The Matter Force

Ray Fleming
11303 Blackmoor Drive, Austin, TX 78759
e-mail: rayrfleming@gmail.com

If we study the fundamental forces of the Standard Model, we find mechanical forces conspicuously absent. This error of omission is one of the most significant problems with physics today. Additionally, mechanical force theory is frozen in the physics of a distant past. If we look deeper we find that inertia is analogous to a current in a conductor and its magnetic field, and tops, gyroscopes and flywheels also behave in a magnetic-like fashion. Tidal forces between solid bodies are more magnetic-like than tidal, while the shape of spiral galaxies is more reminiscent of Lorentz forces than a gravitational force. Even effects attributed to General Relativity such as Lense-Thirring and de Sitter precession and the anomalous precession of the perihelion of Mercury are more simply described as magnetic-like effects due to rotating bodies matter. Now there is even a well-established force in the universe causing matter to accelerate away from matter. By combining these observations with classical mechanics we can develop a mechanical force theory, the matter force, which is mathematically consistent with electromagnetic force theory.

1. Introduction

An examination of the four fundamental forces of the Standard Model shows that a force is a force unless it is a mechanical force and then it is not important enough to be regarded as a fundamental force. Or perhaps the thinking is that mechanical forces are something more basic, such that they do not need to be considered when discussing fundamental forces. Of course the mechanical forces do need to be considered as they can oppose or be added to any of the other four forces. Mechanical forces have also been frozen in time, forever closed, removed from any serious discussion of possible improvements even though hundreds of years have passed and much knowledge of the universe gained in the intervening time.

Mechanical force theory must be reexamined in light of how it is best integrated into a coherent fundamental force theory. It is time that physicists stop neglecting these forces and give them equal footing with the other forces of the Standard Model. It is only when we understand the true nature of mechanical forces and how they relate to the other fundamental forces that we will have hope of unifying all forces into a single theory. A force is a force and it should not have a lesser status simply because it is mechanical.

2. Inertia

Inertia is Newton's First Law for a reason as it is the first critical statement one can make about mechanical forces [1]. It is a statement that a body in motion stays in motion and a body at rest stays at rest. Alternatively, that statement can be turned around to say that the vacuum of space, æther or not, does not produce drag on a body. Scientists knew long ago that planets were not subjected to drag, particularly not coming from a specific direction, as that would cause all orbits to degrade. Mechanical objects on Earth do not experience drag due to a vacuum either.

> *For whether there be any intrinsically material inertia or not, there certainly is an electrical inertia. […] Quite possibly there is no other kind. Quite possibly that which we observe as the inertia of ordinary matter is simply the electric inertia, or self-induction, of an immense number of ionic charges, or electric atoms, or electrons. This is by far the most interesting hypothesis, because it enables us to progress, and is definite. The admixture of properties – partly explained, viz. the electrical, partly unexplained, viz. the material – lands us nowhere.* [2]
>
> -- Oliver Lodge (1906)

The trouble with inertia is the lack of an underlying mechanism to explain it. Scientists have been forced to accept it for what it is without explanation and move on, and modern teaching is resistant to the question even being asked. It was perhaps William Thompson (Lord Kelvin) who first proposed a reasonable underlying mechanism as part of his vortex theory of the vacuum. He proposed that little gyrostats filled the vacuum and that they would spin in response to the movement of matter, and the spinning gyrostats would keep the matter moving [3]. This is very similar to the way James Clerk Maxwell viewed magnetic theory in his treatise "On Physical Lines of Force" in which he famously unified the electric and magnetic forces while implementing a vortex theory of magnetism [4]. In his theory, magnetic fields were vortices in the vacuum produced by magnetic current, and those vortices could in turn induce current. Unfortunately this vortex model was dismissed and lost to physics long before we had theories in place to understand their true nature.

In a modernized vortex theory, the vacuum is a variation of a Dirac Sea containing virtual particle pairs such as electrons and positrons forming dipoles. These dipoles polarize or rotate in response to charge location and motion. Dirac's dipoles are a form of zero point energy, vacuum fluctuations, which exist too briefly to be detected directly. In a Dirac Sea model electrical inertia can be simply illustrated (Fig. 1) with particle pairs rotating forming a magnetic field in response to charge motion and the magnetic field causing the charges to move.

