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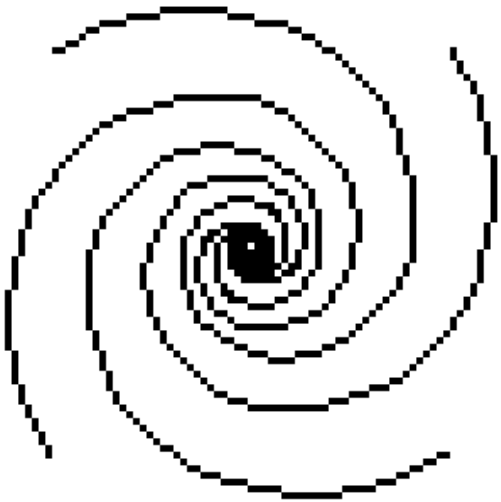
Electric Gravity



john.erich.ebner@gmail.com
http://blackholeformulas.com

Abstract

We demonstrate that a theoretical electric force can model gravitation in calculations. This force may model the Earth in orbit if the electric force equals the gravitational force and if the charge of the Earth and Sun are of opposite polarity.

The large-scale static-like behavior of gravity can be described on the microscopic scale, where matter is treated statistically as a collection of dynamic atoms and molecules.

Bohr's hydrogen atoms or electron-proton dipoles when expressing elliptical orbits, develop charged ends and precess into ellipsoids. These charged ends attract other nearby charged dipoles with van der Waal's forces which cause atoms to stick together in their atomic arrays.

There is a slight inequality in attraction and repulsion between the rotating dipoles. The attractive force between unlike charges is slightly larger than the repulsive forces between like charges.

This is a kinetic theory of gravity, the pulsed force created by the momentary interaction of these rotating or oscillating sets of dipoles when they align in-series causes gravitation, centrifugal force and inertia.

The shortness of these in-line in-series impulses explains the weakness of gravity compared to the electrostatic force.

This model links electricity, gravity and quantum mechanics. Sometimes when you model nature, the model speaks with clarity to the questions that you ask of nature.

Key words

Gravity (Electric, electrostatic, electrodynamic, statistical, dipole), gravity, gravitational force, van der Waal's force, elliptical orbits of atoms, polarized atoms, electrostatic dipoles, gravitational refraction of light

Authors Note

This document was written with Latex `http://latex-project.org/ftp.html` and TexStudio `http://texstudio.sourceforge.net/`, both of which are excellent, open-source and free. The PDF pages it produces can be read in two page view and printed two pages at a time in landscape to save paper or make a booklet.

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Contents

List of Figures

1 Introduction

We simplify and imagine nature to be composed of machines which we can understand. We use these machines by analogy to explain the behavior of nature. Maxwell said, "Using mechanical illustrations to assist the imagination, but not to account for the phenomena."

The Cosmos [1] is a machine where gravitational force equals centrifugal force. The electromagnetic wave [2], Bohr's planetary atom [3] and the ring electron [4] are examples of tiny machines which illuminate nature. Pushing gravity [5] has a rich and interesting history but is an unlikely mechanism to explain gravity because of pushing gravities [6] huge continuous energy demand.

Electric gravity also has a long history. Assis described his work and Faraday's experiments along these lines.[9]

We will see how gravitational force equals electric force in equations. The tiny machines which illuminate gravity are electric dipoles which are like Bohr atoms, charged electron and proton masses which orbit around their common center of gravity.

We show that rotating dipole atoms with elliptical orbits develop charged ends and precess into ellipsoids. These charged ends attract other charged dipoles with van der Waal's forces which cause atoms to stick together in their atomic arrays.

The pulsed force created by the momentary interaction of these pairs of dipoles when they align in-series causes gravitation, centrifugal force and inertia. The shortness of these in-line in-series impulses explains the weakness of gravity compared to the electric force.

Gravity based on dynamic electric dipoles, provides a clear plausible mechanism for how gravity works, with forces in equilibrium and no continuous energy demand. Orbiting electric dipoles also explains much about why gravity works.

Heisenberg said the position and orbits of the electron in the hydrogen atom can not be observed and therefore they should be set aside as fruitless ideas. He focused only on observable quantities of spectral frequency and intensity.

We will see that these currently unobservable qualities of charge location in atoms are exactly what are needed to explain gravity.

We will look first at the theory that gravity is caused by static charges. It is interesting how well this possibility fits the gravitational equations even without the required dynamics.

2 Static charges can model gravitation

2.1 Ratio of electrostatic to gravitational forces

$$F_c = \frac{c_e^2}{4\pi\epsilon_0 r^2} \tag{2.1}$$

This is the electrostatic force between two charges c_e at a separation of r meters. c_e is the charge of the electron or proton.
ϵ_0 is the permittivity of vacuum.

$$F_g = \frac{G{\cdot}\, m_e{\cdot}\, m_p}{r^2} \tag{2.2}$$

This is the gravitational force between an electron and a proton at a separation of r meters. G is the gravitational constant. m_e and m_p are the mass of the electron and proton.

$$\frac{F_c}{F_g} = \frac{c_e^2}{4\pi\epsilon_0{\cdot}\, G{\cdot}\, m_e{\cdot}\, m_p} = 2.269E39 \tag{2.3}$$

This is the huge ratio of electrostatic to gravitational forces. Small charges produce big forces. Any theory of gravity must explain this smallness of gravity.

2.2 Balancing electrostatic and gravitational forces

$$F_c = F_g \qquad or \qquad \frac{c_e^2}{4\pi\epsilon_0 r^2} = \frac{G{\cdot}\, mass{\cdot}\, Mass}{r^2} \tag{2.4}$$

When is the electrostatic force between two opposite charges equal to the gravitational force between two masses?
The forces are equal at any distance. They are both inverse square forces. The r^2 cancel.

$$\frac{c_e^2}{4\pi\epsilon_0} = G{\cdot}\, kg^2 \; or \; 4\pi\epsilon_0 G = \frac{c_e^2}{kg^2} \; or \; \sqrt{4\pi\epsilon_0 G} = \frac{c_e}{kg}$$

Solve for the kg and collect terms:

$$\sqrt{4\pi\epsilon_0 G} = \frac{8.091E{\neg}19{\cdot}\, A{\cdot}\, s}{9.390E{\neg}9{\cdot}\, kg} = 8.616E{\neg}11\frac{A{\cdot}\, s}{kg} \; or \; \frac{coulombs}{kilogram} \tag{2.5}$$

This is gravitational charge per kilogram. There are:

$$6.2415E18{\cdot}\, c_e = 1{\cdot}\, A{\cdot}\, s = 1{\cdot}\, Coulomb = 1{\cdot}\, Farad{\cdot}\, volt. \tag{2.6}$$

2.3 Gravitational Charges

$m_{sun} = mass\ of\ the\ Sun = 1.9884E30 \cdot kg.$
$m_{earth} = mass\ of\ the\ Earth = 5.9722E24 \cdot kg.$
$m_{hydrogen} = mass\ of\ hydrogen = m_e + m_p = 1.6735E\neg 27 \cdot kg.$
The gravitational charge in electron charges is:

$$A \cdot s = mass \cdot \sqrt{4\pi\epsilon_0 G} \cdot \frac{A \cdot s}{kg} \tag{2.7}$$

The gravitational charge of the Sun in Coulombs is:

$$gc_{sun} = m_{sun} \cdot \sqrt{4\pi\epsilon_0 G} \cdot \frac{A \cdot s}{kg} = 1.713E20 \cdot A \cdot s \tag{2.8}$$

The gravitational charge of the Earth is

$$gc_{earth} = m_{earth} \cdot \sqrt{4\pi\epsilon_0 G} \cdot \frac{A \cdot s}{kg} = 5.146E14 \cdot A \cdot s \tag{2.9}$$

The gravitational charge of a hydrogen atom or dipole is

$$gc_{hydrogen} = m_{hydrogen} \cdot \sqrt{4\pi\epsilon_0 G} \cdot \frac{A \cdot s}{kg} = 1.442E\neg 37 \cdot A \cdot s \tag{2.10}$$

This is the charge of the electron divided by 1.111E18.

