



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

UNIFIED FIELD THEORY AND ITS APPLICATIONS

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Abstract: In this article, in addition to developing a unified field theory, origin of magnetic fields of the planets and the sun are explained and the theory is verified with the experimental and observed data. De Broglie's matter wave equation is redefined for the magnetic material particles. A general formula for all forces of the nature is developed and found that there are 5 forces of nature and the fifth force is related to the general theory of relativity. A new theory of electromagnetic radiation and propagation of waves is developed based on the electrical charges. The new theory developed is applied to develop the transient and steady state theories of the Universe in the last section. The new theory of cosmology developed shows that the speed of energy (c) is $0 < c < 3 \times 10^8$ m/s in the observable universe and 3×10^8 m/s $< c < \infty$ in the transient and hidden part of the universe. This is identified as the dark matter of the universe. The proposed theory does not generate any singularity unlike in the general relativity theory based cosmology. The theory also integrates the absolute space with the relative space.

Key words: Unified Field theory, Photons, matter, waves, charges, transient and steady state universe.

Introduction: In the paper [1], a deterministic quantum theory is developed. In the paper [2], velocity and energy of the particles is determined. In the paper [3], Fundamentals of deterministic quantum mechanics is analyzed. In the paper [4], particles and fields are analyzed. In the paper [5], a theory of fields and energy is developed. In the paper [6], general theory of gravitational and other fields and its applications to astrophysics are explained. In the papers [7] and [8], a general deterministic theory of fields is developed. In the paper [9], a modified theory of the early universe is presented. In the paper [10], an analysis of the material universe is made. In the paper [11] an unified theory of cosmology is presented. In the paper [12], deterministic interpretation of quantum mechanics is presented. In the paper [13], the statistical interpretation of the quantum mechanics is disproved.

In this paper, in the section-I, relationship between mass, the gravitational and electromagnetic fields is analyzed and explained. Then the relationship between electric charges and electric and magnetic fields are analyzed and explained. In the next section, Charge mass and mass relationship is established first and then the same principle is applied to build a model of matter particle and the gravitational field and electric fields are proved to be one and the same. Based on the theory developed, the origin of magnetic fields of all the planets of the solar system is explained and the theoretical calculations of relative magnetic field strengths of all planets are made. The calculations made agree with the observed data of all the planets except for Mercury. Reason for the disagreement in the case of Mercury is explained. So, in this way, the unified field theory developed is verified by the experimentally measured and observed data.

In the section-III, five forces of nature namely electromagnetic, gravitational, general relativity, strong and weak nuclear forces are integrated by generalizing Newton and Coulomb's laws of forces. De Broglie's matter wave equation is redefined for magnetic material particle. Sir Isaac Newton developed the corpuscular theory of light propagation. Christian Huygens developed wave theory of light propagation and disproved the Newton's theory. J.C. Maxwell developed the field theory of electromagnetic waves and the light. Then, the existence of Ether particles in the space was disproved. Albert Einstein developed photon theory of light and electromagnetic energy. Then wave particle duality theory was developed by the statistical interpretation of wave particle dual nature of energy and matter. The author through a series of articles proved theoretically that all the particles are made up of electromagnetic waves and all the fields are electromagnetic fields. So, in the 4th section, a new theory of electromagnetic radiation and propagation of waves is developed based on the electrical charges. The new theory developed is applied to develop the transient and steady state theories of the universe in the last section

Unified Field Theory-I:[14] [15][16] As per the Newton's law of gravitation, gravitational field due to mass $M = G.M/R^2$, where R is the distance between the matter particle and the point at which the field due to the mass M is to be determined. G is Universal gravitational constant. At $R = 0$, the location of the matter particle, the field is infinite. So, a matter particle may be defined as a particle of highly concentrated field. Energy is stored in the field. In other words energy is stored in the mass and that energy is given by MC^2 where C is the speed of light in the free space. So, a matter particle may be defined as a particle of highly concentrated energy. All these relationship between mass, energy and field are confirmed by the De Broglie's matter wave equation $MC^2 = h.f$ where h is Planck

constant and f is frequency of matter wave. So, the mass and the field are one and the same. Only difference is density of the field in the mass is very high.