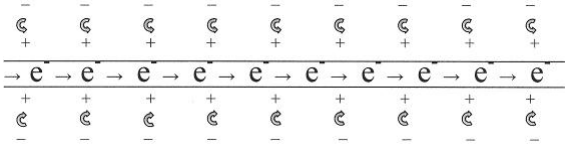

Fig. 1. An electric current causing rotation of Dirac Sea dipoles

As William Thompson and Oliver Lodge anticipated more than a century ago, mechanical inertia can be described in precisely the same way (Fig. 2) where the same Dirac Sea virtual dipoles rotate in response to the motion of a body of electrically neutral matter, and the rotating dipoles cause the matter to move.

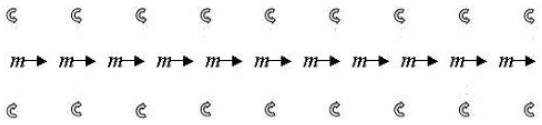

Fig. 2. A body of matter moves causing rotation of Dirac Sea dipoles

This mattermagnetic model of inertia provides us with a simple explanation for inertia, while, for the moment, leaving us with the unanswered question of what type of charge causes the interaction responsible for the self-induction.

3. Tops and Magnetism

The magnetic field produced by the motion of matter is more clearly illustrated by the movement of spinning tops, gyroscopes and flywheels, for when they are spinning and are accelerated toward Earth by Earth's gravity, they do not fall, but instead move tangentially to the acceleration due to gravity. Note that they move tangentially in relation to the direction of any acceleration that changes the axis of rotation. As a top precesses, the sideways motion yields another upwardly directed tangential force opposing gravity. The related torque puts the weight of the top back on its tip rather than at the center of mass.

This is a clear case of a force opposing gravity, a force that is not part of the four Standard Model forces, when it should be. It should be part of a fifth force. And, while it is very true that mathematical descriptions of gyroscopes have been known for more than a century, they leave a key question unanswered. What is the gyroscope pushing against? The classical model of a gyroscope does not respect Newton's Third Law. Where is the equal but opposite reaction coming from? If we are not to believe in magical action at a distance then the gyroscope must push against something and that something can only be the vacuum and it must, through some mechanism, grab hold of the vacuum so that it can push on it.

The simplest may to explain gyroscopic motion acting with respect to the vacuum is to compute the mechanical motion using magnetic force law. The magnetic field, as you would expect is proportional to the rotational inertia and momentum. This math does not lead to a different answer, it just provides a different way to get the same answer, but this way gives us a better explanation of the action mechanism. The magnetic field due to the motion of matter can be computed using the Biot-Savart Law for point charges as shown in Eq. (1), where in this case the point charges are units of matter *m*, and the constant for the permeability of the vacuum with respect to matter is μ_{0m}, both of which are to be determined. The forces on discrete bodies of matter are then generally computed with the Lorentz Force Law as shown in Eq. (2) [5].

$$\vec{\mathbf{B}}_m = \frac{\mu_{0m}}{4\pi}\int \frac{\vec{\mathbf{v}}\times\hat{\mathbf{r}}}{r^2}dm \qquad (1)$$

$$\vec{\mathbf{F}}_m = m\left(\vec{\mathbf{v}}\times\vec{\mathbf{B}}_m\right) \qquad (2)$$

At this point it is important to reiterate that a mattermagnetic model is nothing more than a mathematically equivalent approach to describing the physics of tops, gyroscopes, and flywheels and shows no computational advantage over existing models except for introducing some sort of field, the zero-point field, that the rotating objects can push against so that we can actually understand the force mechanics.

4. Tidal Force and Convection Currents

It is known from observations that rotating bodies in orbit interact through what are termed tidal forces. With our moon, for example, it is thought to have rotated in the past, but eventually the rotation stopped due to tidal force interactions, such that one side of the moon always faces the Earth. The concept of tidal forces is inconsistent with classical gravitational theory, which acts fundamentally point-to-point, with no rotational component. Additionally when solid spherical bodies interact via tidal forces while not having tides.

If on the other hand we have bodies move past each other producing a matter-magnetic field, that matter-magnetic field causes the rotation of the orbiting bodies to slow. Tidal forces are simple matter-magnetic interactions. The mattermagnetic field due to the Sun's motion opposes the rotation of a planet that initially rotated in the same direction as the sun (Fig. 3). This effect also causes a small increase in orbital distance.