2.4 Sun and Earth Gravitation Force

The gravitational force between the Sun and Earth is:

$$gravitational\ force = \frac{G \cdot m_{sun} \cdot m_{earth}}{au^2} \tag{2.11}$$

An au, astronomical unit, is the average distance from the Earth to the Sun. Multiply by $4\pi\epsilon_0/4\pi\epsilon_0$:

$$gravitational\ force = \frac{G \cdot m_{sun} \cdot m_{earth}}{au^2} \frac{4\pi\epsilon_0}{4\pi\epsilon_0}$$

Factor $(4\pi\epsilon_0 G)$ into two square roots

$$gravitational\ force = \frac{m_{sun}\sqrt{4\pi\epsilon_0 G} \cdot m_{earth}\sqrt{4\pi\epsilon_0 G}}{au^2 \cdot 4\pi\epsilon_0}$$

Collect terms:

$$gravitational\ force = \frac{gc_{sun} \cdot gc_{earth}}{au^2 \cdot 4\pi\epsilon_0} = 3.54E22 \frac{kg \cdot m}{s^2}$$

Newtonian gravity using mass.

$$\frac{G\cdot 1.988E30\cdot kg\cdot 5.972E24\cdot kg}{(149.598E9\cdot m)^2} = 3.54E22\frac{kg\cdot m}{s^2} \tag{2.12}$$

The Coulomb forces calculated using gravitational charge and Newtonian gravity calculated with masses are the same. Gravitational charge and mass are equivalent. The force is the same only the units used to calculate the force change.

2.5 Sun and Earth Centrifugal Force

$$\frac{m_{earth}\cdot v_{earth}^2}{dbc_{earth}} = \frac{m_{sun}\cdot v_{sun}^2}{dbc_{sun}} = 3.55E22\frac{kg\cdot m}{s^2} \tag{2.13}$$

The centrifugal force of the earth equals the centrifugal force of the sun which is also equal to the gravitational force between them as we saw in the last section. These equal forces are unchanged by using gravitational charge instead of mass. v is the orbital velocity. dbc is the distance to the barycenter, the center of mass of the earth-sun system

$$\frac{m_{earth}\cdot v_{earth}^2}{dbc_{earth}} = \frac{m_{earth}\cdot v_{earth}^2}{dbc_{earth}}\frac{\sqrt{4\pi\epsilon_0 G}}{\sqrt{4\pi\epsilon_0 G}}$$

multiplied by $\sqrt{4\pi\epsilon_0 G}/\sqrt{4\pi\epsilon_0 G}$:
Substitute for $gc_{earth} = m_{earth}\sqrt{4\pi\epsilon_0 G}$

$$Earth's\ centrifugal\ force = \frac{gc_{earth}\cdot v_{earth}^2}{dbc_{earth}\cdot\sqrt{4\pi\epsilon_0 G}} \tag{2.14}$$

$$Sun's\ centrifugal\ force = \frac{gc_{sun}\cdot v_{sun}^2}{dbc_{sun}\cdot\sqrt{4\pi\epsilon_0 G}} \tag{2.15}$$

2.6 Earth's Gravitational Acceleration

$$\frac{m_{earth}\cdot G}{r_{earth}^2} = 9.80\frac{m}{s^2} \tag{2.16}$$

Gravitational acceleration at the surface of the Earth.
$r_{earth} = 6378000m$.
Multiply by $4\pi\epsilon_0/(4\pi\epsilon_0)$:

$$\frac{m_{earth}\cdot G}{r_{earth}^2}\frac{4\pi\epsilon_0}{4\pi\epsilon_0} = 9.80\frac{m}{s^2}$$

Factor $4\pi\epsilon_0 G$ into two square roots.

$$\frac{m_{earth}\sqrt{4\pi\epsilon_0 G}\sqrt{4\pi\epsilon_0 G}}{r_{earth}^2 \cdot 4\pi\epsilon_0} = 9.80\frac{m}{s^2}$$

Substitute for $gc_{earth} = m_{earth}\sqrt{4\pi\epsilon_0 G}$. Collect terms:

$$\frac{gc_{earth}}{r_{earth}^2}\sqrt{\frac{G}{4\pi\epsilon_0}} = 9.80\frac{m}{s^2} \tag{2.17}$$

The electrostatic acceleration of the Earth at the surface of the Earth, using gravitational charge is the same as the gravitational acceleration using mass. Calculations using charge or mass produce the same gravitational accelerations.

2.7 Sun and Earth Gravitational Energy

$$gravitational\ energy = \frac{m_{sun} \cdot m_{earth} \cdot G}{au} \tag{2.18}$$

$$gravitational\ energy = \frac{gc_{sun} \cdot gc_{earth}}{au \cdot 4\pi\epsilon_0} \tag{2.19}$$

Gravitational energy using mass or gravitational charge work equally well.

2.8 Charges required to keep the Earth in Orbit

All the electrons in the Sun and Earth repel each other. All the protons in the Sun and Earth repel each other. All the electrons in the Sun and Earth attract all the protons in the Sun and Earth. All the atoms in the Sun and Earth are polarized in this way which might cause a charge imbalance force.

$$\frac{gc_{earth}}{charge\ per\ electron} = number\ of\ electron\ charges$$

$$\frac{5.416E14 \cdot A \cdot s}{1.602E\neg 19 \cdot A \cdot s} = 3.212E33 \cdot electron\ charges \tag{2.20}$$

the number of electron charges required for the Earth. Since the Sun shines on half the Earth, $area = 4\pi r^2/2$, there are $1.256E19 \cdot charges/m^2$ required on the Sun lit side of the Earth. There are $6.241E18 \cdot charges/(A \cdot s)$, charges per amp per second.

This is $2.013 \cdot amp/m^2$ but the solar output is $1366 \cdot volts \cdot amps/m^2 = watts/m^2$. This is more than enough charge for electrostatic gravity. We must remember however, the gravitational charge is spread throughout the volume of the Earth not just on half its surface area.

$$charges \frac{mass}{charge} = mass\ of\ electrons$$

$$3.212E33 \cdot charges \frac{9.11E\neg 31 \cdot kg}{charge} = 2926 \cdot kg \cdot of\ electrons \quad (2.21)$$

The surprisingly small charge of $2926 \cdot kg$ of electrons in the Earth when balanced by $5.37E6 \cdot kg$ of proton charge in the Sun will provide the tensile force to keep the Earth in orbit without any ongoing power requirements. Small charges produce big forces.

Compare this charge disparity of $2926 \cdot kg$ of electrons that is required for electrostatic gravity with the solar output of millions of kilograms of protons and electrons in the solar wind.

The solar output on the surface of the Earth, the Earth's insolation is $1366 \cdot watts/m^2$ in space or a total of $1.75E17 \cdot watts$. The dark night side of the Earth has no such power inputs. There would be no solar inputs to a region during an eclipse. This suggest powerful currents and polarizations. The solar output or solar wind could provide the slight charge imbalance necessary for gravity, but we will look at it from another perspective.

Charge imbalance is everywhere; in bonding of atoms, in chemistry and in dielectric and deformable dielectric materials. One might extract a current from a plate heated on one side or a solar cell or a plant in the Sun.

Does a tiny current flow from a plant in the Sun to the ground? Does a plant need a ground? Not the ground. Does photosynthesis leave a residual charge on an algae or on the Sun lit side of the Earth? Life does have electricity. Electricity flows in circuits. Does it seem amazing or absurd that the electricity of life might affect gravity?

Breathing works because oxygen is a good electron receptor. Oxygen completes the circuit like a gaseous battery. Does this leave a charge disparity in the atmosphere? Do we run on electricity? You bet.

Before oxygen became common on the Earth, life used several mineral electron receptors, like iron and sulfur compounds, to fuel its reactions. These life forms are still common in low oxygen environments.

Chemical reactions and bonding are based on charge and its flow which is electricity. All of these might leave different charges on the day and night side of the Earth. An electrical version of Gaia. This very slight differential charge throughout a planet is what is required for electrostatic gravity.

