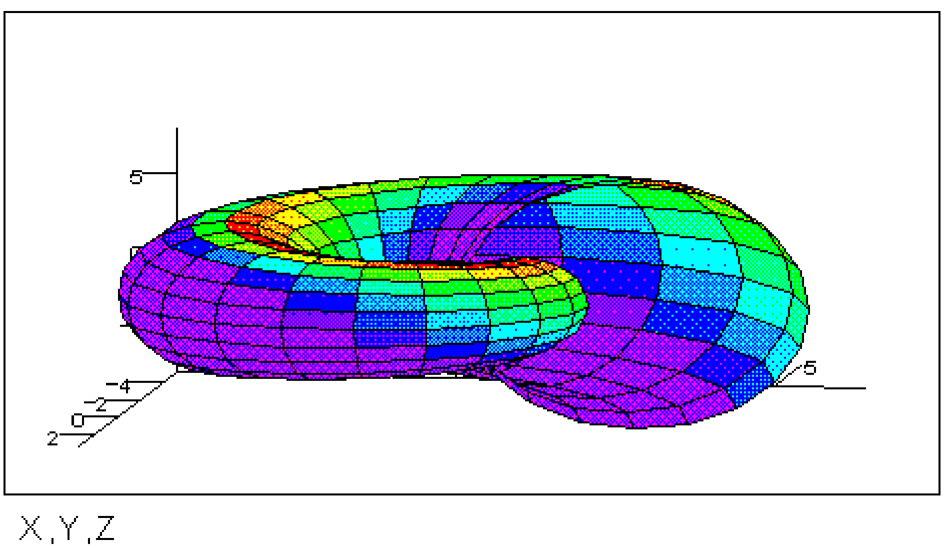
ELECTROGRAVITATION AND A NEW GRAVITATIONAL CONSTANT

BY

JERRY E. BAYLES

quark137@aol.com

Electrogravitational Research, Medford Oregon



The expanding and rotating space-time torus above represents the filling of space-time with negative field energy arising from slightly imperfect standing wave radiation which in the main is that energy that is so called rest mass of the basic particles. This negative field energy is equivalent to Einstein's Gamma (expansion) parameter in his General Theory of Relativity.

Abstract:

The similar forms of the classical equations for the electric, magnetic, and gravitational forces suggest that they may be related to each other by a common mechanism of action. These are presented below as equations (1) through (3), respectively.

1) $F=\frac{q_o^2}{4\cdot\pi\cdot\varepsilon_o\cdot r^2}$ 2) $F=\frac{\mu_o\cdot m_1\cdot m_2}{4\cdot\pi\cdot r^2}$ 3) $F=\frac{G\cdot M_1\cdot M_2}{r^2}$

The terms m_1 and m_2 are the magnetic pole strengths in a classical magnetic force equation. M_1 and M_2 are the macroscopic mass terms in the classical gravitational force equation and q_o is the fundamental charge unit.

The purpose of this paper will be to establish a causal quantum mechanism for the gravitational force that will unify not only the electric and magnetic forces but the weak and strong forces also. This will be accomplished through the reduction of the electron field energy to its smallest quantum value. This value will then be utilized in a cross-product vector potential method to arrive at a solution for why the gravitational force is always one of attraction. The electron is considered in this paper to be a fundamental particle that has a direct connection to all of the known forces.

Furthermore, this paper will consider the existence of five fundamental forces instead of the normally assumed four forces. The electromagnetic, strong, weak and gravitational forces will be expanded by considering that the electromagnetic force is composed of the electric and magnetic forces as individual action forces.

It is not the purpose of this paper to attempt to overthrow the concept of curved space as presented by Albert Einstein's General Theory Of Relativity but rather to propose that curved space is caused by the action of *electrogravitation.* Therefore, curved space is the result of gravitation and not the cause.

It is my contention that so-called particle 'mass' is standing wave field of energy and that it is supported from a refresh energy pulse from what I call energy space that is similar to Dirac's sea of energy. I also consider that the standing wave is comparable to a special form of the Poynting power vector wherein the volts/meter (E) and the weber/meter squared (B) are out of phase by 90 degrees *timewise* and thus the net velocity and real power is very close to zero, which is the normal situation for a standing wave of electrical energy.

Further, I propose that the mass-engendering standing wave field is not a perfect standing wave. That is why the refresh pulse from energy space must replace the lost energy of the particle, energy that implements the electrogravitational action. (Else, the particle would soon radiate itself away.) The electrogravitational energy may be generated by the fact that the electrostatic energy of a charge-particle can be present without an associated velocity while the magnetic field requires a charge to move through space. Any move will require a least span distance in a least span of time. (A quantum.) Therefore, the B field will be forced to lag the inception of the quantum E field by a least quantum span of time which may be represented as a small lagging phase of the B field behind the E field of a resulting not-so-perfect standing wave. Thus, it is a very small imperfection in what would otherwise be a perfect standing wave that causes enough energy to be available to support the electrogravitational energy field.

By enabling existing technology to simulate the particle mass field as described above, we may allow for the extraction of vast amounts of energy from energy space by causing the B field to be shifted more than it is in the quantum aspect. The uncertainty principle also forces the quantum phase shift of B away from E. This is by reason that current uncertainty arises from charge per unit time uncertainty.

For the numerical analysis that follows, I now state the constants required by the Mathcad engine.

The following constants are pertinent to this paper and are all in the S. I. system of units.

