The Common Cause of Magnetism and Gravity

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The common cause is electrostatic dipoles inside electrons and inside atomic nuclei. The angular momentum of the Earth, of other planets and satellites, the sun and the stars produce transverse electric dipoles. For example, in the Earth there are similarly oriented electric dipoles along radial lines and along longitudinal lines. The attraction of the radial dipoles to each other produce the gravitational force as measured by a weight scale or spring and which if measured by a magnetic needle or magnetometer is a magnetic force. The unequal distribution of iron, cobalt and nickel beneath the Earth's surface accounts for the difference in the two measurements.

Years of evidence for charge polarization inside electrons and atomic nuclei, from high energy collision data, permit the hypothesis that electrostatic dipoles inside atomic nuclei can account for the magnetism of current carrying wires.

More direct evidence that the magnetic force is due to electrostatic dipoles is the detection of a repulsion between a current carrying wire and a charged foil opposite to the statically induced attraction when the current is in a specific direction parallel to the surface of the charged foil.

The following mathematical identity shows clearly that the magnetic attraction of parallel current carrying wire segments, $ds.ds'$ of cross section area, A, r meters apart, is attributable to the attraction of $nAds$ electric dipoles, erv/c inside the free electrons with drift velocity, v, and inside lattice nuclei:

$10^{-7} ii'dsds'/r^2 = 9(10^9)(neArv/c)(neArv'/c)/r^4$ where $rv/c = R\varepsilon/(1-\varepsilon)$

Here are answers to possible objections:

OBJECTION 1 A metal is transparent to a magnetic field but not to an electrostatic field :

If we interpose a piece of insulated metal between two such parallel wires, the dipoles in the current carrying wires will pull the dipoles inside the free electrons and inside the lattice nuclei in the current carrying wires in the same direction with an inverse square force for small wire segments which is stronger than the inverse cubed force on the free electrons. (The force between parallel wires is an inverse distance force when we integrate over the inverse square force for the infinitesimal wire segments.) Thus, as observation requires, the interposed metal is effectively transparent to the electric dipole representation of the magnetic force between the current carrying wires

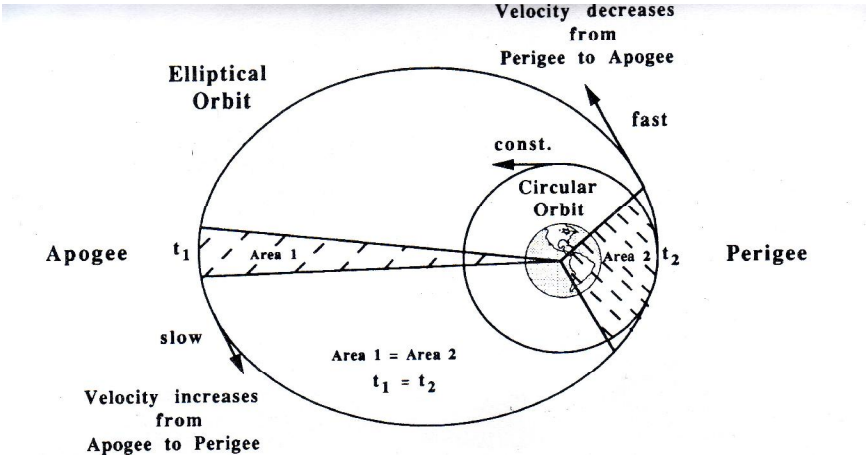
OBJECTION 2:

The force between electrostatic dipoles decreases as an inverse fourth power of

distance, but the force between currents decreases as the inverse of the distance.

The answer is that the electrostatic dipoles increase in proportion to the distance between them as indicated in the mathematical identity. For example, attractively oriented collinear electrostatic dipoles transverse to a pair of attractive parallel current carrying segments interfere with each other less as they are drawn further apart. Similarly for collinear dipoles oriented, with like poles facing each other, to repel each other.

To fully understand this, we must consider how electrostatic dipoles are produced inside current carrying wires. That is, how does the polarization inside lattice nuclei (and inside free electrons) come about? We could have an orbiting charged particle within the nuclei and free electrons of radius $R=10^{-15}$ meters approximately, that is, of very small mass, m_0, and such that when added to the central mass and charge, the total charge and mass of the electron and of the nucleus are as observed. When the sustained electric field, E, driving the current, acts on the free electrons, it also acts on the orbiting charge inside the free electrons and inside the lattice nuclei. The result is an increase in the interior orbital charge velocity analogous to the engine burn of a rocket moved from a circular to an elliptical orbit. This produces an ellipse transverse to the force from E.