2.9 Ruling out the obvious static charges

The force of gravity on the Earth can't be like the simple charge on a capacitor. I have a weight of $200 \cdot pounds$, $90.2 \cdot Newtons$ and a mass of $9.25 \cdot kilograms$.

$$mass\sqrt{4\pi\epsilon_0 G} = 9.25kg \cdot 86.17\neg 12\frac{A \cdot s}{kg} =$$

$$7.97E\neg 10 \cdot A \cdot s = my\ gravitational\ charge. \tag{2.22}$$

This is around $800 \cdot pico \cdot A \cdot s$. This is for a static charge. We can quickly rule out static charge as follows,

Gravity being caused by static charges alone is ruled out.

$$7.97E\neg 10 \cdot Farad \cdot 1 \cdot volt = 7.97E\neg 10 \cdot A \cdot s. \tag{2.23}$$

Someone would have noticed if a tiny $800 \cdot pico \cdot farad$ capacitor on being charged to 1 volt would gain the weight of $200 \cdot pounds$. Gravity being caused by static charges alone is ruled out. We require dynamic not static charges for gravity.

2.10 Centrifugal force being restrained by a steel cable

In this example of the magnitude of the forces, the sun and earth are seen connected together by a cable like a giant dog bone or dumb bell.

To deflect the mass of the earth, $mass = 5.9722E24 \cdot kg$, from her inertial, straight line path, requires a centripetal force of,

$$\frac{mass_{earth} \cdot velocity_{earth}^2}{distance\ to\ sun} =$$

$$\frac{5.9722E24 \cdot kg \cdot (29,785.9 \cdot m/s)^2}{149.598E9 \cdot m} = 3.5418E22 \frac{kg \cdot m}{s^2} \quad (2.24)$$

Force resisted by steel. Ultimate strength is force per unit of cross section area (N/m^2). The SI unit of stress is the Pascal, where $1\ Pa = 1\ N/m^2 = 1 \cdot kg/(m \cdot s^2)$. The ultimate tensile strength of AISI 1018 Steel is 440 $mega\ N/m^2 = 440E6 \cdot kg/(m \cdot s^2) = 63,816$·psi. The earth could be held back by a,

$$\frac{centripetal\ force}{tensile\ strength} = area\ of\ steel\ cable$$

$$\frac{3.5418E22 \cdot kg \cdot m/s^2}{440E6 \cdot kg/(m \cdot s^2)} = 8.0497E13 \cdot m^2\ of\ steel\ cable. \quad (2.25)$$

The $\pi \cdot radius^2$ area of the earth is $\pi \cdot (6.378E6 \cdot m)^2 = 1.2747E14 \cdot m^2$. The cable would need to be 63 percent of the area of the earth.

The cable might be replaced by a high density but invisible stream of current, photons, gravitons or a constant flux of particles or waves continuously pushing against the Earth to keep it in orbit. Do you think the exchange of virtual photons could keep it in orbit?

These options are ruled out by their huge constant energy requirements. Charges in the sun and earth require no energy for this tensile force. This would be Newtonian, electric, action-at-a-distance gravity or electric gravity.

3 Dynamic charges in moving dipoles

We will look for a dynamic charge imbalance in the atoms themselves. This is a search for the mechanics and oscillating mechanism of the atom.

We seek the geometry of Bohr's planetary atom that allows it to store charge and act like a capacitor when pulled and pushed by the charges in other masses or when accelerated or when buffeted by Brownian motion.

We must seek a dynamic charge somewhere in the constantly moving oscillating charges and reversing dipole forces of the electron-proton dipole pair in the atom.

We will use the machinery of rotating dipoles because it is so easy to see their momentary in-line alignment. But clearly, the random Brownian movement or thermal motion of the atoms also provides obvious opportunities for occasional momentary in-line alignment of dipoles. See Schrodinger's, What is life ? [10]

Dipoles which align occasionally, in Brownian motion or dipoles which align for a very small period of time, is all that is required for gravity which is 2E39 times weaker than the static attraction of opposite charges. When atoms become ellipsoids the charge and the mass of the electron and proton become more separated. Work is done and energy is stored in the electric field.

As the electron and proton follow their elliptical paths, their orbital and radial velocity and location of their charges varies. The direction of their plus to minus dipole charges, their polarization and forces continuously change.

It is this directional non-equal reversing dipole force which attracts us. The cause of gravity is atomic and dynamic. It is only at macroscopic scale that statistical gravity appears as a static force.

3.1 Binary atomic systems with orbiting charges

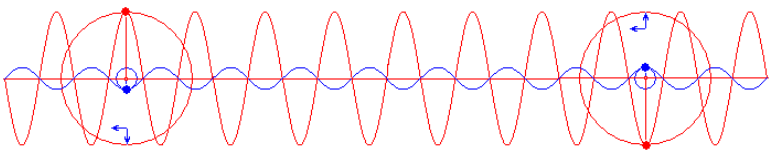


Figure 1: A binary system with orbiting charged particles has wave-like orbits

In figure (1), the dots are electrons and protons orbiting on their circular paths. They orbit together on opposite sides of the

center of mass of the system. The orbital period of the proton and electron pair is the same. They are a dipole. The sine waves are an edge view of the orbital plane and currents traced out by the electron and proton pair as they move across the page on a helical path like a spring on a string.

The stationary unmoving center proton and orbiting electron view of the planetary atom conceals their binary wavelike behavior which the sine waves emphasize. There are wave, particle, planetary and dipole descriptions of atoms.

Looking at a point, in the orbital plane as the electron-proton orbit in figure (1), would show alternating charges and dipole forces at the frequency that the electron and proton orbit and pass in front of each other. Plus-minus-plus-minus at $6.6E15 \cdot hertz$ as the dipoles reverse direction at a wavelength of $45.5E\neg 9 \cdot m$ in the extreme ultraviolet.
$v_e/(2\pi \cdot r_e) = frequency = 6.58327E15 \cdot 1/s$
$v_e = 15973\frac{m}{s}$ is the velocity of the electron and $r_e = 3.86E\neg 13 \cdot m$ is the radius of the electron orbit.
$c/frequency = wavelength = 45.54E\neg 9 \cdot m.$
This is in the extreme ultraviolet, EUV. Here is a reference to the Solar Dynamics Observatory, (SDO)

> "EUV wavelengths range between 50 and 5 nano meters, which coincide with the characteristic absorption wavelengths of inner-shell electrons in the atoms that compose matter. As a result, EUV light directed onto a standard mirror or lens at normal incidence is absorbed rather than reflected, making it undetectable. For this reason, EUV light is also absorbed by Earth's atmosphere, which is why telescopes must travel to space to study the light emitted from the Sun."

A distant static charge would only see the oscillating high frequency plus-minus-plus-minus merged to neutrality. This excludes gravity from being caused by the interaction of dipoles and static charges.

However, a distant in-phase rotating dipole would experience short pulses of Coulomb, magnetic and thereby, gravitational forces by being 'tuned' to the same frequency.

We see two binary hydrogen atoms in figure (2). Their two rotating electron-proton dipoles line-up momentarily twice during each in-phase orbit.

Binary systems can generalize Bohr's planetary atom with an unmoving center proton to a system where electron-proton dipoles

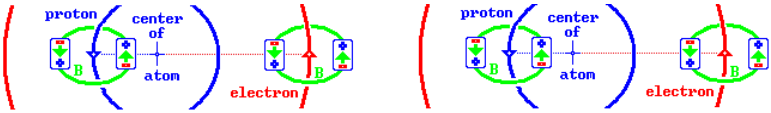


Figure 2: Two Bohr hydrogen atoms in series. The closest magnetic fields of the electrons and protons attract.

rotate around their common center of gravity producing concentric electron and proton currents with green magnetic fields around those currents producing forces due to moving charge [16].

We have rotating electron-proton dipoles with magnetic dipoles centered on the electron and proton.

Dipoles are tiny machines which illuminate much of nature.

Forces in equilibrium hold the atom together. The centrifugal force equals the sum of the Coulomb force between the charges plus the magnetic force between the electron and proton.

