A New Unified Theory of Modern Science

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A NEW UNIFIED THEORY

OF MODERN SCIENCE

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ABSTRACT

A new unified theory of modern science is introduced. It is based on the theory of electrodynamics for finite-size many-body particles. A general electrodynamic model for charged elementary particles is presented. From a calculation of the theoretical gyromagnetic ratio μ/L and comparison with the experimentally measured value, it is shown that many-body particles consist of three bound charges. The self-fields of a charged many-body elementary particle are derived and found to give rise to the "relativistic" fields of a moving charged particle. Mass is found to be an electromagnetic quantity characteristic of many-body particles that reflects the local effect of the rest of the universe on the motion of a charged particle. The "relativistic" increase of mass with velocity is found to be an electromagnetic effect of the increased binding energy of the many-body particle due to induced self-field effects. In this manner the principal results often explained in terms of relativity theory are shown to be normal electromagnetic self-field effects of real finite-size many-body particles. Furthermore, arguments are given to show that the gravitational force, strong nuclear force, and the weak nuclear force are merely different manifestitations of the electromagnetic force, and that electrodynamics of finite-size real particles is the proper unified theory of modern science.

INTRODUCTION

The philosopher and scientist, Poincare, once made some particularly illuminating observations when he wrote,

> If we admit the relativity postulate we find that the law of gravitation and the laws of electrodynamics have a number in common, the speed of light: we also recover this number in all other forces of whatever origin; this cannot be explained except in one of the following two ways:
>
> a) either there is nothing in the universe which is not of electromagnetic origin;
>
> b) or, that the feature which, so to say, is common to all phenomena is only a sham, related to our methods of measurement.(1)

Today, physicists generally acknowledge that experimental results for the relativistic electromagnetic, gravitational, strong nuclear, and weak nuclear forces are in best agreement with mathematical expressions or equations for these forces involving "c" the velocity of light. These scientists generally believe that the appearance of the velocity of light in expressions for the various fundamental interactions is merely a measurement condition stemming from relativity theory. However, relativity theory has been known to be a false theory from its inception.(2)

By accepting the false theory of relativity and Poincare's proposition b), scientists have gotten further away from the grand "unified" or "universal" theory of science. They now have to contend with four fundamental forces, i.e., electromagnetic, gravitational, strong nuclear, and weak nuclear; instead of just one fundamental force, the electromagnetic.

The purpose of this paper is to correct classical electrodynamics so that it is in better agreement with the real world and suitable for becoming the new unified theory of modern science. This will be done by removing the point-particle idealization from classical electrodynamics, and replacing it with real world elementary particles with finite-size and internal many-body structure. Also Mach's Principle will be satisfied by systematically applying one of the fundamental laws of electrodynamics known as Lenz's law.

NEW ELECTRODYNAMIC MODEL

The notion of point elementary particles that modern science has inherited from the Greek atomists no longer seems to be consistent with experimental data. A high energy physicist named Hofstadter received a Nobel prize for developing charged particle scattering techniques to measure the internal charge structure of elementary particles and nuclei. In his Nobel lecture Hofstadter said:

> The history of physics shows that whenever experimental techniques advance to an extent that matter, as then known, can be analyzed, by reliable and proved methods, into its elementary parts, newer and more powerful studies subsequently show that the "elementary particles" have a structure themselves. Indeed this structure may be quite complex so that the elegant idea of elementary (point particles) must be abandoned.(3)

It is not readily obvious that acknowledging elementary particles to have finite size with some internal charge structure would make any significant change in physical theories. However, in the case of electrodynamics, this paper attempts to show that the induced fields produced by a moving charged elementary particle can alter the distribution of charge within the particle in a self-consistent way to give rise to field and mass effects previously attributed to the theory of special relativity.

Abraham in 1903 (4) and Lorentz in 1904 (4) made the first attempts to construct an electromagnetic model of a charged elementary particle. Lorentz suggested that charged elementary particles consist of rigid rotating spherically symmetric charge distributions. When he used this model to predict the experimental value for the ratio of the magnetic moment and the angular momentum $\mu/L = e/m$, it gave the incorrect value $\mu/L = e/(2m)$. Also when he used this model to calculate Newton's Second Law of Motion, he obtained $F = 4/3\ ma$ instead of $F = ma$. Finally, the model required forces of non-electromagnetic origin to hold the charged particle together.