Similarly, as per the Coulomb's law of electricity, electric field of charge Q is directly proportional to Q and inversely proportional to R^2 where R is the distance between the location of the point charge Q and the point at which the field due to Q is to be determined. As per this law, electric charge may be defined as a particle of highly concentrated electric field. So, electric charge and the field are one and the same. So, the electric field is made up of electric charges of weak density. Movement of electric charge produces electric current which in turn produces magnetic field as per the Biot-Savart's law of magnetism. So, the movement of an electric charge produces the magnetic field. In other words an electric charge indirectly produces magnetic field and the electric field is produced directly by the same electric charge. So, in this way, electric and the magnetic fields are linked through the electric charges.

As per the Biot-Savart's law, magnetic field is inversely proportional to R^2 . The magnetic charge could be defined as $I \cdot dl$ where I is the current produced by the movement of the electric charge ($dQ/dt = I$) and dl is the distance travelled by the charge Q during the time interval dt . The magnetic field at the location of the magnetic charge is infinite as per the Biot-Savart's law because $R=0$ at the location of the magnetic charge. So, a magnetic charge may be defined as a particle of highly concentrated magnetic field or highly concentrated magnetic charges or magnetic field could be defined as weakly concentrated magnetic charges as compared with the density in the magnetic charges. The line segment through which the electric current flows is the magnetic dipole which produces the magnetic field. For the flow of electric current, electric potential difference is required. So, the positive and negative magnetic charges can't be separated like the electric charges. An electric point charge produce electric field where as an electric dipole through which electric charge moves and produces current produce the magnetic dipole.

Unified Field Theory-II:[14] [15] [16] By comparing the Newton's law of the gravitational force with the Coulomb's law of electrical force, we get $Q = \sqrt{(4\pi\epsilon G) \cdot M}$ where ϵ is the electrical permittivity of the free space. So, the mass and the charge are proved to be equivalent. This equation leads to the conclusion that electrical and gravitational fields are equivalent. The gravitational field is always attractive unlike the electrical field. This is because of the following reason. All the matter particles are made by atoms. An atom could be modelled as an ever rotating dipole. So, a matter particle could be considered as an array of rotating dipoles. So, if a matter particle is brought close to another matter particle, array of the rotating dipoles will always align in such a way to attract each other.

The earth's magnetic field originates due to the gravitational/electrical force between the earth and the Sun. The rotating electrical dipoles of the earth and the Sun align in such a way to attract each other, as explained in the previous paragraph. As is well known, the earth rotates about its own axis by the gravitational pull of the Sun. So, due to the alignment of the electric dipoles the direction of line connecting the centre of earth and the Sun and the rotation of earth about its own axis, there will be circular current flow in the alternate directions on the circular planes perpendicular to the axis of rotation. Earth is approximately an elongated spheroid in the north south direction. So, many circular current discs of varying diameter from zero to diameter of the equator are piled up from the north and south poles to the equator plane. All these circular current discs produce the earth's magnetic field in the direction of line connecting the north and south poles. So, the earth's magnet existed from the time the earth began to rotate about its own axis. This theory is proved by the strong experimental evidences [17]. As per this theory, there must be a magnetic field along the axis of rotation of all the bodies attracted by a gravitational pull and rotating about its own axis. So, all the planets, Sun and the satellites of the solar systems must generate strong or weak magnetic field like the earth along its own axis of rotation. The strength of the magnetic field generated depends on the speed of rotation and the mass of the planet. The following table clearly explains the magnetic fields produced by the planets of the solar system.[18][19][20].