We have both pulsed magnetic and Coulomb forces when the attracting electron-proton dipoles in the attracting atoms align momentarily in-series like in this figure.

It is the sum of these two pulsed forces which create gravity and inertia. Dipole pairs are coupled oscillators.

Each Bohr hydrogen atom contains the proper amount of energy to agree with the Balmer series hydrogen spectral lines while also agreeing with the energy of ionization.

When the hydrogen atom is ionized the electron-proton pair separate and absorb energy. $13.6 \cdot eV$ is required to pull them apart. When the electron-proton pair merge to become a hydrogen atom they give off this energy.

Likewise, when separate pairs of electron-proton pairs align they give off energy.

3.2 Circular electron-proton orbits

The dipole of the electron-proton pair in their orbits make rings of charge or currents in figure (3). See the animation at [11]. These orbiting charges are electron and proton torroidal currents which orbit the long way around the torus or ring. We have helical poloidal magnetic fields which orbit around the toroidal currents, looping the short way around the torus through the hole like the wires on torroidal transformers. The magnetic field points out of the page along the axis of rotation.

There is a uniform charge density. The angular velocity of the electron and proton charge along their orbital path around the

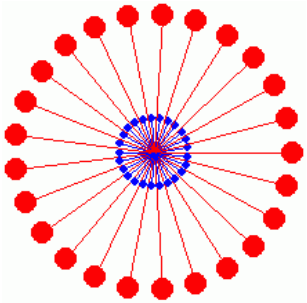


Figure 3: Circular dipole orbits

center of mass is uniform. The charge per radian of the electron and proton on their binary orbital path are constant and equal since they have the same angular velocity. The radial distance between the charges is constant.

This is a charge neutral binary atom confined to orbit in a plane. It is not the sphere of the atom which we see in scanning tunneling microscope pictures.

Tokamaks [12], spheromaks [13] and ring electrons [4] have toroidal currents and helical poloidal magnetic fields.

3.3 Elliptical electron-proton orbits

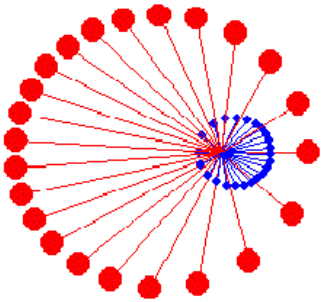


Figure 4: Elliptical dipole orbits

The barycenter, the center of mass, is at the common focus of the electron and proton ellipses shown in figure (4). See the animation at [15].

Using Kepler's law, the charge points or the dots are separated by equal periods of time and each sweep out equal area triangles

in equal periods of time along their elliptical orbits.

A text file [14] which can be 'run' with the Basic computer language calculates the elliptical radii and angles.

These ellipses are very polarized. The charges and masses are not concentric. Their velocity and acceleration vary.

The velocity of elliptical orbits slow down as they move toward apogee. Since they spend more time near apogee at a slower speed the charge and mass density is non-uniform and is greater farther out.

Approaching apogee, the acceleration slows down to zero. The acceleration then changes sign and increases while it approaches perigee. At perigee, the acceleration is again zero. Note: the velocity is never zero; only the acceleration, twice each orbit.

There is a jerk at apogee and perigee when the acceleration is zero for both the electron and proton. It is this jerk of the tangent masses, charges and electric fields which causes the radial pulses of gravity.

The electron is on the left, apogee side of its orbit, 17/23 of the time, so the left side is more negative. It is on the right, perigee side of its orbit, 6/23 of the time. The proton is on the right, apogee side of its orbit, 17/23 of the time, so the right side is more positive.

If the rotation is counter-clockwise, the magnetic field is said to come out of the top, per the right hand rule, which we will call the north pole. The electric and magnetic fields are perpendicular.

These charged elliptical rings precess into ellipsoids like beads rolling on a string. Their charged poles would attract the opposite charged poles of similarly polarized ellipsoidal atoms. This is the origin of van der Waal's forces.

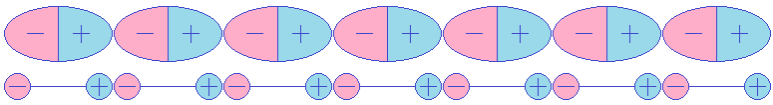


Figure 5: Series dipoles

Can you see how a chain or series of these ellipsoids, with their oppositely charged ends, would stick together like magnetic beads?

Can you see how there are opposite concentrations of charge and mass along the line of a long chain of these ellipsoids?

The best reference on dipoles is by Tatum [19].

3.4 Precession of ellipses into ellipsoids

The electron-proton orbits around one of three axes of a dipole. An external electric field will exert a torque, which tries to tilt the plane of rotation, around a second perpendicular axis. Then the dipole will precess around a third perpendicular axis like a gyroscope or like a bead rolling on a string, imparting a spherical structure on the dipole or atom. See precession [17] and precession animation [18].

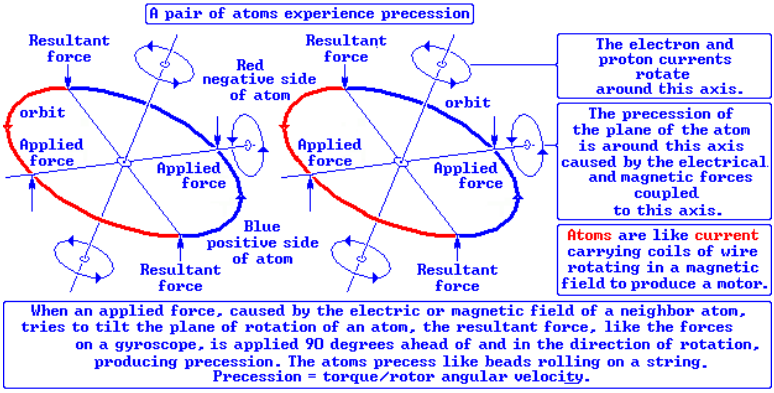


Figure 6: How Precession Works

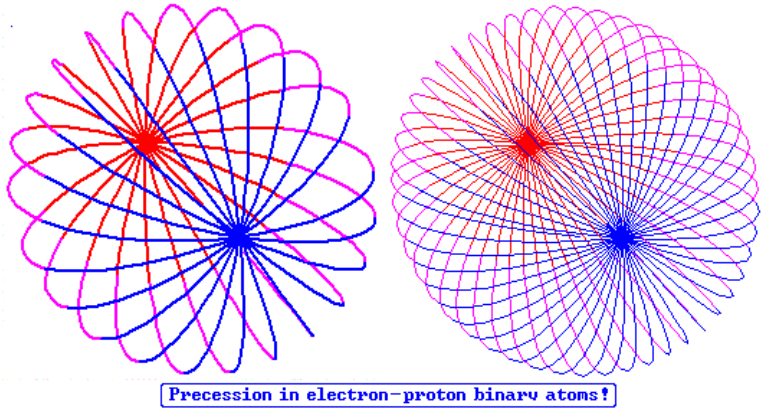


Figure 7: Precession, like beads rolling on a string, along their plus minus, series dipoles, axis.

3.5 Origin of dipole moments and van der Waal's forces by Tatum

"How may a dipole moment be induced in an uncharged body? Well, if the uncharged body is metallic (as in the gold leaf electroscope), it is quite easy. In a metal, there are numerous free electrons, not attached to any particular atoms, and they are free to wander about inside the metal. If a metal is placed in an electric field, the free electrons are attracted to one end of the metal, leaving an excess of positive charge at the other end. Thus a dipole moment is induced.

What about a nonmetal, which doesn't have free electrons unattached to atoms? It may be that the individual molecules in the material have permanent dipole moments. In that case, the imposition of an external electric field will exert a torque on the molecules, and will cause all their dipole moments to line up in the same direction, and thus the bulk material will acquire a dipole moment. The water molecule, for example, has a permanent dipole moment, and these dipoles will align in an external field. This is why pure water has such a large dielectric constant.

