = -A/r^2 + B/r^3,$$

where $A=GM$, $B=C^2/m^2$ and G =universal gravitational constant, and where L is a constant related to the angular momentum.

The basic form of the last equation was first proposed by Gottfried Leibniz (1646-1716). The centrifugal term of the acceleration gives us an inverse cubic force field which arises from a dipole. Therefore, it provides an evidence of a background medium of electric dipoles responsible for causing electromagnetic phenomena. On the other hand, the inverse square term is related with the gravitational force that continually pulls the planets towards the Sun. Gravity is a monopole force field that arises from a large scale radial flow of pure aether into atomic and molecular matter [17]. In 1930 Dirac proposed the space as a sea of electron and positrons called “Dirac sea”,

infinite particles of negative energy. In other words, “Dirac sea” is a sea of electron-positron dipoles. As they are produced following an underlying principle and do not annihilate, there must be a rotation of the positronium atom about the common center. In recent years there is an increasing demand in proposing that “the medium for the propagation of light (*aether*) is a dense sea of electrons and positrons. This proposal is endowed with a challenging question “why the electrons and positrons do not annihilate each other, as would be the case in the Dirac Sea?” [17]. On 15th July 1944, Nicolas Tesla, a strong advocate of Vedic view of space and time, suggested about the nature of space as a sea of minute quantum whirlpools of primal matter:

“Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception and filling all space - the Akasa or luminiferous ether - which is acted upon by the life giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. 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”. [18] Sir Oliver Lodge, a noted exponent of aether theory strongly feels the adoption of quantum vortices in the space for a “possible structure of space”: “The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion”[19].

Mathematical treatment of vortex hydrodynamic model:

Maxwell studied the Faraday’s “lines of force” which were physically imagined as a stress in the aether. In 1867 Thomson (Kelvin) tried to establish an analogy between the electric phenomena of Faraday’s lines of force with the elasticity of aether. He examined the equilibrium of a stationary incompressible elastic solid in the state of a strain, and “showed that the distribution of the vector that represents the elastic displacement might be assimilated to the distribution of the elastic force in an electrostatic system” [Whittaker, E. (1989). *A History of the Theories of Aether and Electricity: Vol. I: The Classical Theories; Vol. II: The Modern Theories, 1900-1926 (Vol. 1). Courier Dover Publications, page-242.*]. This means that the curl of a vector a is equal to the magnetic induction B , where the vector a was identified with the elastic displacement in the strained ethereal medium. Therefore, symbolically, we can write the relation that gives the mechanical interpretation of electromagnetic phenomena, as

$$\text{Curl } a = B,$$

where the vector a is equivalent to the vector potential that which was used in the memoirs of Neumann, Weber and Kirchhoff on the induction of currents. However, following an independent method Thomson arrived at the above equation. This equation of Thomson tells us that the electric and magnetic forces are transmitted via ethereal strain just like an elastic wave is propagated as a change in displacement in aether. Maxwell imagined the Faraday’s lines of force as lines of flow of a liquid. The lines of force represent a direction of a vector and the magnitude of the vector is inversely proportional to the cross sectional area of a narrow tube formed by such lines as shown in the figure-1.

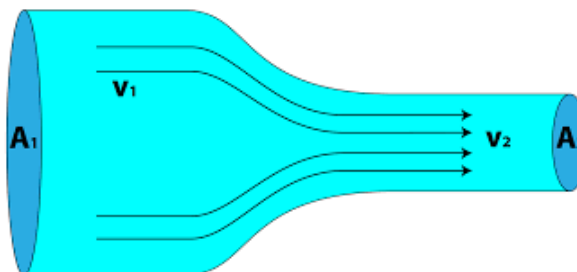


Fig-1. Tube of liquid flow

In hydrodynamics the tubes of flow of an ideal liquid can be given as continuity equation which states that the rate of flow, that is amount of liquid (mass or volume per unit time which is known as flux) is constant for any cross section. Symbolically the continuity equation can be given as

$$A_1 v_1 = A_2 v_2 = Av = \text{Volume Flux } (\phi_v) = dV/dt$$

This means that $v = \phi_v / A = \text{Flux} / \text{Area of cross section} = \text{Flux density or field density or field induction}$. In this case of fluid flow it is the flux of velocity vector v . The flux of velocity vector or hydrodynamic flux is ϕ_v , directly proportional to the number of imaginary field or flux lines passing through a given cross section A . Similar to the flow of an incompressible liquid flux we can represent the Faraday's electric and magnetic lines in terms of field vectors E and B respectively which is analogous to the field vector v of liquid flow. Faraday himself had an idea that "along the lines of magnetic force there may be a *dynamic condition* analogous to that of the electric current, and in fact, the *physical lines of forces are currents*".