Also we require that free electrons have an orbiting charged particle of charge, say, -2*e*, and larger mass core of charge, + *e*, and that the lattice nuclei have orbiting charged particles of charge, - *e* and a larger mass core of , +2 *e*, inside the atomic nuclei.

That is, the field causing an elliptical extension of the circular orbit and so a polarization of negative charge, in a specific direction will produce the same polarization direction inside the nucleus and inside the free electron.

The distance between the average center of orbiting charge and the center of core charge is , $R\varepsilon/(1-\varepsilon)$

Thus we also see that as two such current carrying wires are drawn apart the transverse dipole point charge force of one wire on the other will produces less of longitudinal extension of polarization in the other wire. At the same time the transverse dipoles in each of the parallel wire differential segment attracts or repels those in the other wire with an inverse square dipole dipole force.

It turns out as shown below that the mass of the orbiting charge inside the electron and inside the nucleus must be about 10^{-56} kg. if the typical fields inside the current carrying wires associated say with currents of a few milliamps to a few amps are to produce the dipoles in each of the lattice nuclei and free electrons sufficient to produce a dipole dipole force equivalent to the magnetic force of the associated currents.

OBJECTION 3: Objects cannot move faster than the speed of light as their mass increases to infinity at this limit.

The answer is not "Tachyons" which cannot slow down to the speed of light without their mass increasing to infinity. Rather it is that the apparent mass increase of Beta electrons to infinity as the speed of light is approached, is due to a decreasing rate of increase of the electrostatic dipoles inside the speeding electrons. In the early 1900s, Kaufmann showed the trajectories of the slightly faster high speed electrons ejected by radium nuclei moved more slowly than expected. The electron trajectories showed a decreasing rate of increase of the response of faster electrons to a magnetic field and to an electrostatic field through which they moved. Lorentz and Einstein mistakenly attributed this to an increase in mass and the conversion of energy into mass. Rather, it is the absorption of energy by the small orbital mass inside the electron etc., against the increasing and increasingly non linear elastic resistance of the orbital system until the small orbital mass is ejected at 10^{22} meters per second.

One implication that tends to validate the model is that the speed of light can be written as a function of the electric constant and the electron radius without involving the magnetic constant.

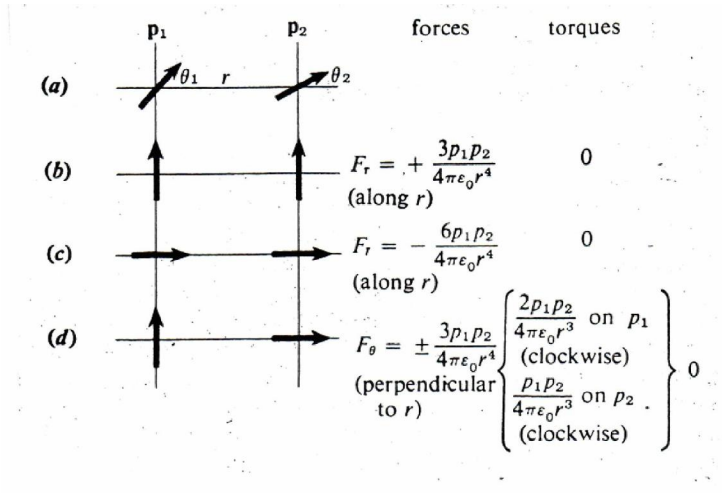
That is, an electric field applied to an electron of core mass, $m_e = 9.1(10^{-31})kg.$ of charge, $+e = +1.602(10^{-19})C.$ and a much smaller orbital mass, m_0, of charge, $-2e$, (or vice versa) moving at a virtual or actual superluminal velocity acts on the electron but also on the orbital mass, m_0 circling the electron mass, m_e, of charge, +e, say in the XY plane at a radius of approximately, 10^{-15} meters. Consider the classical central force inside the electron, projected on the X axis which acts half the time in the same direction, half the time in the opposite direction as an exterior force, $-2eE_x$