But what if the molecules do not have a permanent dipole moment, or what if they do, but they cannot easily rotate (as may well be the case in a solid material)? The bulk material can still become polarized, because a dipole moment is induced in the individual molecules, the electrons inside the molecule tending to be pushed towards one end of the molecule. Or a molecule such as CH_4, which is symmetrical in the absence of an external electric field, may become distorted from its symmetrical shape when placed in an electric field, and thereby acquire a dipole moment.

Thus, one way or another, the imposition of an electric field may induce a dipole moment in most materials, whether they are conductors of electricity or not, or whether or not their molecules have permanent dipole moments.

If two molecules approach each other in a gas, the electrons in one molecule repel the electrons in the other, so that each molecule induces a dipole moment in the other. The two molecules then attract each other, because each dipolar molecule finds itself in the inhomo-

geneous electric field of the other. This is the origin of the van der Waal's forces [19]."

3.6 Beat frequencies in oscillating atoms

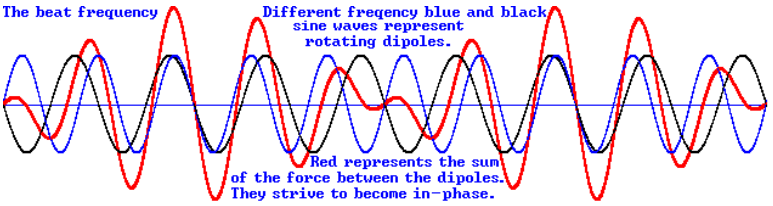


Figure 8: Beat frequencies and series forces

In figure (8), we see that oscillating atoms or dipoles will tend to align their frequencies and thereby reduce their energies. The resultant of the sine wave additions and subtractions is a striving for in-phase alignment at a common frequency. Energy is given off in bonding and likewise here in the alignment of dipoles. This is a mechanism where a system strives to reach a lower energy state where it is stable. While the force between a dipole and a charge decreases with the inverse cube, clearly, the force is increased when more than two dipoles align in series. If this observation is right then a series of aligned dipoles must produce an inverse square force. It is not too hard to see a long series of these dipoles becoming aligned like iron filings around a magnet as in figure (9) or [20].

3.7 Quantum silliness

has attributed the van der Waal's forces and the Casimir forces to the Heisenberg uncertainty principle; the more certain we are of where something is, the less certain we are about where it is heading. Quantum field theory holds that empty space, the vacuum, is fizzing with short-lived particle-anti-particle pairs according to the uncertainty principle. The shorter the time the pair exists, the greater energy the pair may impart to the vacuum so very short lived pairs have near infinite energy. This means that one calculates the energy density of the vacuum as near infinite, which many do, which is silly, of course. The actual energy density in a vacuum is near zero. Particle-anti-particle pairs annihilate each other transforming their mass into energy. Electron-positron pairs annihilate each other producing gamma rays. Particle-anti-particle pairs are

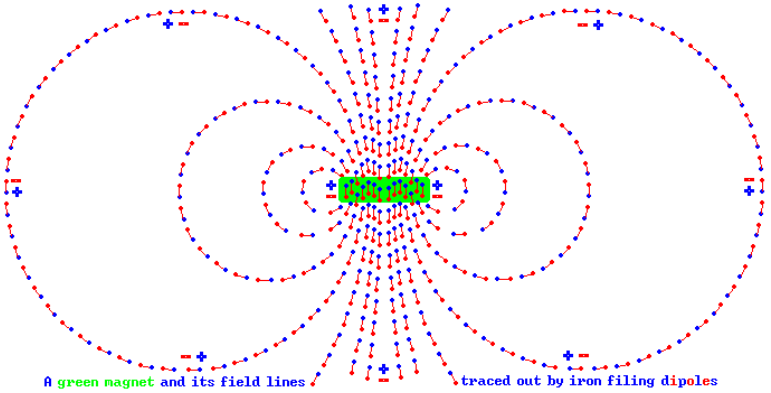


Figure 9: Magnetic dipoles

only created out of energy, not vacuum, if there is enough energy for mass pair creation, as there is in a particle accelerator. Energy is conserved. Nothing is created out of nothing.

3.8 Atoms are held together by electric forces

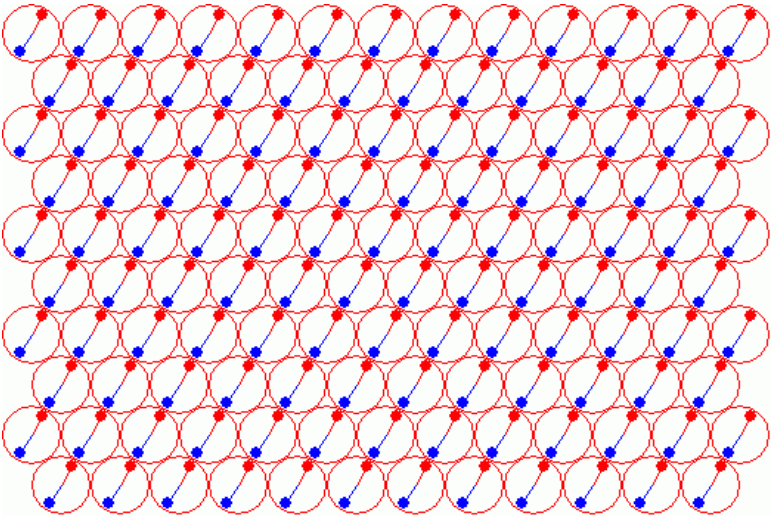


Figure 10: Rotating dipoles

Atoms are held together by electric bipolar van der Waal's forces which are weak in gases, stronger in liquids and stronger still in

solids. The rings in figure (10) are the spherical shells of atoms. See the animation at [21].

Atoms in scanning tunneling microscopes look like neatly stacked spheres. This is a group of atoms at equilibrium. The dipoles consist of dots which are protons and electrons. The dipoles rotate and are in phase like the hands of two clocks.

Huygens reported in 1657 that the forces between pendulum clocks on a shelf caused their synchronization.

Likewise, we expect the powerful forces between series dipoles to be synchronized like an array of compasses.

3.9 Atoms which have elliptical orbits are very polarized

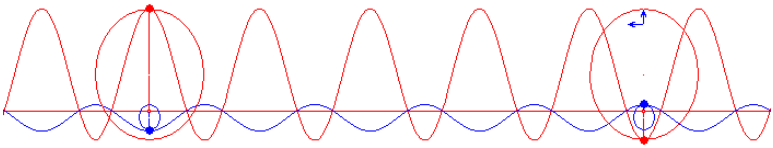


Figure 11: Polarized elliptical orbits

The waves in figure (11) are an edge view of the elliptical orbital plane and currents traced out by the electron and proton dipole as they move across the page on a helical-elliptical path.

With unaccelerated motion of atoms there is a balance between the charges or charge neutrality which is absent when they follow a curved path or are accelerated.

With a circular orbit, the orbital velocity and momentum are constant and there is no radial velocity or momentum.

With elliptical orbits we see a variable orbital and radial velocity, a variable orbital and radial momentum and the electron and proton spend more of their time far out on the apogee side of their orbits. I recommend the orbit simulator websites of Dunn [22], Burtle [23] and Koppen [24].

3.10 Atoms are polarized by forces

The sine waves in figure (12) are an edge view of the orbital plane traced out by the electron and proton pair as they move around the circles on a helical path like a spring on a string.