Due to the failure of Lorentz's crude electrodynamic model and others like it, this approach was abandoned. The purpose of this paper is to introduce a new electrodynamic model for charged elementary particles based upon the notions that all the universe is electrodynamic in nature and that electrodynamics must satisfy Mach's Principle.(5,6) This model has none of the defects of the previous models.

Consider a simple electrodynamic model for charged elementary particles that is in agreement with real experimental data. In this model the charged particle at rest is assumed to be an electromagnetically bound collection of moving charges with a sharply localized spherically symmetric charge density of radius a_o and total charge q. The internal charge distribution is perfectly elastic and deforms when acted upon by an external field or induced fields produced by the motion of the particle itself.

For a charged elementary particle with spin or magnetic moment, such as the proton, the model can be made more explicit. In this case some of the bound charges must be rotating about the center of the particle. The simplest way to construct such an electromagnetically bound system is to have a single charge in the center of the particle with a number of symmetrically situated charges of opposite sign rotating about it.

In order to ascertain the plausibility of such an explicit model, one can calculate the theoretical value for the ratio of the magnetic moment μ to the angular momentum L and then compare this with the experimental value of the ratio. Consider a calculation of the angular momentum $L = I\omega$ where:

$$I = \sum_{i=1}^{N} m_i r_i^2 = \int r^2 dm = \int r^2 (m/4\pi a_o)r\ \sin^2\theta\ \delta(r-a_o)d^3r = 2ma_o^2/3 \tag{1}$$

and N is the number of charges rotating such that $q' = \sum_{i=1}^{N} q_i$.

Note the use of the assumption that all the rotating charges are on the surface of the particle and that the mass of the particle is due to the interactions of these charges with one another.

Consider a calculation of the charged particle's magnetic moment μ

$$\mu = 1/(2c) \int x' \times J(x')d^3x' = q'\omega a_o^2/(3c) \, u_z \qquad (2)$$

where for a charge distribution uniformly distributed over a spherical surface rotating with constant angular velocity ω about the z axis

$$J(x') = q'\omega/(4\pi a_o^2) \, r'\sin^2\theta \, u_o \, \delta(r'-a_o) = J_o(x') \qquad (3)$$

Note that Equation (2) only holds for rectangular components, since it is derived from Poisson's equation.

Forming the ratio of the magnetic moment μ to the angular momentum L one obtains

$$\mu/L = [q'\omega a_o^2/(3c)] / [2ma_o^2\omega/3] = q'/(2mc) \qquad (4)$$

Experimentally

$$\mu/L = q/(mc) \qquad (5)$$

The experimental and theoretical values can be made to agree if only those charges of one sign q' within the particle rotate, and there are twice as many of them as those of opposite sign q", i.e.,

$$q = q' + q" = -2q" + q" = -q" \qquad (6)$$

Thus, for the case of charged elementary particles with spin, such as the proton, a simple model can be constructed consisting of three charges with two of one sign rotating symmetrically about a central charge of opposite sign.

ELECTROMAGNETIC FIELDS OF MOVING REAL CHARGED PARTICLES

The fundamental equations of electromagnetism are based upon five experimental laws, i.e., Gauss's law for an electric charge, Gauss's law for magnetism, Ampere's law for induction of magnetic fields by a current or a changing electric field, Faraday's law for the induction of electric fields by a changing magnetic field, and Lenz's law for the characteristics of induced fields. More than one investigator (7,8) has shown that these fundamental empirical laws of electrodynamics by themselves are sufficient to obtain the experimentally observed fields of very high velocity charged particles in accelerators and other experiments, if one acknowledges that real particles have finite–size and many–body internal structure. These derivations assume that the many–body distribution of charge within the elementary charged particle rearranges itself in response to external and induced fields. Since the charge distribution is assumed to be perfectly elastic, it quickly rearranges itself to be self-consistent with those fields. This rearrangement causes a change in the internal binding energy of the particle and the kinetic energy stored in the external electromagnetic fields.