$m_e := 9.109389700\cdot10^{-31}\cdot kg$	Electron rest mass.
$q_o := 1.602177330\cdot10^{-19}\cdot coul$	Electron quantum charge.
$\mu_o := 1.256637061\cdot10^{-06}\cdot henry\cdot m^{-1}$	Magnetic permeability.
$\varepsilon_o := 8.854187817\cdot10^{-12}\cdot farad\cdot m^{-1}$	Dielectric permittivity.
$r_c := 3.861593255\cdot10^{-13}\cdot m$	Compton electron radius.
$l_q := 2.817940920\cdot10^{-15}\cdot m$	Classic electron radius.
$r_c := 3.861593223\cdot10^{-13}\cdot m$	Compton radius of the electron
$\alpha := 7.297353080\cdot10^{-03}$	Fine structure constant.
$G := 6.672590000\cdot10^{-11}\cdot newton\cdot m^2\cdot kg^{-2}$	Accepted gravitational constant.
$R_{n1} := 5.291772490\cdot10^{-11}\cdot m$	Bohr radius of Hydrogen.
$h := 6.626075500\cdot10^{-34}\cdot joule\cdot sec$	Plank constant.
$c := 2.997924580049930\cdot10^{08}\cdot m\cdot sec^{-1}$ Nominal = $\underline{2.997924580}$ $\underline{x10^{08}\ m/sec}$	Speed of light in vacuum. (+ extended adj.)

Mathcad has a default precision of 15 places and the very slight adjustment of the velocity of light above corrects a small error in the derivation of the electrogravitational energy. Note that this small adjustment (much less than the normally stated accuracy) makes no difference in equations 19 and 20 where the field energy at the Compton radius of the electron is derived from the total energy density by the area times time gate method and the result was shown to be the same as the potential energy in equation 6.

The above are the currently accepted values. The below constants are related directly to the theory of electrogravitation proposed by this author.

$V_{LM} := 8.542454612\cdot10^{-02}\cdot m\cdot sec^{-1}$	Least quantum velocity.
$f_{LM} := 1.003224805\cdot10^{1}\cdot Hz$	Least quantum frequency.
$L_Q := 2.5729832158\cdot10^{3}\cdot henry$	Least quantum inductance.
$C_Q := 3.861593281\cdot10^{-6}\cdot farad$	Least quantum capacitance.

$i_{LM} := q_o\cdot f_{LM}$ or, $i_{LM} = 1.60734404\cdot10^{-18}\cdot amp$

(= Least quantum amp.)

V_{LM} will be derived by subtracting the B field energy density from the E field energy density and then gating that energy density through a window of area times time related to the classical electron radius and the Compton proton time respectively.

Main Paper

Recent experiments that attempted to refine the value of the accepted value of the gravitational constant have revealed a fairly large discrepancy, not only between the new values, but the old value as well. A quote from the April 29, 1995 issue of Science News is, "Now, experiments by three independent groups have produced values for the strength of the gravitational force (G) that disagree significantly with the currently accepted number and with each other." (See Reference [1], p. 13.)

Further, from the May 18, 1996 issue of Science News, "The news that three respected research groups had independently produced values for the strength of the gravitational force (G) that disagreed significantly with the currently accepted number and with each other created a considerable stir last year." (See Reference [2], p. 13.)

Finally, a quote from the March 1996 issue of Discover Magazine, "Ever since Isaac Newton watched an apple fall to the ground, scientists have taken gravity for granted. Until, that is, they tried to measure its strength with high-tech precision. Their results were so incredibly far off as to be newsworthy." (See Reference [3], p. 13.)

The results quoted above can be accounted for by the quantum vector potential nature of electrogravitation as proposed in this paper. It can be shown that the rest mass of the electron may be expressed by the charge couplet in equation (4) below.

$$m_{electron} := \frac{\mu_o \cdot q_o \cdot q_o}{4 \cdot \pi \cdot l_q} \qquad \text{or,} \qquad m_{electron} = 9.10938969 \cdot 10^{-31} \cdot kg \qquad 4)$$

This value is nearly exact compared to the accepted rest mass of the electron, where:

$$m_e = 9.1093897 \cdot 10^{-31} \cdot kg$$

It is suggested that the geometry of the electron is made up of standing wave field energy caused by the uncertainty in the position of that electron (and its charge) which forms a right-handed triad in its quantum-jump actions.

We begin by calculating the Compton radius real space electric field energy and volts/m potentials in equations 5 & 6 below:

$$r_c := \frac{h}{2 \cdot \pi \cdot m_e \cdot c} \qquad \text{or,} \qquad r_c = 3.86159325 \cdot 10^{-13} \cdot m \qquad 5$$

$$E_{pot} := \frac{q_o^2}{4 \cdot \pi \cdot \varepsilon_o \cdot r_c} \qquad \text{or,} \qquad E_{pot} = 5.97442404 \cdot 10^{-16} \cdot joule \qquad 6$$

where the energy space volts/m and field energy density is given by the equations 7 and 8 below as:

$$E_{fld} := \frac{q_o}{4 \cdot \pi \cdot \varepsilon_o \cdot r_c^2} \qquad \text{or,} \qquad E_{fld} = 9.65648197 \cdot 10^{15} \cdot \frac{volt}{m} \qquad 7$$

and,

$$E_d := \frac{1}{2} \cdot \varepsilon_o \cdot E_{fld}^2 \qquad \text{or,} \qquad E_d := \frac{q_o^2}{32 \cdot \pi^2 \cdot \varepsilon_o \cdot r_c^4} \qquad 8$$