Thus, $F=-2E_x\pm 9\left(10^9\right)\left(2e^2\right)\left(R^{-2}\right)$ where $R=(a)\left(10^{-15}\right)$ meters. The force component in the x direction is

$$(F)(x/R)=eE_x\pm\left[(9)(2)(2.56)/a^3\right]\left[10^{9-38+30+15}\right][x]=eE_x\pm c^2x,\ \text{ if } a=1.724$$

Thus, R = 1.724(10^{-15}), is the electron radius, implying the elasticity of the charged mass inside the electron is equal to the speed of light squared. We can determine the small mass, m_0, of the, $-2e$, charged particle orbiting inside the electron by considering the similarity between electric dipoles and magnetic dipoles.

The following diagram shows the forces between parallel and collinear dipoles corresponding respectively to collinear and parallel current segments.
(1)



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Lets consider an example, suppose our parallel wires are, $r=2cm.$ apart, of copper with a $2mm.$ diameter of cross section area, $A=(3.14)\left(1^2\right)\left(10^{-3}\right)^2$.

Suppose the current in each wire is one Ampere. Then, $1=nAev_e=(8.47)(3.14)(1.6)\left(10^{28-6-19}\right)(v_e)=4.255\left(10^4\right)(v_e)$. So $v_e=(2.35)\left(10^{-5}\right)m./s.$ The implied value of, E, is obtained from $v_e=eEt/m_e=(2)(1.6)\left(10^{-19}\right)(E)\left(10^{-14}\right)/(9)\left(10^{-31}\right)$ where we put, $t=2\left(10^{-14}\right)$ seconds, so that the resistivity of copper is as observed, $\rho_C=m_e/ne^2t$. Thus $E=(9)(2.35)\left(10^{-31-5}\right)/(3.2)\left(10^{33}\right)=(6.6)\left(10^{-3}\right)V./m.$ The transverse dipoles per unit length produced in the wire by this longitudinal E field are $rv_e/c=\left(2.35/\sqrt{3}\right)\left(10^{-15}\right)=R\varepsilon/(1-\varepsilon)=10^{-15}\varepsilon/(1-\varepsilon)$ implying that $\varepsilon/(1-\varepsilon)\approx 2.35$; so by trial and error, .9/.1 = 9 and .8/.2 = 4 and .7/.3 = 2.33. So,

$\varepsilon = .7$ for $E = (6.6)(10^3) V./m.$ and $v_e = (2.35)10^{-5}\, m./s.$ with, i and i' both equal to one Ampere and wire diameter $= 2mm.$, for a separation of wires, $r = 2cm.$.

The effect of E_x on the orbital charge inside the electron is to produce an ellipse of eccentricity, ε, with major axis perpendicular to the X axis,. The increase in orbital velocity required for an ellipse of eccentricity, ε, is, $eEt/m_0 = v_1 - v_0 = (1+\varepsilon)^{1/2} v_0 - v_0 = (1+\varepsilon/2)v_0 - v_0 = v_0\varepsilon/2$. This follows from the formula, $(m\rho^2)(v_0^2/k\rho) = 1 + \varepsilon\cos\alpha$ where, $k = (9)(10^9)e^2$ and, ρ, is the distance from a stationary central charged particle to a moving charged mass, m, etc.. The central force on $m_0 : m_0 v_0^2/R = (9)(10^9)(2e^2)/R^2$ implies

1) $v_0 = \left[(9)(10^9)(2e^2)/Rm_0\right]^{1/2} = \left[(9)(2)(2.56)/1.724\right]^{1/2}\left[10^{(9-38+15)/2}\right]/m_0^{1/2}$
$= 5.17(10^{-7})m_0^{-1/2}$ where ε = .7 for E=6.61(10^{-3})

And from the applied force 2eE on m_0,

2) $2eEt/m_0 = v_0\varepsilon/2$ where ε = .7 for E=6.61(10^{-3})

Putting these equations containing, u_0, together, we obtain,
$210^{-28}\, eEt/m_0 = .35\times 5.17\times 10^{-7}/m_0^{1/2}$ so
$m_0^{1/2} = 2\times 1.602\times 6.61\times 2\times 10^{-19-3-14}/(.35\times 5.17\times 10^{-7}) = 2.34\times 10^{-28}$. So
$m_0 \approx 5.5\times 10^{-56}\, kg., v_0 \approx (\varepsilon/2)\times 6.62\times 10^{-7}\times m_0^{-1/2} \approx 10^{21}\, m./s., f_0 \approx 10^{35}$. If ε = .99 instead of, $.7, m_0 = 7.75\times 10^{-56}$ kg..