S.N. PLANET	MASS (M) (M x 10 ²⁴ kg.)	SPEED(S) (km/hr)	M x S
1. Mercury	.33	10.83	3.564
2. Venus	4.87	6.52	31.655
3. Earth	5.97	1574	9444
4. Mars	.642	866	554.24
5. Jupiter	1898	45,583	8,66,07,700
6. Saturn	568	36,840	2,09,02,400
7. Uranus	86.8	14,794	12,87,078
8. Neptune	102	9,719	9,71,900

In the above table, the factor $M \times S$ (Mass-Speed product) indicates the relative magnetic field strength of the planets, because for greater speed of rotation and greater mass, greater magnetic field is produced by the planet. So, as per the above table, earth has got greater magnetic field as compared with the planets Mercury, Venus and Mars. The four planets Jupiter, Saturn, Uranus and Neptune produce greater magnetic field than the earth. But mercury's magnetic field is increased by the Sun's magnetic field because mercury is closer to Sun. So, mercury's magnetic field is measurable and weakest one. The magnetic fields of Venus and Mars are not measurable. So, the calculated values of the relative magnetic fields of all the planets agree with the measured values of the magnetic fields

produced. In this way, the electric, magnetic and gravitational fields are integrated and electrical charges are proved to be the source of electric, magnetic and gravitational fields.

Unified Field Theory-III:[14] [15][16] In this section, four forces of nature namely electromagnetic, gravitational, weak, strong and weak nuclear forces will be integrated. As explained in the field theory section, all the matter particles are made by the electric waves of high field intensity. Since the field and charges are proved to be one and the same and matter particles are proved to be equivalent to the electric charges, the fields are made up of charges. Positive half cycle of an electric wave is made up of positive electric charges and the negative half cycle of the electric wave is made by the negative electric charges. So, all the negatively charged particles are made by negative half cycles of the electric field and positively charged particles are made by positive half cycle of the electric field. Matter particles without any charge are made by both positive and negative half cycles of electric wave. All the particles of the world are made by fusing the positive or/and negative half cycles of the electric waves of different frequencies. Similarly, the magnetic particles are made by fusing the positive and negative magnetic half cycles of the magnetic waves of different frequencies.

Unlike the electric charges, magnetic charges can't be separated and so, magnetic charges always stay in the form of magnetic dipoles. As explained in the previous sections, magnetic waves of an electromagnetic waves are produced by the current produced by the movement of electric waves. So, in the magnetic materials, electromagnetic wave loop is rotating about its own axis to produce magnetic waves at the speed of 3×10^8 m/s. So, unlike the ordinary matter particles, all magnetic matter particles are made by full cycle of electromagnetic waves. So, De Broglie's matter wave equation to the magnetic matter particles must be modified to $MC^2 = 2hf$.

The nucleus of an atom has all the elementary particles of the nature except the electrons and these nuclear particles are bind together by two forces. They are strong nuclear forces and weak nuclear forces. As explained in the previous sections, all the matter particles of the nature are made by fusing the positive and negative electric waves appropriately. Since the waves are periodic, they could be mathematically expressed by Fourier series. Each Fourier component represents a particle. The energy of each particle is given by the De Broglie's matter wave equation. The only difference between classical matter and charge particles and the nuclear particles is the distance of separation. All the nuclear particles are packed very tightly with distance of separation at micro and nano or smaller than micro and nano scales.

The Newton and Coulomb's laws of forces are not valid at distances very close to the source because as the distance tends to zero, field becomes infinite. So, at distances close to zero, field is proportional to a quantity in the range of $1/R^2$ to $1/R^n$ where $2 < n < \infty$. Similarly, if R tends to ∞ , field goes to zero as per the Newton and Coulomb's laws. So, the field varies from zero to a quantity proportional to $1/R^n$ where $1 < n < 2$. So, all the near field or nuclear fields could be defined by a single formula and that is $E(R) = G.M/R^n$ where $2 < n < \infty$. The field at large values of R could be defined by $E(R) = G.M/R^n$ where $1 < n < 2$. All the electrical charges are converted into equivalent mass using mass charge equivalence principle in the formulae for the fields.