Using the fundamental empirical laws of electrodynamics, the above investigators derived the self-consistent induced fields E_i and B_i in order to obtain the total fields of the moving charged particle, i.e.,

$$E(r) = E_o(r) + E_i(r) = E_o(r)/[\gamma^2(1-\beta^2\sin^2\theta)^{3/2}] \qquad (7)$$

$$B(r) = B_o(r) + B_i(r) = v/c \times E(r)$$

where $E_o(r)$ and $B_o(r)$ are the fields of the particle at rest, $\beta = v/c$ and $\gamma^2 = 1/(1-\beta^2)$.

In the above derivations the factor $\beta = v/c$ comes essentially from the application of Lenz's law.(7) According to Lenz's law the induced electric field E_i in the direction of motion should be proportional to the original field E_o but of the opposite sign, i.e.,

$$E_i(\theta=0) = -\beta \ E_o(r) \tag{8}$$

This use of Lenz's law allows Mach's Principle to be satisfied. According to Mach's Principle any correct physical theory must take into account all the charges and masses in the universe in a fundamental way, because the electromagnetic and gravitational forces have infinite range. The use of Lenz's law appears to satisfy Mach's Principle by taking into account the electromagnetic interaction of all other particles in the universe. It is interesting to note that the special theory of relativity does not satisfy Mach's Principle.

In the above derivations Ampere's law for a single point element of charge moving with a velocity v was written

$$B_i(r) = q/c \ v \ x \ r'/|r'|^3 = v/c \ x \ E_o(r') \tag{9}$$

Note that Ampere's law for a point element of charge gives the transformation of the $E_o(r')$ field in the moving (primed) frame of reference to the induced field $B_i(r)$ in the observer's frame of reference (unprimed). This empirical law was assumed valid for all velocities and was used to obtain the results (7) above.

Also note that if Ampere's law is cast into its usual Maxwell equation form

$$\nabla \ x \ B_i(r) = 4\pi/c \ J(r) \tag{10}$$

the transformation information between the moving frame (primed) and the osberver's frame (unprimed) is lost. This is due to the point particle idealization assumed in order to obtain the Maxwell equation form. For this reason it appears that Maxwell's equations are technically incorrect and not as fundamental as the statements of the empirical laws upon which they are based.

In the above derivations Faraday's law for the changing magnetic flux linked by a circuit being proportional to the induced electric field around the circuit was written

$$\int_C E_i(r') \ . \ dl = -1/c \ \partial/\partial t \int_S B_i(r) \ . \ n \ da \tag{11}$$

where the line integral is around the path of the circuit of charges rotating about the central charge and the surface integral is the surface of the whole charged particle. n is a unit vector perpendiclar to the surface of the charge.

Note that Faraday's law gives a relationship between $B_i(r')$ in the moving frame and $B_i(r)$ in the observer's frame. This relationship is lost if one casts Faraday's law into its Maxwell equation form, i.e.,

$$\nabla \ x \ E_i(r) + 1/c \ \partial B_i(r)/\partial t = 0 \tag{12}$$

Since Faraday's law and Ampere's law both relate electromagnetic fields in the observer's reference frame to those in the moving frame of reference, it is illogical to employ any additional transformations, i.e., the Lorentz transformation of relativity theory, to relate electromagnetic fields in the two frames.

NEWTON'S SECOND LAW OF MOTION F = ma

Galileo showed in his day that accelerations of rolling balls down inclined planes were proportional to the resultant force on the ball. This was the key relationship between force and motion. Further work by Newton and others showed that the acceleration was proportional to the force if the mass was kept the same. However, for the same acceleration double or triple masses require double or triple forces giving rise to the more general law

$$\text{Force} = (\text{mass})(\text{acceleration}) \tag{13}$$

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which is commonly known as Newton's Second Law of Motion. The Newtonian inertial mass m = Force/acceleration was thought to be some universal unchangeable property of material of all kinds that measures its inertia or resistance to acceleration.