Next we can consider large gaseous or liquid spherical bodies such as the Sun and Earth. As a first approximation we can divide that mass in two yielding a sphere in the middle with a radius of approximately 0.8 times the total radius, and an outer spherical shell with the remaining half of the mass. If we consider the Lorentz force effects between these two parts of the body we can see that the inner sphere will cause a counter-rotating field in the outer shell, while the outer shell will cause a counter-rotating field in the inner sphere (Fig. 3).

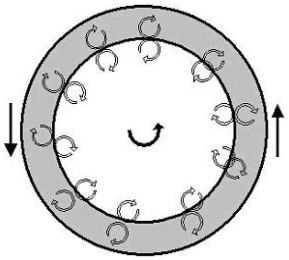

Fig. 3. Convection currents in a rotating gaseous sphere

These counter-rotating fields induce rotational motion of the gas or liquid, causing convective currents. This is the underlying source of the magnetic dynamo, which is well documented for our Sun and the Earth, but has never been well explain scientifically. With a mattermagnetic theory in place, the convection responsible for the dynamos of the Sun and Earth are readily understood.

5. Spiral Galaxies

Based on classical gravitational theory alone large rotating galaxies would form a disk-like shape with no arms and no spi-

rals. They would also be much smaller, as spiral galaxies do not contain enough mass to explain the inward forces that are necessary to retain the outermost stars. This is the missing matter problem at the galactic level.

For spiral galaxies to exit there must be other forces behind the spiral shape including an additional inward force and a force pushing the stars into bands. The spiral shape gives us a clue, as it is indicative of stars in the outer arms being pushed inward with greater force. Gravity does not get stronger with distance, so this is definitely not a gravitational effect. The arms also indicate that these forces are stronger in the vicinity of other stars.

In a small disc it is readily seen that the outer edge of the disc has a faster tangential velocity and so it is with a spiral galaxy. If we find a force that is proportional to velocity, we will have our solution to the puzzle. There is such a force, the Lorentz force as previously shown in Eq. (2). When applied to a spiral galaxy it can readily account for the additional force required to retain the outermost stars. We can also recognize that if stars are moving essentially parallel they are a point charge variation of the parallel conductor problem and like parallel conductors they are pushed together leading to formation of the arms.

Perhaps the best attempt at simulating the shape of spiral galaxies mathematically was accomplished by Anthony Peratt [6]. His work was based on the idea that galaxies were formed in a plasma state moving in response to electromagnetic forces. The images he developed with his model are startlingly accurate at modeling each spiral galaxy subtype. His plasma-based theory is not taken very seriously since stars are electrically neutral at interstellar distances. What Peratt succeeded in showing is that spiral galaxies are formed in accordance with Maxwell's Equations. Spiral galaxy formation though is not due to electromagnetics; it is due instead to mattermagnetics.

Turning to our solar system, if part of the inward force we think of as gravity is due to Lorentz forces, as in spiral galaxies, then we would certainly see non-uniformity in the apparent gravitational force at varying distances from the sun. As it turns out we have measured just such a change in apparent gravity while monitoring the Pioneer 10/11, Galileo and Ulysses space probes [7]. Those experimental results make it clear that gravity is a multi-component force. At least one additional component force that explains these results is the mattermagnetic force.

6. Proofs of General Relativity

One of the so-called proofs of General Relativity is the Lense-Thirring effect, also known as frame-dragging. This is an effect that causes precession of gyroscopes due to the rotation of the Earth. The Earth's rotation causes a mattermagnetic field, which in turn causes precession, so the Lense-Thirring effect can be classically described as a mattermagnetic force, making frame-dragging an unnecessary complication.

A related General Relativistic effect causing precession is the de Sitter effect, which is also known as the geodetic effect. It is said to be due to spacetime curvature. The de Sitter effect is a minor source of precession, but somewhat greater than the precession caused by the Lense-Thirring effect. The de Sitter effect can be classically described as a mattermagnetic force due to the magnetic field produced when two bodies move relative to each other, in this case making spacetime curvature an unnecessary complication.

One of Einstein's original tests of General Relativity is the anomalous precession of the perihelion of Mercury. When we hear the word "precession" we should automatically think of magnetic fields and Lorentz forces. The missing 43 arcseconds per century cannot be accounted for with Newtonian gravity, but when a mattermagnetic force is added, there are additional contributions to the precession that correct for the anomaly, without requiring General Relativity. The first significant mattermagnetic contribution is due to the relative motion between the Sun and Mercury and the second the rotation of the Sun. Each of those produces a mattermagnetic field and as Mercury travels through that field, there is a Lorentz force tangential to its velocity vector. The mattermagnetic field due to the rotation of the sun is much smaller than the field due to the relative motion, and it is also in the opposite direction.