Why does such charge polarization with its magnetic effects not occur in dielectric strips subject to an electric field? Because the loosely bound electrons around atomic nuclei in these dielectrics, redistribute themselves, to cancel the effects of the outside electric field on the central nuclei. The dielectric as a whole becomes polarized opposite to the applied field.

But if the applied field is constantly changing, then the nuclei of dielectrics have a chance to respond to the applied field before the surrounding electrons can completely cancel the changing applied field. The result of each change in force will be a small amount of charge polarization transverse to the force or force change.

This in fact happens all the time as the Earth spins. As the Earth spins on its axis (.465m./s. and orbits the Sun, (29.9m./s.) at a distance on the order of 10^{11} meters and, with the Sun, orbits the Galactic center 10^{20} meters away at (220m./s.) etc, the motion of the Earth's atoms implies constantly changing forces.

These mechanical forces were initially ultimately electrical on the Earth's major dielectric atoms, eg, silica, and oxygen, and so produced a small amount of charge polarization in these atomic nuclei each time the tangential velocity changes direction. (That mechanical,contact forces are ultimately electrical, is seen from the example of two colliding billiard balls and the electrical nature of the constituent atoms.)

As the Earth turns, the centripetal force due to the initially created radial collinear dipoles that attract each other is at any point , perpendicular to a tangent line which itself is at a slight angle to a subsequent tangent line and thus has a non zero component projection on this subsequent tangent line. And this tangential dipole force produces radial oriented dipoles along a subsequent radial line from the Earth's center to this subsequent tangent line. And in this way the radial and longitudinal dipoles are sustained.

Another possible mechanism to account for the radially and longitudinally oriented dipoles: The initial force that caused the rotation and after, sustained by inertia, was tangential along a west to east line of latitude and thus perpendicular to a radial line to the Earth's center and to a north south or longitudinal line. The radial and longitudinal dipoles initially produced, cause collinear attraction along radial and longitudinal lines etc and in combination, produce forces on protons initially without dipoles, that causes dipoles transverse to the radial dipoles and transverse to the longitudinal dipoles. That is new radial, longitudinal and latitudinal or tangential dipoles are continually produced.

Thus it is possible that an uncancelled electric field, E_{rot} exists inside the average dielectric atom for an average duration,τ , and due to this time limitation and not just to surrounding electrical forces, produces an elliptical extension of orbital charge inside the protons of eccentricity, ε. The increase in orbital velocity from $v_0 = [(9\times(10^9)\times 2e^2)/Rm_0]^{1/2} = 10^{21}$ to $eE_{rot}\tau/m_0 = (\varepsilon/2)(v_0)$ and the dipole produced is, $R\varepsilon/(1-\varepsilon)$ where $\varepsilon = 2eE_{rot}\tau/m_0v_0$ and $m_0 = 10^{-56}$.

For example, if the produced dipole length is $s=10^{-18}$, then $R\varepsilon/(1-\varepsilon) = 10^{-18}$ so with $R= 10^{-15}$, $\varepsilon \approx 10^{-13}$ is the eccentricity.

The electrical force and duration, $eE_{rot}\tau$, producing dipoles is proportional to the force or torque that produced the spin angular momentum of the Earth: $eE_{rot} = KM_E\ v_{rot}^2/r_E$ where $M_E = [5.98\times(10^{24}]$ and $v_{rot}^2/r_E = [465]^2/[(6.37)\times(10^6)]$. So $E_{rot}\tau = (10^4)K$ volts/meter times τ. The duration may be inversely proportional to the 24 hour period as a measure of how rapidly the tangent lines change direction.

The net result is the existence of co-linear similarly and so attractively oriented electrostatic dipoles along the Earth's radii and along lines of longitude with parallel

longitudinal dipoles repelling.