Therefore, the Compton radius electron electric field energy space energy density is:

$$E_d = 4.12816077 \cdot 10^{20} \cdot \frac{\text{joule}}{\text{m}^3}$$

Dividing the energy space energy density by the potential energy expresses the common volume as:

$$\frac{\dfrac{q_o^2}{32 \cdot \pi^2 \cdot \varepsilon_o \cdot r_c^4}}{\left(\dfrac{q_o^2}{4 \cdot \pi \cdot \varepsilon_o \cdot r_c}\right)} \quad \text{yields} \quad \frac{1}{\left[8 \cdot \left(\pi \cdot r_c^3\right)\right]}$$ which is a cylinder eight times as long as the radius. 9

Related calculations involving the energy space Poynting power at the Compton radius of the electron are:

$B_{fld} := \dfrac{E_{fld}}{c}$ or, $B_{fld} = 3.22105567 \cdot 10^{7} \cdot \dfrac{\text{weber}}{\text{m}^2}$ Magnetic field strength. 10

$S_{EB} := \dfrac{E_{fld} \cdot B_{fld}}{2 \cdot \mu_o}$ or, $S_{EB} = 1.23759146 \cdot 10^{29} \cdot \dfrac{\text{watt}}{\text{m}^2}$ Poynting power of the product of the magnetic and electric field. 11

The energy space energy density of the electron magnetic field at the Compton radius of the electron is:

$B_d := \dfrac{B_{fld}^2}{2 \cdot \mu_o}$ or, $B_d = 4.12816077 \cdot 10^{20} \cdot \dfrac{\text{joule}}{\text{m}^3}$ Magnetic field energy density. (Same as electric field energy density.) 12

Also, multiplying either the magnetic or electric energy space energy density by the velocity of light in free space will also yield the energy space Poynting power in watts /m^2 as below.

$S_{Bpoynt} := B_d \cdot c$ $\quad S_{Bpoynt} = 1.23759146 \cdot 10^{29} \cdot \dfrac{\text{watt}}{\text{m}^2}$ 13

$S_{Epoynt} := E_d \cdot c$ $\quad S_{Epoynt} = 1.23759146 \cdot 10^{29} \cdot \dfrac{\text{watt}}{\text{m}^2}$ 14

The above is the calculation involving the geometry of a cylinder. (Or the field geometry at a large distance.)

However, the volume of a torus at or near the Compton radius is presented as the correct geometry in chapter one of my book so we adjust the volume as follows:

Volume of a torus of equal perpendicular radii is: $\quad Vol_{torus} = 2 \cdot \pi^2 \cdot r_c^3$ 15

Then finding the ratio of the torus volume to the cylinder volume:

$$\frac{2\cdot\pi^2\cdot r_c^{\,3}}{8\cdot\left(\pi\cdot r_c^{\,3}\right)} \quad \text{simplifies to} \quad \frac{1}{4}\cdot\pi \quad \text{Multiply this result by} \quad 32\cdot\pi^2\cdot\varepsilon_o\cdot r_c^{\,4} \qquad \underline{16}$$

to find the correct volume expression for the Smax as:

(Torus area x two circle areas)

$$\frac{1}{4}\cdot\pi\cdot\left(32\cdot\pi^2\cdot\varepsilon_o\cdot r_c^{\,4}\right) \quad \text{simplifies to} \quad 8\cdot\pi^3\cdot\varepsilon_o\cdot r_c^{\,4} = \left(4\cdot\pi^2\cdot r_c^{\,2}\right)\cdot 2\cdot\left(\pi\cdot r_c^{\,2}\right) \qquad \underline{17}$$

See end note p. 14.

Using the geometry of a torus, the electric field related Compton electron Poynting power is:

$$S_{max} := \frac{q_o^{\,2}\cdot c}{8\cdot\pi^3\cdot\varepsilon_o\cdot r_c^{\,4}} \quad \text{or,} \quad S_{max} = 1.57575039\cdot 10^{29}\cdot\frac{watt}{m^2} = \frac{4}{\pi}\cdot S_{EB} = 1.57575039\cdot 10^{29}\cdot\frac{watt}{m^2} \qquad \underline{18}$$

[Equation 18 above is from my Eq. 14, p. 8, chap. 1 of "Electrogravitation As A Unified Field Theory" by Jerry E. Bayles.]

Note: $$t_e := \left(\frac{h}{m_e\cdot c^2}\right) \quad \text{or,} \quad t_e = 8.093301\cdot 10^{-21}\cdot sec \quad = \text{Compton electron time.} \qquad \underline{19}$$

Finally, $$E_{rc} := S_{max}\cdot\pi\cdot r_c^{\,2}\cdot t_e \quad \text{or,} \quad E_{rc} = 5.97442404\cdot 10^{-16}\cdot joule$$

Energy is gated in from energy space by area x time 'window'.

Note previously, $$E_{pot} = 5.97442404\cdot 10^{-16}\cdot joule \qquad \underline{20}$$

See eq. 15, p. 9, chap. 1 of the aforementioned book for the original equation statement.

Again, I propose that the electrogravitational energy is derived from the energy density that arises from the electric and magnetic energy densities not being exactly equal. If we subtract the energy space magnetic energy density above from the energy space electric energy density, we arrive at an energy density difference that is very close to the previous values stated in my book mentioned above.