Quite separately from inertial mass one can develop the idea of a gravitational mass, i.e., the quantity of matter pulled on by a gravitational field. It is found to have identical properties to the inertial mass. However, the surprising fact is that these two kinds of mass are exactly the same for all pieces of matter. It is surprising, because the masses are described so differently. One measures the body's inertia or resistance to velocity changes, and the other measures the body as both receiver and giver of gravitational pulls.

If they are equal, if no experiment shows a difference, then perhaps they have the same origin in nature and our notions of inertia and gravity are incomplete descriptions of some more general notion. Note that Poincare suggested that the more general motion might be electrodynamics.

Following Poincare's suggestion a number of investigators (7,8) have calculated the total energy of electromagnetic particles using models compatible with the one given above. Their work shows that the total rest energy of a charged elementary particle U_o is given by the sum of the external electric and magnetic field energy $V = V_E + V_M$ and the internal binding energy $U_b = U_{bE} + U_{bM}$, i.e..

$$U_o = V + U_b = 2q^2/(3a_o) + V_M + U_{bM} \tag{14}$$

For a charged elementary particle at low velocity

$$U = 2q^2/(3a_o) + 1/2 \ [2q^2/(3a_o)] \ v^2 + V_M + U_{bM} \tag{15}$$

In classical mechanics the total energy U of a slowly moving body is equal to the sum of its rest mass and kinetic energy, i.e..

$$U = U_o + 1/2 \ m_o \ v^2 \tag{16}$$

Comparing equations (15) and (16) above enables one to identify

$$m_o = 2q^2/(3a_o c^2) \qquad U_o = 2q^2/(3a_o) = m_o c^2 \tag{17}$$

The above results should be expected, since by definition the kinetic energy is the added energy which results from motion and the only added energy in terms of electrodynamics for a slow charged particle due to its motion is that of the magnetic field energy.

Now the force on a particle is defined to be the time rate of change of the momentum, i.e.,

$$F = dp/dt = d/dt(m_o v) = d/dt\gamma[(2q^2/(3a_o c^2)]v = 2q^2/(3a_o c^2) \ dv/dt = m_o a \tag{18}$$

Note that for the charged particle at low velocity the many-body charge distribution remains essentially spherical with constant radius a_o so that the derivative acts only on the velocity. Also note that our simple electrodynamic model obtained $F = m_o a$ instead of $F = 4/3 \ m_o a$ as Lorentz obtained.

It now appears that Newton's Second Law of Motion, which has previously been considered as a fundamental postulate defining force and mass, has its origin in the electromagnetic structure of matter. Furthermore, mass no longer appears to be a fundamental quantity, since it can be defined electromagnetically. Following Poincare's reasoning, Newton's Universal Law of Gravitation should also have an electromagnetic origin. The universal gravitational constant G should be derivable in terms of electromagnetic quantities.

From the work of the investigators above, the total energy of a moving charged particle that is valid for all speeds is

$$U = \gamma U_o = \gamma m_o c^2 = mc^2 \tag{19}$$

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It is evident from these results that the total energy and rest mass of a real charged particle in nature increases with velocity by the factor γ. This effect appears to be completely electromagnetic in origin. Furthermore it depends critically upon the finite-size and many-body structure of charged elementary particles as observed in many experiments. Not only is this electromagnetic effect obtained independent of relativity theory, electrodynamics employs assumptions that are in opposition to relativity theory's point particle idealization.

CONCLUSIONS

In science at present there is associated a fundamental constant with each of the fundamental forces in nature, i.e., the electromagnetic force, the gravitational force, the strong nuclear force, and the weak nuclear force. The fundamental constant for electrodynamics is c, the velocity of light. The fundamental constant for the gravitational force is G the universal gravitational constant.

Poincare noted that the relativistic versions of all the fundamental force laws have the electromagnetic force constant c in common. Logically one would expect each of the force laws to have one and only one unique force constant associated with it. The fact that the relativistic versions of all these force laws do seem to agree well with the data logically leads to one of two conclusions. The appearance of the electromagnetic force constant in all the fundamental force laws is due to a measurement condition stemming from relativity theory or all the fundamental force laws are really electromagnetic in origin.