Thus a magnetized steel compass needle is pulled downward and made to line up with lines of longitude. The Earth's magnetic field and that of other planets is thus accounted for. The Earth's magnetic field is just the Earth's Gravitational field measured by magnetic measuring instruments. The slight difference in the pattern of relative strengths of Gravitational and Magnetic fields over the Earth's surface is attributable to the susceptibility of such instruments to the unequal distribution of iron, cobalt and nickel beneath the Earth's surface and their net direction of magnetization at specific locations (The molten iron core is too hot to produce the constant magnetic fields of magnetized solid iron. But the iron nuclei here have net electric dipoles, just like the other elements, in directions transverse to the spin of the Earth on its axis and to the orbital motion of the Earth around the sun and with the sun around the galactic center).

The magnetism of steel compass needles and in general of iron, cobalt and nickel is due to peculiar least energy alignments of the spins or electric dipoles of their atomic electrons that produce a net electric dipole in each iron atom. In domains of many such adjacent atoms, a common orientation is produced. The alignment of these randomly oriented domains by a current carrying coil produces the observed net magnetic effect of bar magnets like the compass needle. But this is in addition to the electric dipoles inside the iron nuclei due to the rotational and orbital motion of the Earth and whose effect is much weaker. see http://www.physics101.org/diamagnetism.pdf

Thus the Gravitational force of the Earth on terrestrial objects is attributable to charge polarization inside their atomic nuclei transverse to the direction of the Earth's spin, ie along an Earth's radius and along a line of longitude. Similarly for the Sun on planets and the Galactic center on the Sun. Etc..

The inverse square Gravitational force is equivalent to an inverse fourth power electrostatic dipole-dipole force if the dipoles in any pairwise interaction are proportional also to the distance between the dipoles. Thus adjacent objects along a radius toward the Earth's center, attract. Objects on adjacent longitudes repel because of the repelling parallel dipoles while objects on the same longitude or north south line tend to attract.

But the total force on any object is the sum total of all such pairwise forces. The influence of more distant dipoles on any given dipole is obviously less than the nearer dipoles and the expansion of the dipole lengths, *rs,* at increasing distance, r, is subject to the restriction that, *rs*, is less than the distance between atoms or, in a plasma, between ions and electrons. The poles of each dipole are -qe and +(q-1)e

Thus $9\times (10^9)$ times, qers, times, $N_E$qers , divided by r^4 is the force between a

radially oriented dipole on the surface of the Earth and all of the N_E dipoles of the earth, some of which attract and some of which repel the surface proton dipole, can be represented by a net average dipole that produces the same force as the Newtonian force directed toward the Earth's center. Of course, the nearer dipoles along the same radial line have a greater influence than the more distant dipoles at greater angles to the surface dipole under consideration etc..

That is, we can represent all of the pairwise forces as the force between a concentration of dipoles near the center of the Earth and the test object where the concentration of dipoles are radially oriented toward the test object and sufficient to give a force equal to the Newtonian force on the test object. Every pairwise dipole force has a component along such a radial line. Adding these forces gives a net radial dipole force while dipole forces from parallel dipoles on opposite sides of the test object cancel and add to zero.

If we consider two pairs of objects such as the two small(2gram) gold beads suspended on a torsion balance, .3 meters horizontally from two stationary 8kg lead balls in Boys' version of the Cavendish torsion experiment, the attraction between the small beads and the large balls is in part, the projection of the radially oriented force toward the Earth's center, on the small balls and the radially oriented dipoles inside them

If the horizontal arm holding the moveable gold beads was placed along an east west line, the collinear dipoles along an altitude line would be attracted downward while the north south oriented electrostatic dipoles inside the atomic nuclei of the balls would be in an attractive collinear, north-south alignment and the slight twist of the suspension wire shows the observed roughly 10^{-7} Newton, force.

If the arm was placed along a north -south line the orientation of the electrostatic dipoles in adjacent balls of each pair would be in a parallel repelling alignment and there would be no collinear attractive dipoles. An intermediate placement of the arm would show the effect of collinear attractive force components and parallel repelling forces. The sum of these effects are generally attractive because repelling, parallel, dipole forces are half as strong as collinear dipoles forces for the same size dipoles. (However the effect of all of the other dipoles inside the Earth will reduce these local effects. One way of considering the total force is that there is a horizontal component of the downward radial force on each of these smaller moveable balls that produces an apparent attraction to the larger balls)