Danby has shown that the additional term normally attributed to General Relativity can be calculated as a function of a vector cross product [8]. Within a matter-magnetic model the vector cross product is due to a Lorentz force with the matter-magnetic field being due to the relative motion and rotation of the Sun and other planets. Note that this force is perpendicular to the velocity vector, not directed toward the Sun (Fig. 4).

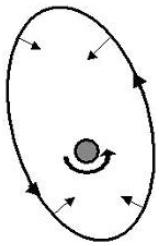

Fig. 4. A planet in orbit around a rotating sun

The tangential force introduces two additional types of motion. The first is periodic and does not contribute to the precession, while the second introduces a secular motion that increases the rate of advance of the perihelion when the force is directed inward. The matter magnetic field between Mercury and the Sun is responsible for virtually all of the 43 arcseconds per century anomaly. The remaining contributions due to the Sun's rotation and the mattermagnetic forces due to the other planets appear to cancel for the most part.

Note that this result is computational similar to a theory proposed by Tom Van Flandern [9]. Van Flandern however did not appeal directly to a mattermagnetic argument, instead based his result on ballistic slowing caused by the vacuum due to an unknown interaction facilitated by the wave-like nature of the electrons in matter. He argued that the slowing resulted in a tangential pseudo-force. This pseudo-force is equivalent to the Lorentz force, differing only in the underlying explanation.

Slowing of light caused by the vacuum is important to unraveling the other proofs of General Relativity. The first important point to recognize about light and the zero point field is that if light is transmitted through a medium, the speed of light is a property of the medium, not a property intrinsic to light. The second point is that in the case where there is no medium the speed of light is intrinsic to light, and it becomes necessary to

consider space contraction to account for light slowing. But, when there is a light-carrying medium, the medium causes light to slow, and space is then geometrically flat. Keep in mind that it is necessary to account for the slowing of light as it passes near the Sun due to evidence for the Shapiro delay [10-13].

A mattermagnetic effect provides a simple explanation if we again consider a Dirac Sea type model and an inertial interaction as described previously. The presence of matter causes the rotation of the Dirac Sea dipoles to slow due to the matter-magnetic interaction. Since light rotates 180 degrees each half wavelength, this slowing of the rotation of the vacuum fluctuations induces a torque on the light, in turn slowing light's rotation, effectively reducing its velocity. The torque due to the vacuum is a London-van der Waals torque, and the increase in the torque of the vacuum leads to ballistic slowing as theorized by van Flandern.

Each of the remaining proofs of General Relativity is ultimately due to a mattermagnetic interaction. It is the variation in the van der Waals torque of the vacuum that is responsible for the bending of light, the Shapiro delay, gravitational redshift and changes in clock rates. This also means the Newton's statement of inertia needs to include the caveat that the body is not near other bodies of matter.

7. The Matter Dipole

Assuming the matter-magnetic force is strictly analogous to electromagnetics than there must be both positive and negative matter charges and they must form dipoles. There also needs to be a long-range force whereby matter is repelled from matter. It is well known that on a universal scale, matter is moving away from matter, but it has long been attributed to a residual velocity from an explosive event rather than an unidentified force. That should have changed, with the need for a new force becoming uncontestable, when it was recognized that the rate of expansion of the universe is accelerating [14]. We now know there must be a force causing matter to move away from matter, the so-called Dark Energy.

For more than a century physicists have attempted to describe a magnetic-like force between bodies of matter with a gravitomagnetic theory where mass is the charge and gravity is the linear force [15-18]. Among the problems with this theory are that there is no experimental evidence for negative mass or negative gravity, and certainly no evidence for the existence of mass dipoles. There is a further difficulty with mass in that it is not an intrinsic property of protons and electrons in the first place. Mass is a secondary effect as those particle's mass equals the vacuum energy they exclude due to their physical dimensions [19]. Also, if this new force is analogous to electromagnetics, like charges cannot attract, they must repel. Gravitomagnetic theories are justifiably dismissed due to those and other shortcomings.

To find the dipole we must examine particle pairs that form the electric charge dipoles of the Dirac Sea, namely the electron-positron pair. We know that both particles have the same mass, spin, and lepton number; there are certainly no dipoles there. If we examine the basic physical properties of an electron and positron (Fig. 5) there is only one that is a negative attribute that forms a dipole with a positive attribute related to matter. The opposite charge to matter can only be antimatter.