The axis of rotation and the center of mass of the electron-proton pair is along the ring path. The protons are pushed to the

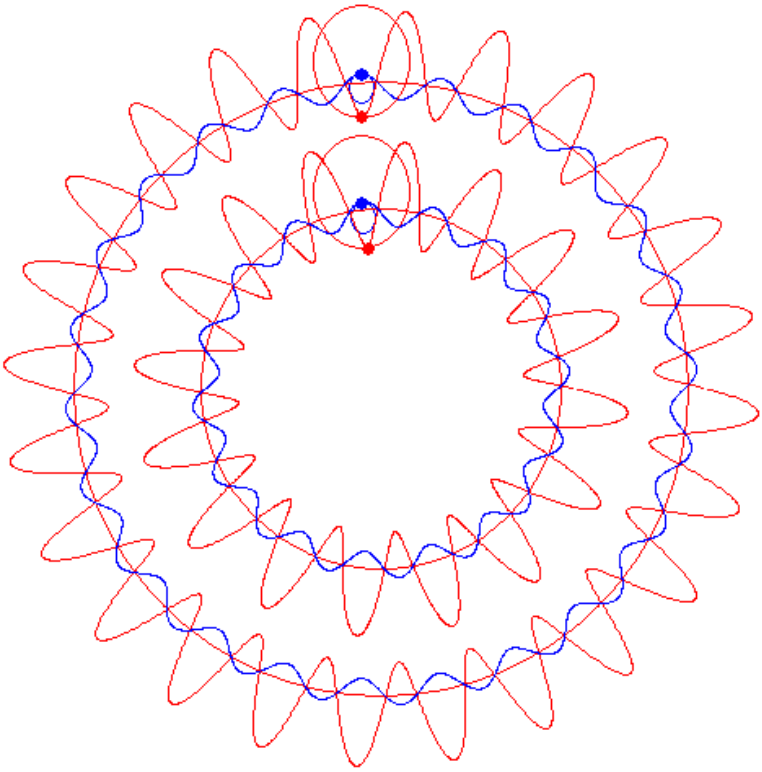


Figure 12: Atoms are polarized by forces on a curve

outside by the centrifugal force caused by following a curved path. The electrons travel farther on the outside of the ring path, on the apogee side of their orbit. They are like a bent helical spring which is pinched together on the inside of the circles. They each trace the surface of a torus which is somewhat stretched in the radial direction because of their elliptical cross section.

The helical path of the electron and proton is a toroidal current path with a superimposed helical poloidal magnetic field path. We have a helix on a helix. A cross section along the circle ring path would show ellipses. There is a charge density imbalance between the inside and outside of the rings. The atoms are polarized by forces.

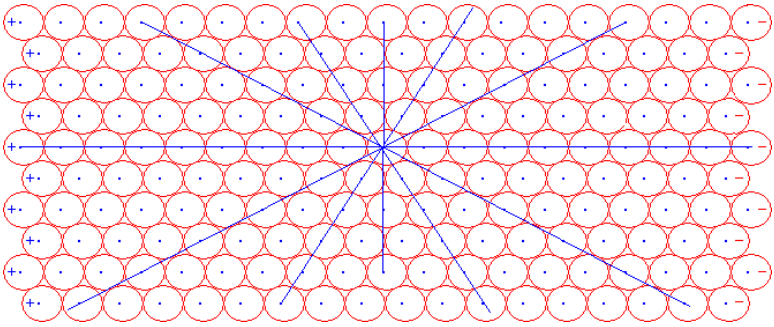


Figure 13: Why materials shear in planes

3.11 Polarized ellipsoid atoms

The blue lines in figure (13) show a few of the many ways the in phase atomic dipoles may line up producing van der Waal's force. It is clear why so many materials shear off in a plane and why crystals cleave in certain planes.

The atoms in this figure prefer to make hexagons. This figure shows the profoundly exaggerated effect of the push and pull of the electrons and protons in a mass, or an acceleration, or an electric field, or a current, or a centrifugal force to the left, or a pressure from above and below like a gravitational force.

The atoms are far from equilibrium, polarized, bipolar and ellipsoid. All the dipoles are in phase like the hands of two clocks. The proton and electron orbit around one focus of the ellipse, shown as a blue dot. The opposite charges of the negative ends and positive ends of the ellipsoid atoms produce attractive forces. The atoms stick together like magnetic beads.

The opposite charges of the interior atoms, which hold them together, are hidden within the mass. Only the charged outside ends of the mass are apparent. The net charge would be zero if the mass is in a homogeneous electric field but the electric field is not homogeneous. It is greater near the source of the electric field. There is an electrical gradient.

The electric field of the dipoles decreases quickly with the inverse cube of the distance between the dipoles but since the dipoles are close to each other all are polarized. They act like a mass of polarized dielectric or charge inside a capacitor.

Charges produce inverse square Coulomb forces. Large currents cause exploding wires [46], as charge separation cause the atoms to elongate beyond the elastic limit of the material of which they are

composed, like broken pieces of spaghetti.

3.12 Series dipoles

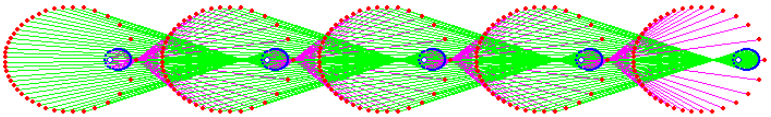


Figure 14: The ends of series dipoles are oppositely charged

The ends of the ellipses are highly oppositely charged in figure (14). The left end of this series is negatively charged and the right end is positively charged. They stick together like magnetic beads. The ellipses precess into ellipsoids, along the long axis, like beads rotating on a string. The internal electron-proton forces hold an atom together. The external electron-proton forces hold the string of atoms together.

3.13 Electron and proton binary atoms

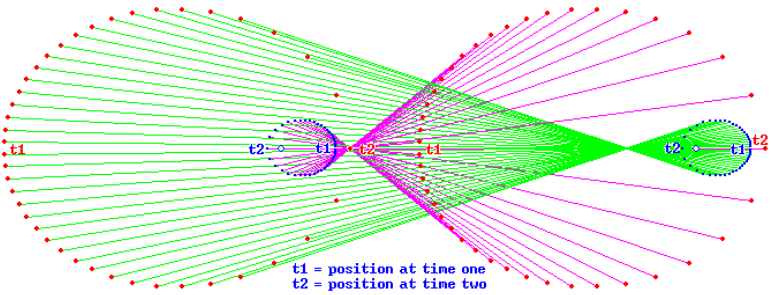


Figure 15: Double dipoles

Two in-phase electron-proton dipole pairs in a series experience forces in figure (15). See the animation at [25]. The electron and proton dots are the instantaneous location of the charges as the charge pairs orbit. The lines connect the forces between the right proton and the left electron. The lines connect the forces between the left proton and the right electron. The lines are longer so the charges are further apart and the forces are weaker than the lines where the charges are closer together and the forces are stronger. The left proton is more strongly attracted to the right electron

along the lines than the right proton is attracted to the left electron along the lines. The pair of repulsive electrons like the pair of repulsive protons stay the same distance apart, both dipoles are in phase, as they follow parallel elliptical paths so the repulsive forces are constant. The attractive forces are variable but they are continuous. There are other pulsed forces when the dipoles line up in series which we postulate as the cause of gravity and inertia. The dots along their paths on each ellipse are separated here by 41 equal intervals of time. 36 intervals are on the apogee side of the center of mass and 5 intervals are on the perigee side of the center of mass. The charges spend more time on the apogee side of the ellipse so the apogee dots are closer together than the perigee side of the center of mass in both the electron and proton ellipses. The apogee end of the orbits are more highly charged. The left end of this atom pair is negatively charged and the right end is positively charged. The vertical and oscillating components of the forces cancel so we are left with only horizontal forces along the center line. These atoms could not stick together without atomic eccentricity and the charge polarity it creates. This is the origin of the van der Waal's force.

3.14 Polarization in dipole notation

Atoms are bipolar ellipsoids or dipoles. They stick together in clumps, rows, columns, loops and rings. They experience tensile and compressive forces. There are linear polarizations perpendicular to an axis of rotation as in the centrifugal force of a rotating or orbiting object. There are circular polarization as in compressive forces like gravity. These dipoles, atoms or molecules have opposite ends which are slightly polarized or slightly oppositely charged. This overly bold compact notation, for a very subtle effect, emphasizes their end charge and relationship to their neighbors. In the figures below, the opposite charges of the ends of the dipoles attract each other with tensile forces along a row. The opposite charges in neighbor atoms along columns also attract each other so the rows also experience compressive or flattening forces. This is the origin of the van der Waal's forces, the electrostatic glue that holds atoms into solids, liquids and gases. The Casimir force and its repulsive opposite quantum buoyancy are also due to van der Waal's forces.

3.15 Centrifugal force is parallel to the dipoles

Atoms respond to orbital or planetary rotation with a centrifugal force which is perpendicular to the axis of rotation in figure (16).