This phenomena, not a fifth force, explains the Gravitational repulsion observed by Eotvos in the 1890s and analysed later by Fishbach in 1986. Eotvos's measured the pull of a weight when the weight and the spring holding it were moving eastward in a boat on the Black Sea and were both heavier than when his boat was moving westward. But most of the effect was due to the spin of the Earth and the tangential velocity, centrifugal force, offsetting the radial

Gravitational force as the boat followed the curvature of the Earth, That is, the downward movement of the weight toward the Earth's center appeared less for this reason. In a plane, after takeoff, usually westward into the wind(blowing from west to east) opposite to the Earth's spin, the subsequent difference in eastward and westward speeds of 400mph produces a noticeable difference in radially oriented electrostatic dipoles making eastward moving objects heavier. But the greater tailwind on eastward moving planes hides this effect.

The unexpectedly small Gravitational effect of the largest mass on the Earth, the Himalaya, which was carefully investigated by J.H.Pratt and G.B.Airy with a plumb line on the Indian side in 1855(Phil Trans v145) is attributable to the electrostatic dipole representation of Gravity. They reported that the plumb line is not deflected as much as expected assuming the same average density of the mountain as of the Earth. And we see that this could be be due to the plumb line being placed north or south of the mountain.

That is the east west line from the plumb to the mountain contains no collinear dipoles in the plumb or the mountain, only parallel repelling dipoles oriented in the up down direction. (Of course there is small horizontal component of the downward force along an Earth radial that might attract the plumb line to the mountain)

From these considerations we can write the radially oriented centrally directed Newtonian force on an atom or group of atoms on the Earth's surface as the force on the radially oriented total dipole of the atom or group of atoms produced by part of a ring of radially oriented dipoles around the Earth's center representing the net effect of the total number of dipoles in the Earth.

There are 6.02 times 10^{26} atoms in a volume of any atom whose mass in kg is the total of the protons and neutrons in the atom; e.g., 28kg of silicon contains 6.02 times 10^{26} atoms. The Earth has (5.98 times 10^{24}) kg which if all silicon has $5.98\times (10^{24})/28$ times 6.02 times 10^{26} such atoms each of which has 28 dipoles allowing one dipole per proton or neutron $\approx 36\times(10^{26+24})$ and so 3.6 times 10^{51} dipoles.

Hence whatever the average atom, the force between these dipoles concentrated at a point, R_E =6.37(10^6)meters from the surface, and a single dipole at the Earth's surface is

$$[9\times10^9\times3.6\times10^{51}][6.37\times10^6]^2[1.602\times10^{-19}\times(1.836/2)\times10^3\times s]^2/[6.37\times10^6]^4$$

$$=[(9\times3.6\times9\times1.6\times1.6\times.918\times.918)/(6.37\times6.37)]\times10^{9+51-38+6-12}\times s^2$$

We let, q, the number of electron–positron charges on the poles of the dipole, qes, inside the proton be equal to (1.836/2)(10^3). That is, we assume that there are 919 positrons and 918 electrons and that a more accurate measure of ratio of electron mass

to proton mass taking into account binding energy would be 1 to 1837. The form such charged masses would take inside the proton could be orbital charged masses around other orbital charged masses as in our hypothesis above of a single $10^{-56}kg$ mass with the charge of an electron orbiting a collection of positrons and electrons with 2 more positrons than electrons and giving thiis total. Support for the hypothesis is that it explains the charge polarization produced in current carrying wires consistent with the observed force between the wires.

Setting the above dipole-dipole force to the Newtonian force and solving for, s, we have.

$$GM_E m_H /[(6.37)\times(10^6)]^2 = [(6.67\times 5.98\times 1.67)/(6.37)^2]\times 10^{-11+24-27-12} = 1.6\times 10^{-26}\, Newtons$$
$$= [(175.18)/(40.58)]\times 10^{9+51-38+6-12}\times s^2$$

$$s^2 = .37\times 10^{-42}, and, s = .6\times 10^{-21}, and, Rs = 3.82\times 10^{-15}\, meters$$

The length, Rs, is well within the upper limit imposed by the surrounding orbital electron shells of the atoms and estimates of proton and nuclear radii. We have thus explained a possible mechanism of the gravitational fields of the inner four planets in our solar system. For the outer four gaseous planets the nuclear dipole length can be longer and so long enough.