Property	Electron	Positron
Group	Lepton	Lepton
Charge	$-e$	$+e$
Spin	½	½
Mass	0.511 MeV/c²	0.511 MeV/c²
Magnetic Moment	$-1\ \mu_B$	$+1\ \mu_B$
Matter - Antimatter	Matter	Antimatter

Fig. 5. Comparison of fundamental properties of the electron and positron

That is quite a paradigm shift, but there simply is no other choice. As with the disguising of mattermagnetic effects, other effects due to this dipole are similarly hidden by modern physical theory. Mass and matter charge are proportional to a large degree in large electrically neutral bodies, which allows matter charge to remain unrecognized while being lumped in with other forces.

If antimatter is the opposite charge of matter, Dark Energy is the repulsive force between bodies of matter, and matter and antimatter are attracted so that they annihilate. In both cases the universe appears to be acting in a way to reduce the local energy density, as one would expect. The matter-antimatter dipoles act in a manner identical to electric charge dipoles.

It is important to recognize that there are two basic types of charge dipoles. There are those that are electron-like and those that are proton-like. The electron-like dipoles, such as the electron-positron pair, have positive matter and negative electric charge opposite negative matter and positive electric charge. The proton-like dipoles have positive matter and electric charges opposite negative matter and electric charges. The primary example of a proton-like dipole is a proton-antiproton pair. Note that electron-like dipoles will neutralize each other's charge when side-by-side and proton-like dipoles similarly neutralize each other. On the other hand electron-like dipoles do not neutralize both charges of proton-like dipoles. If an electron-like dipole and proton-like dipole are adjacent, one type of charge will cancel and the other will be added. By having this combination of two types of dipoles it is possible to have static electric fields without having static matter fields, and *vice versa*.

8. The Matter Force

With a matter dipole in place and the linear forces analogous to electrostatic attraction and repulsion understood, it is now possible to complete a matter theory in a manner completely analogous to classical electricity and magnetism. The matter force can be described using Maxwell's Equations, with an appropriate change in units. The equations below express the basic four equations in simple integral form with capital M standing for the matter force, little m the matter charge, subscript $_m$ designates a matter field component, while ϵ_{m0} is the matter component of the permittivity of the vacuum and μ_{m0} is the matter component of the permeability of the vacuum. These equations can be expressed in differential form and in other integral forms that are standard practice with Maxwell's equations. Eq. (3) is the analog to Gauss's Law with respect to the matter force. Note that the matter form of Coulomb's Law is more practical for routine matter force computations.

$$\int \vec{\mathbf{M}} \bullet d\vec{\mathbf{l}} = \frac{m}{\epsilon_{m0}} \tag{3}$$

Eq. (4) is equivalent to Gauss's law of magnetism.

$$\int \vec{\mathbf{B}}_m \bullet d\vec{\mathbf{A}} = 0 \tag{4}$$

Eq. (5) is analogous to Faraday's law of Induction.

$$\oint \vec{\mathbf{M}} \bullet d\vec{\mathbf{l}} = -\frac{d\Phi_m}{dt} \tag{5}$$

The last of the standard four equations is a variation of Ampere's law,

$$\oint \vec{\mathbf{B}}_m \bullet d\vec{\mathbf{l}} = \mu_{m0}\left(I_m + \epsilon_{m0}\frac{d\Psi_m}{dt} \right) \tag{6}$$

Matter current is better described using momentum terms since the velocities are more variable than with electric currents, which can be approximated as the speed of light. Thus, the Biot-Savart Law for a point charge in Eq. (1) is more practical for routine use. The Lorentz Force Law is the similarly the most important equation for routine force computations.

We can then consider that the matter force and electromagnetic forces should be combined into a single electro-matter force since each particle pair dipole forms both a matter-antimatter dipole and a positive-negative electric charge dipole. The two forces can never truly be separated. The electro-matter force must be considered as a single force, so the mechanical forces are not a fifth force after all. We can combine the electromagnetic and mattermagnetic force equations into a single set of equations that are analogous to Maxwell's equations to form the electro-matter force equations.