Differential between Ed and Bd arrives at value very close to f_{LM}.

$$\Delta EB_{diff} := E_d - B_d \quad \text{or,} \quad \Delta EB_{diff} = -1.58376788\cdot 10^{11}\cdot\frac{joule}{m^3} \qquad \underline{21}$$

Next, the proton mass is stated as below to allow for the calculation of the Compton proton time.

$m_p := 1.672623100\cdot 10^{-27}\cdot kg$ = Proton mass where: $t_p := \left(\frac{h}{m_p\cdot c^2}\right)$ or, t_p = proton Compton time.

$$\Delta E_{EBdiff} := \frac{4}{\pi}\cdot\Delta EB_{diff}\cdot c\cdot\left(\pi\cdot l_q^{\,2}\right)\cdot\left(t_p\right) \quad \text{or,} \quad \Delta E_{EBdiff} = -6.64741628\cdot 10^{-33}\cdot joule \qquad \underline{22}$$

Note: Geometry of torus is arrived at by multiplying by $4/\pi$. $\underline{23}$

Then: $$\frac{\Delta E_{EBdiff}}{h} = -10.03220726\cdot Hz$$

which is the electrogravitational frequency.

This also may be described as a minimum range of frequency uncertainty and not as a radiated frequency in the sense of a photon of radiation energy. It is a mass-energy loss related frequency. Its loss may be replenished by the refresh pulse from energy space.

Note: = -10.90324704 Hz (without fine adjustment of the velocity of light in the constants table above.)

Solving for the least quantum electrogravitational velocity: Where the assumed standard is:

$$V'_{LM} := \sqrt{\frac{\Delta E_{EBdiff}}{m_e}} \quad \text{or,} \quad V'_{LM} = 0.08542437i \cdot m \cdot sec^{-1} \qquad V_{LM} = 0.08542455 \cdot m \cdot sec^{-1} \qquad \underline{24}$$

$$V'_{LM}{}^{2} = -7.29732342 \cdot 10^{-3} \cdot m^2 \cdot sec^{-2} \qquad \text{and,} \qquad V_{LM}{}^{2} = 7.29735308 \cdot 10^{-3} \cdot m^2 \cdot sec^{-2}$$

The next step will define the least quantum magnetic interaction energy. This is presented by equation (25) below.

$$E_{mag} := m_e \cdot V'_{LM}{}^{2} \qquad \text{or,} \qquad E_{mag} = -6.64741628 \cdot 10^{-33} \cdot joule \qquad \underline{25}$$

It is now possible to present the electrogravitational least quantum energy equation below in equation (26) utilizing the result from equation (25) above.

System 1 System 2

$$E_G := \left(E_{mag}\right) \cdot \mu_o \cdot \left(E_{mag}\right) \qquad \underline{26}$$

Where; $E_G = 5.55284583 \cdot 10^{-71} \cdot \frac{henry}{m} \cdot joule^2$

Quantum entangled system interaction at a distance is implied by equation (26) above.

The electrogravitational energy quantum above in equation (26) may be related to force. This is done in equation (27) below where the force between two electrons at the Bohr radius is found.

$$F_{Gnew} := \frac{E_G}{R_{n1}{}^{2}} \qquad \text{or,} \qquad F_{Gnew} = 1.98295696 \cdot 10^{-50} \cdot \left(\frac{henry}{m}\right) \cdot newton^2 \qquad \underline{27}$$

Compare this in magnitude and units to the classical value of gravitation obtained with equation (28) below.

$$F_G := \frac{G \cdot m_e \cdot m_e}{R_{n1}{}^{2}} \qquad \text{or,} \qquad F_G = 1.97729139 \cdot 10^{-50} \cdot newton \qquad \underline{28}$$

The magnitudes are close but it is obvious that the units are not the same. It is suggested by this discrepancy that an important discovery may be found concerning the units not being identical since the magnitudes are so very close.

Equation (25) previous may also be employed to find the least quantum frequency. This is presented by equation (29) below. (Employed as a check on the units.)

$$f_{LM} := \frac{E_{mag}}{h} \qquad \text{or,} \qquad f_{LM} = -10.03220726 \cdot \mathrm{Hz} \qquad \underline{29}$$

It may be further pointed out that several electrogravitational force equations can be presented that will all yield the same answers. This indicates that the gravitational force-field theory presented herein spans a great many of the forms of energy and force branches on the tree of physics. Three of those equations are presented below in equations (31), (32), and (33).

First, let the least quantum electrogravitational current be stated as:

$$\text{Let:} \quad i_{LM} := \left(\frac{h}{m_e \cdot V'_{LM}{}^2}\right)^{-1} \cdot q_o \qquad \text{or,} \qquad i_{LM} = -1.6073375 \cdot 10^{-18} \cdot \mathrm{amp} \qquad \underline{30}$$