In a separate paper (2) it is shown that the theory of relativity is logically false and inapplicable to the data and phenomenon of the real world. In this paper it has been shown that for a particular realistic model of elementary charged particles that the so-called "relativistic effects" on the electromagnetic fields and masses is really due to the induced self-field effects of real particles with finite-size and internal charge structure. Also it is shown in terms of the above model that mass is an electromagnetic quantity which is a local characteristic (i.e., unique property at each point) of the universe. Since the inertial and gravitational masses are found experimentally to be equal, the gravitational force must also be of electromagnetic origin. Thus, Poincare would argue that all forces in nature are of electromagnetic origin and electrodynamics is the grand "unifying" or "universal" theory of modern science.

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DISCUSSIONS

The paper entitled "A New Unified Theory of Modern Science" by Charles Lucas is nicely elaborated. I agree with most of its consequences--(previously thought of as outcomes of special relativity) and mainly with the claim that electrodynamics is the direct agent responsible for the four natural forces known to man. The fact that these forces don't show a mutual relationship is because electricity and magnetism act distinctly at different scales (See for example: Barnes, T. G., "New Proton and Neutron Models," *Creation Research Society Quarterly*, Vol. 17, No. 1, pp. 42-47, June 1980; and Barnes, T. G., et al, "Electric Theory of Gravitation," *CRSQ*, Vol. 19, No. 2, pp. 113-116, Sept. 1982) However, I disagree with Dr. Lucas on three things. First, Lorentz didn't consider elementary particles as spherical charges in constant rotation. According to Lorentz, charges rotate only when immersed in magnetic fields. Second, nowhere in Lorentz's book *Theory of Electrons* was I able to find the statement that F=(4/3)ma. Third, special relativity does satisfy Mach's principle qualitatively by asserting that the only valid reference is that taken with respect to matter itself (first postulate of special relativity).

Two questions arise in regard to Lucas's article. 1) It is well known that in electrodynamics, two opposite charges in circular motion around each other will radiate energy in the form of electromagnetic waves. If there is no external influence to maintain this motion then, after some finite time, all the energy will be radiated away and the charges will spiral down until they collapse. If in Lucas's theory a proton is composed of three charges (two positive ones in permanent motion around a third negative charge) how then does he keep the stability of the system without this radiation problem? 2) If mass is an electromagnetic quantity characteristic of "many body particles" that reflect the local effect of the rest of the Universe on the motion of the particles then, would inertia itself be different for different locations in the Universe?

Francisco Ramirez Avila, IV
Cd. Juarez, Chihuahua, Mexico

The author ignores definitive experimental tests for general relativity [1,2,3] and the velocity of light which make the positions in his two papers and in Thomas G. Barnes' book, *Physics of the Future*, impossible to hold.

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3. Shapiro, I. I., et al., "Physical Review Letters," Vol. 36, 1976, pp. 555-558.

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Hugh Ross
Sierra Madre, California

The novelty in Lucas' paper is the structure of an elementary charge. Instead of one charge there is a collection of dynamic charges within the structure. He calls this a many-body problem. Charges are rotating about the center. No detailed structure is provided. He claims to have achieved an electromagnetic model, a classical model, of elementary charge that has a ratio of magnetic moment to angular momentum which checks with experiment. If he is right that is an important contribution.

There is an error in his reference to H. A. Lorentz. Nowhere in that book does Lorentz suggest "that elementary charged particles consist of rigid rotating spherically symmetric charge distributions." Furthermore, Lorentz never accepted electron spin, not even years later when it was introduced in quantum mechanics.

Thomas G. Barnes, Ph.D.
El Paso, Texas

I think the author should refer to Vallees theory and also to the fact that relativity theory was thoroughly demolished by myself.

L. Essen
Surrey, England

Since Dr. Barnes and his former graduate student, Francisco Ramirez, have been publishing papers for years supporting an electrodynamic model for elementary particles and atoms, their criticisms represent significant problems that they and others have encountered in trying to develop an electromagnetic model. The following paragraphs attempt to address the questions that they raised.

Lorentz probably did not accept electron spin as introduced in quantum mechanics, because quantum mechanics gives a non-physical explanation of spin. In quantum mechanics as developed by Dirac and others, all particles are points due to the use of Hamiltonian mechanics. For a point particle there can be no physical rotation of charge to produce a current giving rise to a magnetic field or spin. Thus spin must be a non-physical quantum property of the electron.