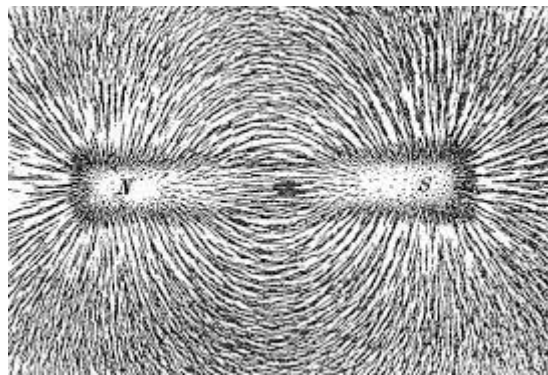


Fig-2. Magnetic lines of force

Following to the continuity equation, the flux of magnetic field induction can be given as $\phi_B = BA$ as shown in the figure-2.

This gives us the magnetic field density as magnetic flux divided by area of the imaginary tube.

$$B = \phi_B / A$$



Fig-3. Electric lines of force

Similar to the magnetic lines of force the analogy of electric lines of flux can be compared to a flux of liquid by using the field vector E (electric field strength/intensity) or electric field induction D as shown in the figure-3. The electric flux can be given as

$$\phi_D = DA$$

Therefore, the electric field/flux density or field induction is given as flux per unit area.

$$D = \phi_D / A$$

In this case of electricity the field vectors E and D are analogous to the circutal vector v which represents a circulating or moving liquid. In this sense the electromagnetic field vectors B , E and D can also be treated as circutal vectors like the velocity vector v . In the absence of any dielectrics the flux of D -vector is continuous which can be given as

$$\text{Div. } D = q$$

In comparison of electric field with the fluid motion it is necessary to introduce the source and sink of the field. The flux lines emanate from a positive charge and terminate on a negative charge. This means that presence of positive and negative charges signify the outward flux and the inward fluxes respectively justifying the idea of source and sink of the electric field lines just like the same in hydrodynamics as shown in the figures-4 below.

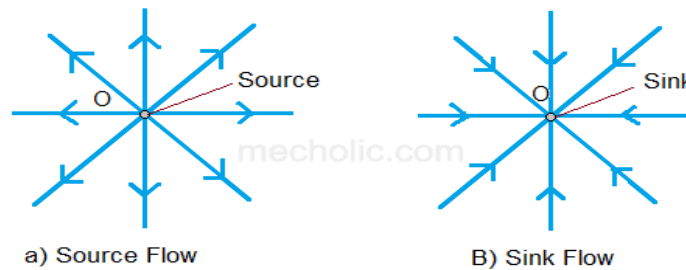


Fig-4 : (a) Source Flow and (b) Sink Flow

Divergence of D is positive for positive charge and negative for negative charges. However, when there are no charges present, the divergence of D and E will be zero which physically signifies that there is no sink and no source. In this case only, the electric field is solenoidal. The electric lines of force are closed just like magnetic lines of force. In other words, D and E are circutal in the absence of charges. However, B is in general circutal in the absence of any magnetic materials or electric currents. The vector D and B represented by Faraday's lines of electric and magnetic forces are analogous to the hydrodynamic liquid flow of velocity vector field or v -field. In other words, D and B fields are hydrodynamic analogue of v -field.

Conclusion:

So far we have learnt about three possible theories regarding the structure of space. One is suggested by Harold Aspden, second is double helix photon unit originally suggested by de-Broglie, and the third is a cubical lattice of electron and positron developed by professor Simhony. All these models are based upon the idea of de-Broglie's "half photon model" followed by the concept of Dirac sea. Anyway, there is a basic need to imagine the best possible structure of space is the electron-positron pair. It is because the electron is the most basic fundamental particle and the positron attains the stability by associating with the electron of the space structure in the process of recombination (or metaphoric annihilation) of matter in the process of releasing the bond energy of rotating electron-positron (positronium atom) pair or photon unit. Due to the enormous life time of the positronium atom as a combination of two oppositely spinning space stuff (aether) in the primal matter (Avyakta), the space is most preferably a sea of electron-positron dipoles. By the method of attaining a spin, the unmanifest undisturbed physical space (avyakta) or primal matter becomes vyakta (manifested fundamental material particles). Although physically it is difficult to answer to the question "who gives the first spin?", the metaphysical answer to this question is "Time" in the form of God (creator) generates a motion in undisturbed space in the form of quantum vortices which can be termed as material particle anti-particle pairs. Different combinations of fundamental particles, most preferably electron and positrons, can give rise to proton, neutron etc., in order to form atoms and molecules.

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