9. Conclusion

It is clear that classical mechanics truly has suffered due to inattention and must be integrated into any unified force theory. A mattermagnetic theory is not only useful for explaining inertia and the magnetic-like motion of a gyroscope, it is useful for explaining a wide variety of previously unsatisfactorily explained phenomena including tidal forces, spiral galaxies, anomalous precession, and solar and planetary dynamos. A mattermagnetic force accounts for each of the proofs of General Relativity as well as the previously unknown force behind the accelerating expansion of the universe. The Matter Force ultimately behaves in a manner entirely constant with Maxwell's equations, and since the charge dipoles for both electric and matter charges always occur together in particle pairs, the electric and matter forces cannot truly be separated and must be combined in a single electro-matter Force.

References

[1] Newton I., *Philosophiæ Naturalis Principia Mathematica*, London, 1687

[2] Lodge O., *Electrons or The Nature and Properties of Negative Electricity*, George Bell and Sons, London, 1906. http://archive.org/details/electronsornatu03lodggoog

[3] Larmor J., "A dynamical theory of the electric and luminiferous ether," Phil. Trans., vol. 185A 1894 http://archive.org/details/philtrans01588323

[4] Maxwell J.C., "On Physical Lines of Force" Part I "The Theory of Molecular Vortices applied to Magnetic Phenomena," Philosophical Magazine XXI, 1861. pp 161-175. http://en.wikisource.org/wiki/On_Physical_Lines_of_Force

[5] Fleming R., *The Zero-Point Universe*, Published by Ray Fleming, Austin Texas 2012, pp 80-84.

[6] Peratt, A. L., "Simulating spiral galaxies," Sky and Telescope (ISSN 0037-6604), vol. **68**, Aug. 1984, p. 118-122.

[7] Anderson, J. D. et al, "Indication From Pioneer 10/11, Galileo, and Ulysses Data for an Anomalous, Weak Long-Range Acceleration," Phys Rev Letters **81**:2858-2861 (1998) http://arxiv.org/abs/gr-qc/9808081

[8] Danby. J. M. A., *Fundamentals of Celestial Mechanics* (Willmann-Bell, Richmond, VA) 1988 2nd Ed.

[9] Van Flandern T., "The Perihelion Advance Formula" Meta Research Bulletin 8:1-9 & 24-30, 1999. http://metareSearch.org/cosmology/gravity/PAFfolder/PerihelionAdvanceFormula-combined.asp

[10] Shapiro I. I., "Fourth Test of General Relativity". Physical Review Letters 13 (26): 789–791. Bibcode 1964PhRvL..13..789S. doi:10.1103/PhysRevLett.13.789, 1964.

[11] Shapiro I. I., et. al. "Fourth Test of General Relativity: Preliminary Results". Physical Review Letters 20 (22): 1265–1269. Bibcode 1968 PhRvL..20.1265S. doi:10.1103/PhysRevLett.20.1265.

[12] Shapiro I. I., et. al., "The Viking Relativity Experiment," Journal of Geophysical Physics, 82, 28, p. 4329-4334, 1977.

[13] Reasonberg R.D., Shapiro I.I., et. al., "Viking relativity experiment: verification of signal retardation due to solar gravity," The Astrophysical Journal, 234:L219-221, Dec 15, 1979.

[14] Riess, A.G., et al, "Observational Evidence from Supernovae for an Accelerating Universe and a Cosmological Constant," The Astronomical Journal, **116**:1009E1038, 1998 September.

[15] Heaviside, O. "A gravitational and electromagnetic analogy" The Electrician 31: 81–82 (1893) http://serg.fedosin.ru/Heavisid.htm

[16] Forward, R.L. "General Relativity for the Experimentalist," Proceedings of the IRE, 892-586, (1961).

[17] Thorne, K.S. "Gravitomagnetism, Jets in Quasars, and the Stanford Gyroscope experiments" from Near Zero, New Frontiers in Physics, ed. J.D. Fairbank et. al., W.H. Freeman & Co, New York, (1988). http://einstein.stanford.edu/content/sci_papers/papers/nz-Thorne_101.pdf

[18] Tajmar, M. et al, "Coupling of Electromagnetism and Gravitation in the Weak Field Approximation," Physica C **385**:551-554 (2003)

[19] Fleming R., "Proton and electron mass derived as the vacuum energy displaced by a Casimir cavity," (2012). http://vixra.org/pdf/1203.0033v1.pdf

Figures

[1]-[5] Fleming R., *The Zero-Point Universe*, Published by Ray Fleming, Austin Texas 2012