The fact that this mechanism explains Gravity as an electrical dipole force suggests that it might account also for the precessions of elliptical planetary orbits around the Sun not accounted for by the additional oppositely directed forces due to other planets besides the Sun on each planet.

Specifically, the small angles between the planetary orbital planes and the Sun's equatorial plane mean that the orbital radial dipole on a line from the planet's center to the Sun's center is at an angle to the Sun's spin radial dipole. The Sun's radial dipole can be projected onto the planet's orbital radius to give the attractive force between the Sun and the planet along the planet's orbital radius. The projection then of the Sun's radial dipole on a line perpendicular to the Mercury sun line and to Mercury's tangential velocity acts at right angles to he planet's radial dipole to give a force perpendicular to the attractive force component toward the sun.

We also show that the further excitation of the naturally occurring oscillating charge inside atomic nuclei in a receiver by sources of radiation that after a delay produce radiation in the receiving atomic nuclei and atoms, that such further oscillation is inhibited by the gravitational field at the receiver.

Einstein's General Relativity explanation of such phenomena starts with the fact that the advances of planetary perihelions, and the time delay of light from stars observed in the day, were due to proximity to the Sun. Newton's gravitational formula for the elliptical planetary orbits was also based on this fact, but there were other effects of proximity to the Sun and large masses in general not captured by Newton's formula.

The proposed nuclear electric dipole theory is another way of getting at these

influences based on the classical premises of Newton and Coulomb and not requiring other premises as discussed in, (www.physics101.org/relativity.pdf)

The theory proposed here also explains how the Earth pulls negative ions produced by Sunlight or cosmic rays of positive ions from the solar wind or beyond the solar system to the Earth's surface.
(e.g a net negative charge and a potential difference of 100 Volts per meter with an increase of altitude above the Earth's surface but less so as we go up to about 400,000 volts at the top of the stratosphere, 50km up,)

The negative charges at the Earth's surface pull positive charges down and lose negative charges with a current of 10 micromicroamps in regions of fair weather due to this average potential difference. (This current is similar to the solar wind of positive particles moving from the Sun past the planets to the spherical boundary of the solar system) On the Earth, this process is interrupted by thunderstorms and lightning, bringing, nine times out of ten, negative charges to the Earth and making the region near the Earth again more negative. A similar process of current reversal of the solar wind is suggested in the Thornhill-Talbot book (ref 12) where the vast distribution of a large total flow of negative charge toward the Sun is not manifest until it nears the Sun where such plasma, non atmospheric,lightening effects and flares become evident. The analogy between the Earth and Sun is clear but the analogy between Earth's ionosphere and the edge of the solar system is less so.)

That the potential difference between the Earth's surface and the top of the stratosphere is due to electrical charge on the Earth's surface is shown by the following experiments: A copper plate with a wire attached to the Earth was suspended a few inches above and parallel to the Earth. Its charge was measured by an electrometer to be negative. Then another plate, parallel to the first but larger and above the first was also connected to the ground. It also showed negative charge but the smaller plate beneath it showed none and the current measured from the lower smaller plate showed the previous amount of negative charge on it.

Now lets confirm that the Gravitational attraction of the planets to the Sun may be represented in terms of electrostatic dipoles.

(Note the planet masses from Mercury to Pluto are multiples of 10^{24}kg. namely, .22, 4.87, 5.97, .64, 1899.7, 568.8, 86.9, 103.0, and .013 times 10^{24}kg vs the Sun's (2) $\times$ (10^{30}) kg. Note the distance between the Sun and Mercury through Pluto is .58 , 1.0728, 1.49, 2.235, 7.748, 14.155, 28.608, 44.849 and 58.855 times 10^{11} meters). The distance between the Sun and the Galactic center is 10^4 parsecs = 3$\times$ (10^{20}) meters.

The Sun is .92H+.08He; a kg of H contains 6.02 times 10^{26} molecules each of which contains one proton and 4kg of He contains 6.02 times 10^{26} molecules. So 1kg of He contains (6.02/4)(10^{26}) molecules each of which contains 2 neutrons and 2 protons. Thus an average Sun kg contains .92 times 6.02 times 10^{26} protons-neutrons plus .08 times 4 'protons-neutrons' times ¼ of 6.02 times 10^{26}. We multiply this sum times the mass of the Sun in kilograms to obtain the total number of 'protons-neutrons' in the Sun: 6.02 times 10^{26} times (.92+.08) times 2$\times$ (10^{30}) kg in the Sun. *We could also divide by the mass of the proton (roughly the same as the neutron), 1.67 times 10^{-27} to get the*

approximate number of protons plus neutrons.