Then:

$$F1_{Gnew} := \left(\frac{h \cdot f_{LM}}{R_{n1}}\right) \cdot \mu_o \cdot \left(\frac{h \cdot f_{LM}}{R_{n1}}\right) \qquad \underline{31}$$

$$\text{or,} \qquad F1_{Gnew} = 1.98295696 \cdot 10^{-50} \cdot \frac{\mathrm{henry}}{\mathrm{m}} \cdot \mathrm{newton}^2$$

$$F2_{Gnew} := \left(\frac{L_Q \cdot i_{LM}{}^2}{R_{n1}}\right) \cdot \mu_o \cdot \left(\frac{L_Q \cdot i_{LM}{}^2}{R_{n1}}\right) \qquad \underline{32}$$

$$\text{or,} \qquad F2_{Gnew} = 1.98294083 \cdot 10^{-50} \cdot \left(\frac{\mathrm{henry}}{\mathrm{m}}\right) \cdot \mathrm{newton}^2$$

$$F3_{Gnew} := \frac{m_e \cdot V'_{LM}{}^2}{R_{n1}} \cdot \mu_o \cdot \frac{m_e \cdot V'_{LM}{}^2}{R_{n1}} \qquad \underline{33}$$

$$\text{or,} \qquad F3_{Gnew} = 1.98295696 \cdot 10^{-50} \cdot \left(\frac{\mathrm{henry}}{\mathrm{m}}\right) \cdot \mathrm{newton}^2$$

It is easily seen that all three answers in equations (31), (32), and (33) are essentially equal in magnitude and units.

It can also be shown that the famous Biot-Savart law that relates the magnetic field generated by a current can be incorporated into an electrogravitational expression also. This is presented by equation (34) below.

First let us define the electrogravitational domain wavelength as:

$$\lambda_{LM} := \frac{V'_{LM}}{f_{LM}} \qquad \text{or,} \qquad \lambda_{LM} = -8.51501272 \cdot 10^{-3}\, i \cdot \mathrm{m} \qquad \underline{34}$$

Also let the following angles be defined:

Let: $\theta := \frac{\pi}{2}$ and $\phi := \frac{\pi}{2}$

Then the Biot-Savart equation for the electrogravitational force between two electrons separated by the Bohr radius is given below in equations 35, 36 and 37.

$$F_{sys1} := \left(q_o \cdot V'_{LM} \cdot \sin(\phi)\right) \cdot \left(\frac{\mu_o \cdot i_{LM} \cdot \lambda_{LM} \cdot \sin(\theta)}{4 \cdot \pi \cdot l_q \cdot R_{n1}}\right) \quad \underline{35}$$

$$F_{sys2} := \left(q_o \cdot V'_{LM} \cdot \sin(\phi)\right) \cdot \left(\frac{\mu_o \cdot i_{LM} \cdot \lambda_{LM} \cdot \sin(\theta)}{4 \cdot \pi \cdot l_q \cdot R_{n1}}\right) \quad \underline{36}$$

Then finally;

$$F4_{Gnew} := F_{sys1} \cdot \mu_o \cdot F_{sys2} \quad \text{or,} \quad F4_{Gnew} = 1.98295695 \cdot 10^{-50} \cdot \frac{\text{henry}}{\text{m}} \cdot \text{newton}^2 \quad \underline{37}$$

The portion of the equations for the individual system forces that is the Biot-Savart least quantum expression at the Bohr radius is given below in equation (38).

$$B_{LM} := \left(\frac{\mu_o \cdot i_{LM} \cdot \lambda_{LM} \cdot \sin(\theta)}{4 \cdot \pi \cdot l_q \cdot R_{n1}}\right) \quad \text{or,} \quad B_{LM} = 9.17823835 \cdot 10^{-3}\, i \cdot \text{tesla} \quad \underline{38}$$

Both of the equations in equation (20a,b) are of the standard form, F = qV X **B**.

Now we have enough of what may be called a preponderance of evidence that will support the case for assigning new units to the classic value of G. This new value is stated below in equation (39).

$$G_{new} := \mu_o \cdot V'_{LM}{}^4 \quad \text{or,} \quad G_{new} = 6.6917091 \cdot 10^{-11} - 1.6389419 \cdot 10^{-26}\, i \cdot \text{henry} \cdot \left(\frac{\text{m}^3}{\text{sec}^4}\right) \quad \underline{39}$$

The ratio of this new proposed value of Gnew to G is:

$$\frac{G_{new}}{G} = 1.00286532 - 2.45623048 \cdot 10^{-16}\, i \cdot \frac{\text{henry}}{\text{m}} \cdot \text{newton} \quad \underline{40}$$

The new value of G may be inserted into the classical formula for the gravitational force and if we allow the expression for mass in equation (4) previous, then the result is an electrogravitational expression. This is presented in equation (41) below.

$$F5_{Gnew} := \frac{\left(G_{new}\right) \cdot \left(\frac{\mu_o \cdot q_o{}^2}{4 \cdot \pi \cdot l_q}\right) \cdot \left(\frac{\mu_o \cdot q_o{}^2}{4 \cdot \pi \cdot l_q}\right)}{R_{n1}{}^2} \quad \underline{41}$$

or, $F5_{Gnew} = 1.98295695 \cdot 10^{-50} - 4.85668337 \cdot 10^{-66} i \quad \cdot \frac{henry}{m} \cdot newton^2$

The above equation is now in the same general form as the classic gravitational expression. What is different are the extra henry/m and newton units. These 'extra' units are hidden units since the henry/m unit is a constant and the newton squared portion is actually inversely proportional to distance where one quantum newton force is also a constant. Thus on a macroscopic scale the simpler form of the classic gravitational force expression is assumed to be a correct form.

The following quote is from the book, Feynman Lectures on Gravitation, where Feynman's thoughts on the subject of the gravitational constant were condensed by the editor of the book, Brian Hatfield. He summed Feynman's conclusions as; "Of course, he expected that there might be difficulties in defining a consistent quantum theory (for example, the dimension of the gravitational constant is an obstacle to renormalization)." (See Reference [4], p. 13.)