So, the field formulae for large values of R may be $E(R) = GM/R$ or GM/R^2 . For large value of R Newton and Coulomb's laws are applicable and as R tends to ∞ , the formula $E(R) = GM/R$. So, Newton and Coulomb's laws are valid only at the intermediate distances. At extreme distances higher or lower order of formulae are applicable. So, as R tends to ∞ , field E and space factor R are interchangeable in the formula, $E(R) = GM/R$. This means field and the space becomes one and the same. This is the basis for general theory of relativity. So, this field component is general relativity field. The component GM/R^2 is gravitational field component. The General relativity field dominates at very large distances and at large distances gravitational field components. In other words, at intermediate distances between large and very large distances, both the fields dominate. So, the generalized Newton or Coulomb's law is $E(R) = \sum GM/R^n$ where $1 < n < 2$. Similarly, at the lower extreme distances close to zero, the field is $E(R) = \sum GM/R^n$, where $1 < n < \infty$. So, general formula for all four fields of nature is $E(R) = \sum GM/R^n$, $1 < n < N$, where N is the truncation number of the series and it is 2 for gravitational and general relativity fields and is > 1 for nuclear fields. There are many elementary particles within the nucleus of an atom.

Electrical Charge Theory of Radiation and propagation:[14][15][16] Electromagnetic field theory was developed based on the sound field theory. So, in the place of matter particles of sound field theory, hypothetical ether particles were assumed for developing the classical electromagnetic field theory. Then the existence of ether particles was disproved. As per the postulates of the special theory of relativity, electromagnetic fields can exist on its own without assuming the ether particles. But how the electromagnetic field can exist on its own is not yet explained. In the previous sections of this article, charges and fields were proved to be one and the same. So, negative field of an electromagnetic wave could be considered as negatively charged particle and positive fields of the wave as positively charged particles. When the electromagnetic wave is radiated into the space without any charge, the end charge of the wave moves into the space and travels continuously towards infinite distance. Since all the other charges are alternatively attached with the end charge, the electromagnetic wave moves like a train in a straight line. So, the electromagnetic field propagation could be explained using both ray and wave theories.

The propagation of electromagnetic wave from a radiator could be explained by comparing the circular surface wave generation on a stable and flat water surface by throwing a stone in the vertical direction to the water surface. From a vertical conducting wire D.C produces static magnetic and electric fields. Fields are made by charges. So, if the charged particles move in the upward and downward directions with a frequency, the attached static electric and magnetic fields/charges vibrates with the same frequency as the charged particles of the conductor and the electromagnetic wave propagates in the direction perpendicular to the direction of movement of charges in the conductor. Since the E.M. field is moving in the free space and the charged particles are moving in the atomic free space of the conductor, the speed of the E.M. wave propagation is greater than the speed of the electrons in the conductor. At high frequencies, electrons move at greater speed and so the attached E.M. waves. When the speed of vibration of the electrons is close the

speed of light in the free space, the waves are detached and moves in the free space with the speed of light. At higher frequencies, speed of the charged particles varies fast and so, the acceleration is high and so, the force acting on the electrons is high. So, the E.M. waves are detached from the charged particles like the stone is detached from the water surface wave generated by the stone. Instead of a stone, if a life boat is thrown on to the stable and flat water surface, that circular life boat too generates circular surface waves, but the water surface waves are attached with the boat always. Similarly, E.M. waves generated by the electronic vibrations of the conductor too attached with the electronic sources. This simple theory clearly proves that the E.M fields are electrical charges and are comparable to the water or air particles of sound/water wave propagation. Therefore, electromagnetic fields or charges are the real ether particles or corpuscular particles assumed while developing the classical electromagnetic theory and the special theory of relativity. So, the theory presented in this section, integrates all the assumptions made to develop the theory of electromagnetic wave generation and propagation.