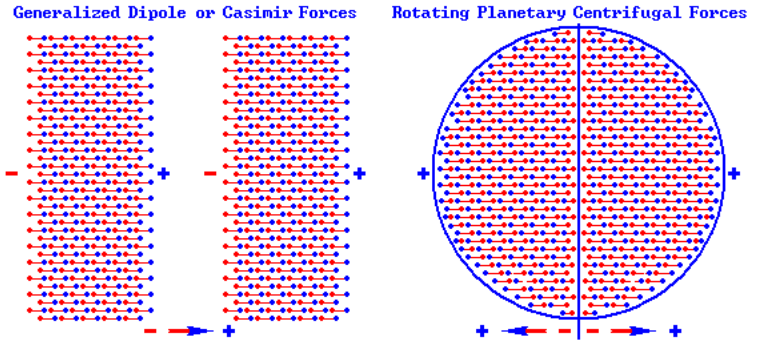


Figure 16: Generalized Dipole Forces

It is always directed away from that axis. The charges due to the centrifugal force are greatest at the equator where the dipole chains are longest, on each side of the axis of rotation.

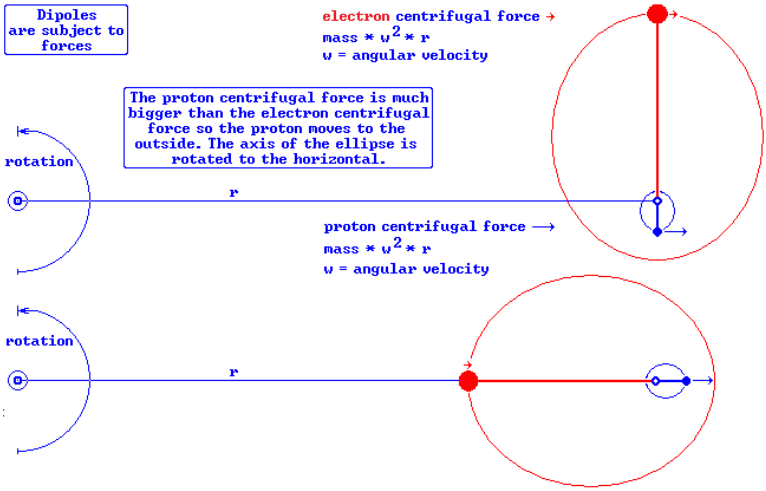


Figure 17: Centrifugal force favors the proton

The centrifugal force of rotation moves the proton slightly away from the center of mass of the atom and the axis of rotation in figure (17). The electron and proton orbits in the atom are elliptical. The atoms are polarized in series and are attracted to their neighbors and the background charge of the Cosmos.

3.16 Loop forces are perpendicular to the dipoles

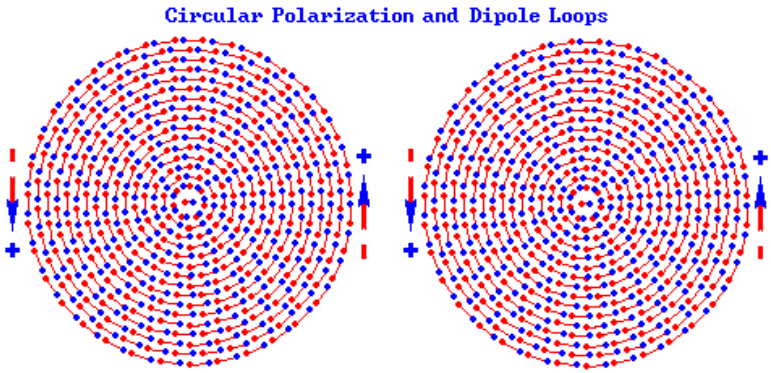


Figure 18: Dipole loops

Electrostatic dipoles can make any shape possible for magnets. Dipoles can make loops just as well as magnets. The loops apply an obvious compressive force. The ends of the individual atomic dipoles tend to line up, opposite charge to opposite charge, around the planet in long dipole loops. The two spheres above attract each other in the same way as oppositely directed columns of magnets in figure (18). Loops can attract or repel. They attract each other when their north poles point in opposite directions and the loops repel each other when their north poles point in the same direction. Dipole atoms or molecules demonstrate the circular polarizations and flattening of gravity in the figure above. There are no open ends on the closed dipole loops. They are loops that wrap around a planet. The dipole loops may extend into the atmosphere, ionosphere, magnetosphere and space. Perhaps, evidence of these extended loops may be found in the aurora borealis.

3.17 On a planetary scale looking only at orbital forces

$C > G$, orbital centrifugal force exceeds the orbital gravitational force in figure (19). The atoms on the night side of the planet, facing away from the Sun, have a positive polarity. This polarization extends across the planet in a very long series dipole. This raises many questions about the solar wind and the plasma sphere of the Earth and any part they might play in electrostatic gravity.

$G = C$, gravity equals the orbital centrifugal force, along the orbit of the planet, near the axis of rotation and the day-night line

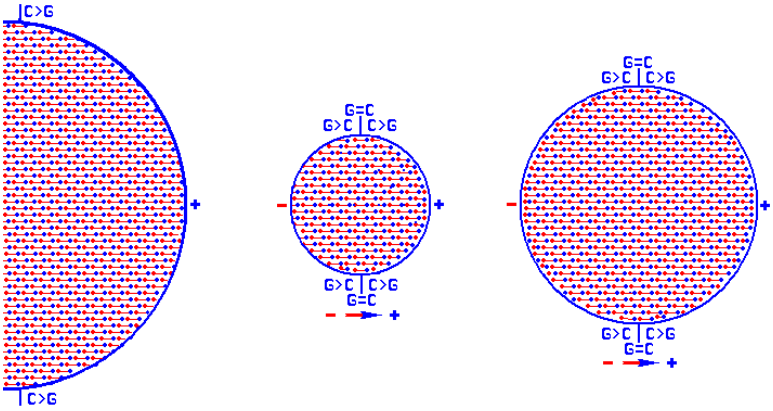


Figure 19: Solar and planetary dipoles

of the planet. This is a neutral axis of equilibrium.

$G > C$, gravity is greater than centrifugal force. The Sun side of the planet has a weak slightly negative polarity. The gravity on the surface of the planet far exceeds the gravity imposed by the Sun. The centrifugal force of rotation usually exceeds the orbital centrifugal force. See planetary data [50].

There is a superposition of solar gravitation and orbital centrifugal force on top of the larger local gravitational force and local rotational centrifugal force. The charges and dipoles of the larger local forces tend to cancel out when seen from a distance. This leaves us with the long series dipoles and their forces seen above. These long series dipoles also extend above the surface into space. This is more complex than our original simple hypothesis of opposite charge in the Sun and planets causing gravity.

The polarized atoms stick together in long rows, rather like magnetic beads making long dipoles. The Suns atoms are polarized in the same direction as the planets. The positive end of a row of atoms in the Sun is attracted to the negative end of a row of atoms in the first planet. The positive end of the row of atoms in the first planet is attracted to the negative end of a row of atoms in the second planet and so on to the other planets. These are series dipoles the width of the planets which can extend into space.

These long series dipoles have large $q \cdot d$ products and proportionally large forces. The force on dipoles is proportional to the $q \cdot d$ product, the charge on the end of the dipole times the length of the dipole, and dE/dx the inhomogeneous electric field caused by similar dipoles in other planetary bodies.

3.18 Circular and Radial Polarizations

Looking at figure (20) we can load a faster animation with 1/20 s between picture frames at [40]. Looking at figure (21) we can load a slower animation with 1/2 s between frames at [41] - allowing easier study of its peculiar motions. Note the right hand spirals and the left hand spirals in the animation.

In figure (20) the dipoles make concentric circles twice in each cycle with opposite polarity. They generate compressive forces along each circle and repulsive forces between pairs of circles. Somewhat like saturns rings or galactic ripples [39].

In figure (21) the dipoles make radial forces twice in each cycle with opposite polarity. Jets would come out of the center. Series dipoles generate much more powerful forces than individual dipole pairs.