It is suggested by this author that the problem of renormalization may be more easily solved by using the new value as defined in equation (41) previous.

The macroscopic electrogravitational case of the force of gravity between two massive objects may be obtained by increasing the magnitude of each force system by the ratio of each system mass to the rest mass of one electron. This is demonstrated using the energy value from equation (25) in equation (42) below.

First let the mass of the Earth and a mass on the surface of the Earth be defined as:

$M_{Earth} := 5.98 \cdot 10^{24} \cdot kg$ $\quad M_{test} := 1 \cdot kg$ $\quad R_{Earth} := 6.37 \cdot 10^6 \cdot m$

Then the ratios are: $R_1 := \frac{M_{Earth}}{m_e}$ $\quad R_2 := \frac{M_{test}}{m_e}$

Finally;

25) $$F6_{Gnew} := \frac{R_1 \cdot E_{mag}}{R_{Earth}} \cdot \mu_o \cdot \frac{R_2 \cdot E_{mag}}{R_{Earth}}$$ 42

or, $F6_{Gnew} = 9.86187225 \cdot \frac{henry}{m} \cdot newton^2$

Compare this with the classical gravitational expression in equation (26) below.

26) $$F'_G := \frac{G \cdot M_{Earth} \cdot M_{test}}{R_{Earth}^2}$$ or, $F'_G = 9.83369558 \cdot newton$ 43

I suggest that the errors discovered in the recent attempts to measure the gravitational constant may be due to at least two effects. The first cause of error may be due to the metal and electronics that are part of the experimental hardware interacting with the quantum vector potentials generated in the Earth's molten core and stray ground currents associated with other actions near the Earth's surface. The second cause of error is that related to the movement of mass in the locale of the test apparatus. It seems logical that if electrogravitation can cause a mass to accelerate, then accelerating a mass should create electrogravitation. (More specifically, a wave of gravitation.) This could be a stronger influence than that accounted for by ordinary gravitational influences since the electrogravitational wave would have a strength related to the rate of acceleration of the mass as well as the magnitude of the mass. It is also suggested by this author that sensitive quantum interference detectors feeding an amplifier tuned to f_{LM} might detect nearby mass accelerations.

One of the strongest arguments against an electromagnetic connection to the gravitational field was that an electromagnetic field can be shielded against while the gravitational field cannot. Further, the electromagnetic field has a bipolar aspect consisting of a negative and positive sense in the field and is a closed field such that all magnetic lines form a closed loop. The gravitational field apparently has no counterpart aspect of repulsion as does the magnetic or electric fields. The magnetic vector potential, (MVP), **can** however act through the best of shielding and when combined with the concept of the vector cross-product of two quantum uncertain currents acting 90 degrees to each other, the quantum electrogravitational action is generated that we take to be what is currently called gravity. Even though the action is unidirectional and always outwards from the origin, the reaction is a mirror image and is the conjugate of the action vector in every way. Thus, the total interaction that occurs partly in normal space is closed through the classic quantum radius points through imaginary energy space while to an outside observer in normal space it would appear that a monopole action had just occurred.

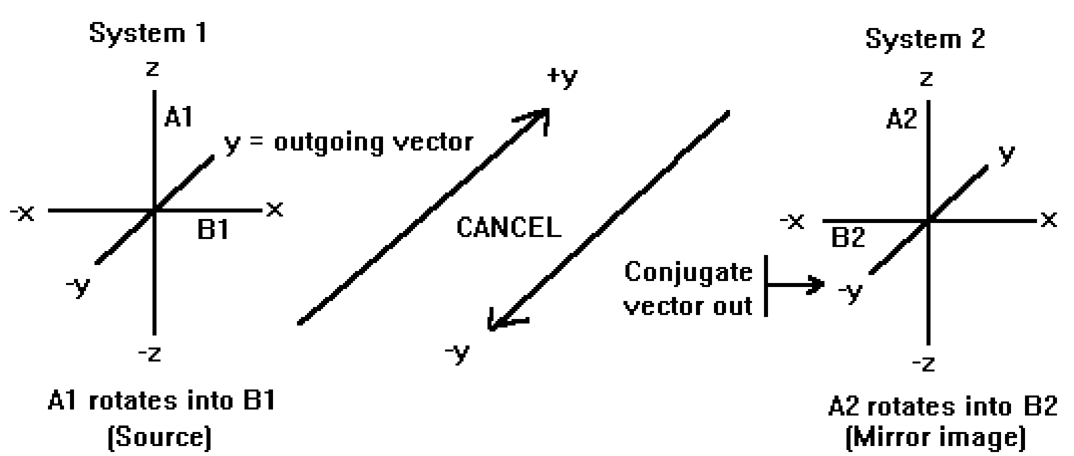
The Aharonov-Bohm effect has been demonstrated by actual experiment to prove that there exists quantum electromagnetic action through normally effective shielding.

The following is quoted from the April 1989 issue of Scientific American, (pages 56 to 62), "When the theories of relativity and quantum mechanics were introduced, the potentials, not the electric and magnetic fields, appeared in the equations of quantum mechanics, and the equations of relativity simplified into a compact mathematical form if the fields were expressed in terms of potentials." (See Reference [5], p. 13.). Also, "The consequence of the Aharonov-Bohm effect is that the potentials, not the fields, act directly on charges." (Reference [5], p. 13.)