Electrical Charge/Field Theory of Cosmology:[14][15][16][21][22] As per the modern and standard big bang theory of cosmology, the material universe originated from a very hot and high density energy ball by a big explosion of the ball. So, the temperature and density were infinite in the beginning of the energy. The space of the material world also originated with the energy. So, this energy ball must have originated from the absolute free space. The high temperature and density electromagnetic energy must have originated from a very high voltage and frequency electromagnetic radiator. Absolute free space is a dielectric material and so, high frequency and high voltage radiation must have broke the absolute free space the energy ball of the big bang theory must have came out from the radiator. Since the frequency of radiation in the beginning was the maximum and big energy ball came out suddenly, due to the breakdown of absolute free space, the velocity of electromagnetic energy must had been maximum in the beginning of the world because the speed of electromagnetic energy is $1/\sqrt{(\mu\epsilon)}$, where μ and ϵ are the permeability and permittivity of the free space respectively. Before the origin of energy the absolute space blocked the high density and frequency energy. So, the permittivity and permeability of the absolute free space could be assumed to be infinity before the time at which energy originated. But when the energy originated and absolute free space was broken, permittivity and permeability of the free space must have become zero and so, the speed of energy must have become infinite. This dielectric breakdown at the beginning of the universe is the real Big Bang of the standard Big Bang theory of cosmology.

This dielectric breakdown of the the absolute space and the subsequent travel of energy at very high speed So, the absolute space with zero permittivity and permeability must had been changed as and when the energy propagated. Consequently the speed, temperature and the frequency of the energy must have been reduced. With the cooling of the energy, photons must have been transformed into matter particles by the fusion of photons. From the elementary particles, by fusion of the elementary particles, hydrogen atoms and gases of the Universe were made. From such hydrogen clouds, stars, galaxies and the solar system originated. The universe from the birth of energy from the absolute space till the time hydrogen atoms were made is called transient Universe and the universe from the time of birth of hydrogen atoms is the steady state expanding universe. Photons are made by electromagnetic waves as per the Planck's law $E = h.f$. So, all the matter particles, energy particles and charges were made by electromagnetic waves. This fact is confirmed by the De Broglie, Newton, Coulomb and Biot-Savart's laws, as explained in the previous sections.

As per the first law of thermodynamics, the energy originated from the absolute space and expanded must be conserved. So, the energy originated travelled from infinite speed to zero speed at the end of the world and returned back to the beginning point of the universe and then once again expanded and so on. So, the transient universe in the beginning was an oscillatory universe. Energy by travelling in the forward and backward directions had cooled down to produce the matter particles to produce steady state expanding universe. So, the speed of the energy in the steady state expanding universe is not constant and is $0 < c < 3 \times 10^8$ m/s. So, energy produces material universe and the matter universe is converted back into energy and so on. So, the steady state and the transient expanding universe is a cyclical universe. In the beginning before making material particles, the entire world was transient world. So, the present world has both transient and steady state expanding parts. Only the steady state universe is observable universe. That is why the maximum speed of light is 3×10^8 m/s. In other words, the speed of energy(c) in the transient universe is 3×10^8 m/s $< c < \infty$. So, from the time $c = 3 \times 10^8$ m/s, steady state expanding universe begins and the space becomes the space of general theory of relativity. In the transient universe, the space is absolute or the space of special theory of relativity and quantum field theory. In the transient universe, mass of a particle $M = M_0/\sqrt{(1-(v/c)^2)}$, where M_0 is rest mass of the particle and v is the speed of the particle which is less than c . As per the De Broglie's matter wave equation, the mass of a photon = $h.f/c^2$. The hidden mass in the transient universe is the dark matter of the world. The radiator or antenna which radiated the energy for the material world must had been closed after emitting the big energy ball like described in the standard model of the world. This condition is required for cooling down of the energy to produce matter particles and steady state observable universe. So, the world is isolated from the radiator which emitted the world.

Conclusion: Origin of planetary magnetic field is explained. All the forces of the nature are integrated and a general formula for field is formulated. The formula indicates the existence of a 5th force related to the general theory of relativity. A new theory of radiation and propagation of electromagnetic wave is developed and a new theory of cosmology is made based on the new theory of radiation and propagation of electromagnetic energy. He speed of light (c) is proved to be $0 < c < \infty$. The theory developed may be verified by experimental and observational methods. That is left for the future work..

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