Hence, whatever the atoms, the Sun contains 6.02 times 10^{26} times M or 1.2 times 10^{57} protons-neutrons and each of these contains a unit dipole, qes_{Sun} , oriented along a line from the Sun to the Earth perpendicular to the tangents of the orbital motion of the Earth and to the tangents of the spin direction of the Sun.

Similarly there are $6.02\times(10^{26})$ times $5.98\times(10^{24})$kg = $41.3\times(10^{50}) = 4.1\times(10^{51})$ protons-neutrons each containing a unit dipole, qes_{Earth} , in the Earth. The attraction between the net dipoles in the Sun and Earth, R meters apart, with $q=.918(10^3)$,

$[(9)\times(2.56)\times(.918)^2\times(10^{9-38+6})\times[6.02\times(10^{26})]^2[Mm/R^4]Rs_{Earth}\times sRs_{Sun}] = GMm/R^2$

$= 7.04\times(10^{9-38+6+52+2})\times[Mm/R^2]s_{Earth}s_{Sun}$. Cancelling Mm/R^2 on both sides leaves,

$G = 6.67\times10^{-11} = [7.03\times(10^{9-38+6+52+2})\times9]s_{Earth}s_{Sun} = 63.27\times10^{28}\,s_{Earth}s_{Sun}$

$s_{Earth}s_{Sun} = .105\times10^{-42} \approx 10^{-43}$.

Thus if $Rs_{Earth} = 10^{-15}$ meters is the maximal allowable dipole length pointing to the Sun, then, with $R=10^{11}$, $s_{Earth} = 10^{-26}$ and $Rsun=10^{11-17}$ or 10^{-6} meters as the length of dipoles in the Sun. A more rigorous calculation might yield a dipole length of 10^{-7} meters and a greater value for, q. The density of atoms or protons on the surface of the Sun, a tenth of gram per cubic centimeter, implies an average separation distance of about 10^{-7} meters.(The extreme temperatures of the Sun and the forces producing the 220 km/sec orbital velocity of the Sun as well as its 2km/sec spin velocity could produce such separations of charge inside the proton.) A similar argument applies to the more distance outer four gaseous planets.

Similarly for the attraction of the Sun to the Galactic center. The unit dipole on the Sun of 10^{-20} meters vis a vis the Earth is not as small as required as the unit dipole on the Sun vis a vis the Galactic center which would have to be 10^{-24} to give a .0001 meter dipole as the maximal allowable with the dipole charge difference of 1000 to 1 and even this might be too large.

Another possibility is that the particles in the Sun and the Galactic center being at very high temperatures may be smaller than the positrons and electrons that may make up the proton and neutron at lower temperatures. Recall our proof of superluminal orbiting masses of 10^{-56}kg inside the proton and inside the electron. Each one of these smaller particles that high energy collisions show to exist for fractions of a second, when the collision temperatures are very high, may have dipoles within them. The greater tangential forces associated with the greater orbital and spin speeds may rip loose more oppositely charged particles inside the protons. Thus the lengths of the net Galactic Center dipole and that of the Sun can be as small as required to give the observed "gravitational" force.

In summary, the Gravitational force as a dipole force explains the heretofore unexplained combination of electrical and thermal forces in and around the planets and the stars. Also variations in the Gravitational force on Earth; the precession of the planetary orbits; the Newtonian Gravitational forces between planets and the Sun and between the Sun and the Galactic center can be represented as due to dipoles transverse

to the spin and orbital movements of the planets and the Sun.

The heretofore unexplained mechanism of Gravity, that Newton regarded as desirable but unnecessary to provide the predictive validity of his force equation, is now explained in terms at least of a more basic and commonly observed force: The Coulomb force between point charges and the magnetic or electric dipole dipole force. Precession and light bending, ie light reception delay effects associated with proximity to the Sun are explained without resorting to the added premise of the average curvature of spacetime near a large mass and ad hoc rules for its variations needed to give the observed data.

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