The combination of the cross-product and the vector potential will serve to describe the electrogravitational action that will be presented next.

First, let the following drawing be offered to possibly help clarify the cross-product approach involving vector potentials that will soon be presented. This is labeled as figure #1 below.

Figure #1



Note: The main obstical to understanding the true mechanics of the gravitational action may be connected to the fact that all quantum forces are assumed to be mediated by an electromagnetic wave that has no energy but does convey momentum. This is likely the result of trying to stay with photons as the mediator of all forces, hence the so called electromagnetic force. However, if we allow for part of the field action to be instantaneous, through the particles center of most probable location, to all such similar particles, we effectivly remove the photon requirement for force action. It is the reaction that is seen to travel at the velocity of light in the intervening normal space distance.

System 1, rotation is Z into X

44) $A1 := \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ $\quad B1 := \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$

Vector cross-product of system 1 is:

46) $Sys1 := A1 \times B1$

$$Sys1 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$$

System 2, rotation is Z into -X

45) $A2 := \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ $\quad B2 := \begin{pmatrix} -1 \\ 0 \\ 0 \end{pmatrix}$

Vector cross-product of system 2 is;

47) $Sys2 := A2 \times B2$

$$Sys2 = \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix}$$

The total product of system 1 and 2 will yield the sign of the unit-scale electrogravitational action as:

48) $F_{g1} := Sys1 \cdot Sys2$ or, $F_{g1} = -1$

The above cross-product approach defines the action as a force of attraction by standard convention. The total interaction is independent of a preferred choice of axis or system since the reaction is always the conjugate of the action system. The result is always attraction between any interacting triad systems.

Another argument that is used as a reason for why the gravitational force cannot be attributed to any electrical force is that the mass of the proton is larger than the mass of the electron by a magnitude of 1836.152756 times that of the electron mass, while the charges are identical in magnitude. Therefore, if some kind of conversion constant is attempted utilizing only the charge values, the unequal mass values will introduce a very large error when the gravitational force is calculated using the classic gravitational equation.

It can be shown that not only can the above argument be rebuffed concerning the mass inequality versus charge equality but the relativistic aspect of mass may also be addressed as well.

First let the following constants be defined:

$m_p := 1.672623100 \cdot 10^{-27} \cdot kg$ = proton rest mass.

Then the least quantum radius associated with this mass is:

$$l_{qp} := \frac{h \cdot \alpha}{2 \cdot \pi \cdot m_p \cdot c} \quad \text{or,} \quad l_{qp} = 1.53469853 \cdot 10^{-18} \cdot m \qquad \underline{49}$$

It is now pointed out that the relativistic aspect of mass may be stated below in equation (33).

$$m'_p = \frac{m_p}{\sqrt{1 - \frac{v^2}{c^2}}} \qquad \underline{50}$$

(This will directly affect l_{qp} above.)

The point of deriving the classical particle radius as a function of its relativistic mass is to indicate that the concepts presented by this author do not intend to divorce the theory as presented from the special or general laws of relativity but rather include Einstein's theory when relativistic velocities and large gravitational potential gradients are present.

The next equations will further examine the electron-proton interaction in detail.

Let us establish the magnetic vectors for a proton-electron electrogravitational action at the r_{n1} radius of the Bohr atom of Hydrogen. First system 1 is established as:

51 $$\iota cp1_a := \frac{q_o \cdot V'_{LM}}{l_{qp}} \cdot \sin(\theta) \qquad \text{and,} \qquad \iota cp1_b := \frac{q_o \cdot V'_{LM}}{R_{n1}} \cdot \sin(\phi)$$ 52

where;

$\iota cp1_a = 8.91803765 \cdot 10^{-3}\, i \cdot amp$ and, $\iota cp1_b = 2.58637334 \cdot 10^{-10}\, i \cdot amp$

Then the magnetic vectors associated with the above current potentials are;

53 $$Acp1 := \begin{pmatrix} 0 \\ 0 \\ \iota cp1_a \end{pmatrix} \cdot amp \qquad Bcp1 := \begin{pmatrix} \iota cp1_b \\ 0 \\ 0 \end{pmatrix}$$ Rotation is: Z into X. 54

Then inserting the correct dimensional constants into the cross-product of the current potentials above;

$$Sys1_{cp} := \frac{\mu_o}{4 \cdot \pi} \cdot (Acp1 \times Bcp1)$$ This is the proton triad system outgoing vector potential. 55

or, $$Sys1_{cp} = \begin{pmatrix} 0 \\ -2.30653748 \cdot 10^{-19} \\ 0 \end{pmatrix} \cdot newton$$

The electron triad vector potential system is now calculated beginning with the statement for the A & B vectors which shall be labeled as Sys2.

56 $$\iota cp2_a := \frac{q_o \cdot V'_{LM}}{l_q} \cdot \sin(\theta) \qquad \text{and,} \qquad \iota cp2_b := \frac{q_o \cdot V'_{LM}}{R_{n1}} \cdot \sin(\phi)$$ 57

where;

$\iota cp2_a = 4.85691492 \cdot 10^{-6}\, i \cdot amp$ and $\iota cp2_b = 2.58637334 \cdot 10^{-10}\, i \cdot amp$

Then the magnetic vectors associated with the above current potentials are:

58 $$Acp2 := \begin{pmatrix} \iota cp2_a \\ 0 \\ 0 \end{pmatrix}$$ 59 $$Bcp2 := \begin{pmatrix} 0 \\ 0 \\ \iota cp2_b \end{pmatrix} \cdot amp$$ Rotation is: X into Z.