The problem of describing the reaction back on a charged particle of its own radiation field was first published by Abraham and Lorentz in 1903-1904. The derivation is discussed by Lorentz in his book Theory of Electronics, Note 18, p. 252. A full blown derivation patterned after that by Lorentz is given in Jackson's book, Classical Electrodynamics, pp. 584-590.

According to Einstein special relativity is appropriate only for systems of particles under the following "special" conditions:

1. The particles can be well approximated as being point-like.
2. The particles move in empty space assumed as homogeneous and isotropic.
3. Gravitational and quantum mechanical effects are ignorable.

This third condition violates Mach's Principle which states that any valid theory must take into account all the electromagnetic and gravitational forces throughout the universe in a logically self-consistent way. Ignoring the gravitational forces is not an acceptable self-consistent way. One reason that Einstein invented the general theory of gravitation was to properly take into account the gravitational forces.

In electrodynamics there is a well-known example of moving charged particles that effectively do not radiate, i.e. the high Q resonant cavity. These cavities support a very narrow band of resonant frequencies which would be a true delta function if it were not for dissipation of energy in the cavity walls and in the dielectric filling the cavity. In the model of the proton presented there is a balance of electric and magnetic fields such that they produce a perfect resonant cavity at the point at which the electric and magnetic forces are equal but opposite in direction and magnitude. In general the length of the cavity must be an integer multiple of the wavelength of the emitted radiation. For the case of the proton, the length of the cavity is one wavelength of the emitted radiation which is similar to the quantum mechanical ground state.

In the electrodynamic model presented, the velocity of light as well as the mass of a particle would vary as one moves through the universe. Both of these may also vary with time. Barry Setterfield has studied all the published experimental values for the speed of light and found it to be consistently decreasing over time. Similar studies should be done on the masses of the electron and proton.

Hugh Ross has referenced some of the most definitive experiments that supposedly support the general theory of relativity. Reference 3 verifies that the gravitational binding energy contributes equally to inertial and passive gravitational masses. This is done using the echo delays of laser signals transmitted from Earth and reflected from cube reflectors on the moon. In the electrodynamics model presented both the gravitational and inertial mass are electromagnetic in nature and equivalent. Thus this data agrees with both general relativity and electrodynamics.

Reference 1 in the paper reports one of the most precise verifications of the relativistic red-shifts of light due to gravitation. The experiment uses a space-borne hydrogen laser. Although the relativistic red-shift has long been considered as supporting general relativity theory, Leonard Schiff at Stanford has published many papers showing that special relativity predicts the same results as general relativity for the relativistic red-shift as well as such phenomena as the bending of star light passing the sun. The basic technique considers the photon to have an equivalent or effective mass. As the photon moves away from a massive body, it loses kinetic energy causing a red shift. As it moves towards a massive body there is an increase of kinetic energy causing a blue shift. This effect has been verified experimentally in laboratory tests with photons moving toward and away from the center of the earth.

Since the electrodynamic model presented seems to be able to reproduce all the known phenomena described by special relativity theory, the data of Reference 1 cannot be considered to uniquely support general relativity, special relativity, or the electrodynamic model.

Reference 2 in the paper reports a Viking spacecraft verification of signal retardation by solar gravity such that the round-trip times of light signals traveling between the Earth and Mars are increased by the direct effect of solar gravity. This type of phenomena can also be explained by Schiff's method.

It is significant to note that Ramirez's paper presented at this Conference eliminated the last known significant experiment that seemed to give unique support to the general theory of relativity. He presented a derivation to show that the rate of precession of the perihelion of Mercury could be predicted using special relativity. At the present time the supporters of general relativity have no known experimental phenomenon that demands that there be a general theory of relativity.

L. Essen and others have from time to time presented good logical arguments invalidating the theory of relativity. What distinguishes this work from theirs is that a proper way to replace the theory is given in the form of an improved electrodynamic model of matter.

<div align="right">Charles W. Lucas, Ph.D.</div>