Then again inserting the correct dimensional constants for the electron triad cross- product of the current potentials in equation (59);

$$Sys2_{cp} := \frac{\mu_o}{4\cdot\pi}\cdot(Acp2 \times Bcp2)$$ This is the electron triad system outgoing vector potential. 60

or,

$$Sys2_{cp} = \begin{pmatrix} 0 \\ 1.25617953\cdot10^{-22} \\ 0 \end{pmatrix}\cdot newton$$

Then the total electrogravitational interaction force between a proton and an electron at the r_{n1} orbital of the element Hydrogen is;

$$F_{gep} := Sys1_{cp}\cdot\mu_o\cdot Sys2_{cp}$$ or, $$F_{gep} = -3.64101184\cdot10^{-47}\cdot newton^2\cdot\left(\frac{henry}{m}\right)$$ 61

Let us now calculate the classic gravitational force for the same parameters involving a proton and electron mass separated by the Bohr radius:

$$F_G := \frac{G\cdot m_p\cdot m_e}{R_{n1}^{\;2}}$$ or, $$F_G = 3.63060903\cdot10^{-47}\cdot newton$$ 62

It is to be noted that charge polarity is not a factor since a (+) charge going in a given direction has the B field given as conforming to the right-hand rule and thus the force vector potential is in the same direction as a (-) charge going in the same direction as the (+) charge but has the B field going in a direction opposite to the right-hand rule. Thus the charge polarity is arbitrary and only the fact that vector potential forces are based on the right-hand triad system as previously presented need be considered in their calculation.

The above counters one of the common arguments against electromagnetic forces being applicable to the gravitational action due to the fact that the electron-proton force is different than the electron-electron force at the same considered distance.

The weak and strong forces may are shown below in equations (63) and (64). They follow the same general form as the electrogravitational equation.

$$F_w = \frac{q_o^{\;2}}{4\cdot\pi\cdot\varepsilon_o\cdot R_x^{\;2}}\cdot\left(\frac{\pi}{\varepsilon_o}\right)\cdot\left(\frac{\mu_o\cdot q_o^{\;2}\cdot V'_{LM}{}^2}{4\cdot\pi\cdot r_c\cdot R_x}\right)$$ = weak force equation. 63

$$F_s = \frac{q_o^2}{4 \cdot \pi \cdot \varepsilon_o \cdot R_x^2} \cdot \left(\frac{2 \cdot \pi \cdot R_{n1}}{\varepsilon_o \cdot R_x} \right) \cdot \left(\frac{\mu_o \cdot q_o^2 \cdot V'_{LM}}{4 \cdot \pi \cdot r_c \cdot R_x} \right)^2$$ = strong force equation. 64

If the proper nuclear Rx (Compton radius) values are plugged into equations (63) and (64) above the resulting forces will be close to the presently accepted values. They also may be calculated using the cross-product vector potential approach as outlined in this paper in previous equations.

In concluding this paper this author would like to say that while the classical gravitational equation was the first equation to be formalized concerning force at a distance, it has stubbornly refused to be improved upon with the possible exception of Einstein's General Theory of Relativity. Unfortunately, His theory has not explained the mechanics completely or we would have solved the anti-gravity puzzle. This paper is a new approach utilizing the very basic accepted classical equations as a starting point to put the gravitational action in a logical engineering format and at the same time in terms of the more recent formulas of quantum physics. -- Jerry E. Bayles

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References

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1. Ivars Peterson, "Gravity's force: Chasing an elusive constant," *Science News*, 29 April 1995: 263.

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3. Hans Christian von Baeyer, "Big G," *Discover*, March 1996: 96.

4. Richard P. Feynman, Fernando B. Moringo, and William G. Wagner, *Feynman Lectures on Gravitation* (Menlo Park, Calif.: Addison-Wesley Publishing Company, June 1995), xxxi.

5. Yoseph Imry and Richard A. Webb, "Quantum Interference and the Aharonov-Bohm Effect," *Scientific American*, April 1989: 56.

END NOTE Concerning the torus adjustment in Eq. 16 and 17 above:

A quick check of the adjusted energy density in equations 16 and 17 divided by the energy potential will yeild the expression for the volume of a torus. This is easily done using the Mathcad symbolic equation solver in the symplify mode.

$$\frac{\text{Pot. Energy}}{\text{Energy density}} = \frac{\dfrac{q_o^2}{4\cdot\pi\cdot\varepsilon_o\cdot r_c}}{\left(\dfrac{q_o^2}{8\cdot\pi^3\cdot\varepsilon_o\cdot r_c^4}\right)} \qquad \text{symplifys to:} \qquad 2\cdot\pi^2\cdot r_c^3 = \left(2\cdot\pi\cdot r_c\right)\cdot\left(\pi\cdot r^2\right) \quad \text{which is torus volume.}$$

Restating the above as a formal expression in terms of the energy density E_d:

$$\frac{q_o^2}{8\cdot\pi^3\cdot\varepsilon_o\cdot r_c^4} = E_d = \frac{\dfrac{q_o^2}{4\cdot\pi\cdot\varepsilon_o\cdot r_c}}{2\cdot\pi^2\cdot r_c^3}$$

The above follows the general form of energy / volume = energy density.