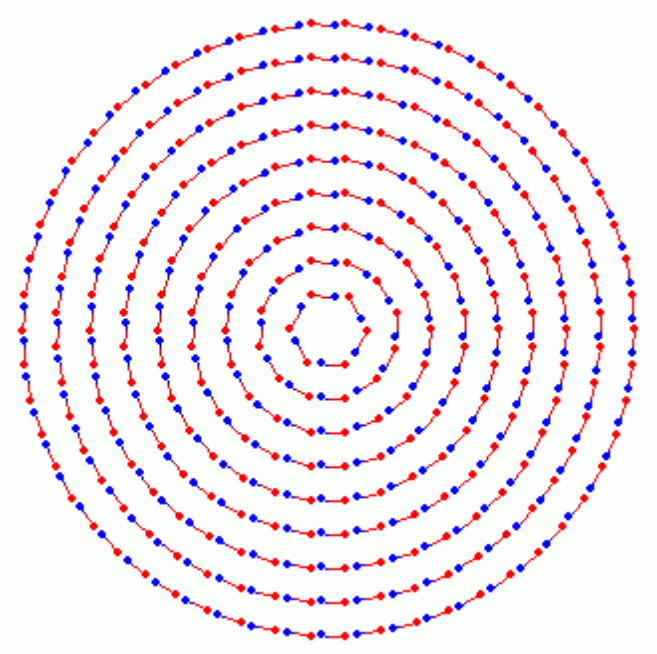


Figure 20: Circular polarization and ripples

3.19 Maynard L. Hill and atmospheric electricity

From an article on his Electrostatic Autopilot [26].

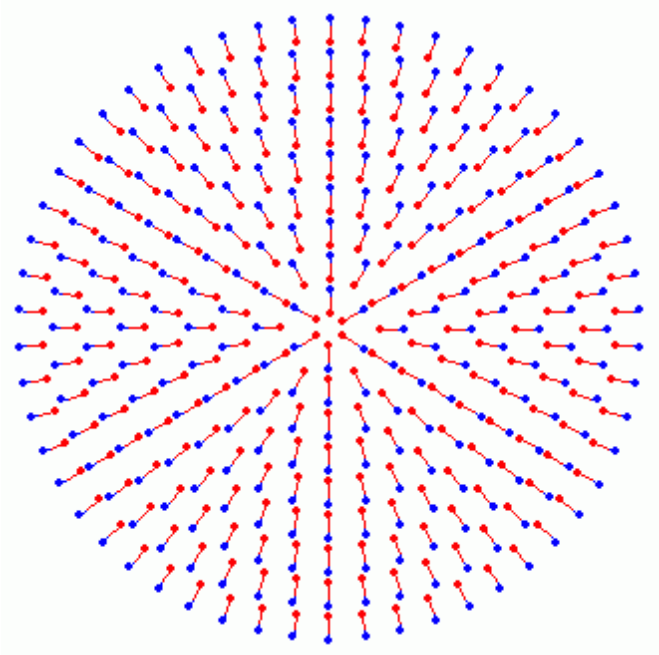


Figure 21: Radial polarization, centrifugal force and jets

"The operating principle of the system are based on two key facets of atmospheric electricity that have been known for a very long time. One is Benjamin Franklin's demonstration in 1752 that lightning transfers large amounts of negative charge to the Earth. The other is Lord Kelvin's analogy, proposed in 1860, that the atmosphere is like a large capacitor where there is a highly conducting layer in the upper atmosphere that acts like a highly charged positive plate, while Earth acts as the negative plate of the capacitor. Through experiments we have shown that there are voltage levels within the atmosphere that are almost as smooth and horizontal as the equipotential planes seen in sketches in college text books describing the electric field between capacitor plates... The upper plate of the capacitor, typically charged to 350 Kv, we will assume resides sufficiently high to permit most air breathing vehicles to fly under it. The capacitor leaks. Based on 2.5E-12 A/m^2 ... 15.6E6 electrons/m^2 s an estimated 1800 amp... world-

wide air-Earth conduction current, we can readily compute that a continuous 630 Mw flow of direct-current flow maintains this potential difference. ... Chalmers clearly says only that thunderstorms transfer negative charge to Earth. But where does the charge come from? Where is the d.c. generator? These questions need an answer."

3.20 A charged capacitor showing its dielectric material

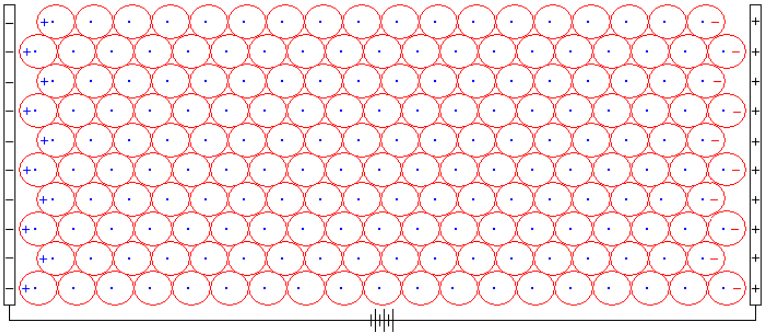


Figure 22: Charged capacitor and dipoles

Using this analogy, the surface of the Earth is at a negative potential on the left plate in figure (22). The right plate is at a positive potential, as is the solar wind. Answering Maynard L. Hill's questions, the charges come from the Sun. The d.c. generator is the solar wind.

3.21 Gravitational refraction of light

This dipole paradigm of gravity is consistent with the index of refraction of gravitation suggested by Eddington in 1920 and currently with a series of papers by Ye and Lin, the authors of, '*A Simple Optical Analysis of Gravitational Lensing*' [27].

They assume that since only vacuum exists between the gravitational masses, vacuum is just a special optical medium which refracts light because of gravity.

However, not usually being encumbered by quantum silliness, thinking the vacuum is a vacuum, I assume that the space between gravitational masses, the vacuum, is filled perhaps at a very low

density - which is all that is required, with polarized molecules, atoms or dipoles.

It should be noted that these dipoles could be part of the missing dark matter. Most dipoles of cold molecular hydrogen are invisible to radio telescopes. Cold molecular hydrogen may be detected in the future as the unseen dark matter. Atoms or molecules can be polarized and can be dipoles. I see that these dipoles, not the vacuum, constitute the optical medium of gravitational lensing.

In another paper,
'*The Deviation of the Vacuum Refractive Index Induced by a Static Gravitational Field*', [28] Ye and Lin calculate the Δn, the change in the index of refraction caused by gravity as,
$\Delta n = 2 \cdot G \cdot mass/(radius \cdot c^2)$. The right side is familiar.
See Schwarzschild black holes [8].
4.24E-6 on the surface of the Sun and
1.39E-9 on the surface of the Earth. The index of refraction caused by gravity is one plus these tiny increments.

3.21.1 Light bends in the electric and magnetic field of the dipoles. The dipoles cause gravity and bend the light

Radio telescopes can detect the atomic hydrogen at 21 cm, if it is dense enough along their line of sight. Cold molecular hydrogen which is more stable and more common is unfortunately mostly invisible at radio wavelengths.
See Marmet [29] or Sky and Telescope [30]. The numbers from Ye and Lin need to be linked with the dipoles.

The atmospheric density at the surface of the Earth is:

$$\frac{1.225 \frac{kg}{m^3}}{0.02846 \frac{kg}{mol}} = 43.04 \frac{mol}{m^3} \tag{3.1}$$

Multiply by Avogadro's number.

$$43.04 \frac{mol}{m^3} 6.022E23 \frac{particles}{mol} =$$

$$2.592E25 \frac{particles}{m^3} \; or \; 295.9E6 \frac{particles}{meter}. \tag{3.2}$$

These dipoles are $3.379E\neg 9 \cdot m$ apart.

Gravity cause these $295.9E6 \frac{particles}{meter}$ to change the index of refraction by 1.39E-9. Each particle or dipole cause a change in the index of refraction of 4.696E-18.

The index of refraction change is caused by the density of the dipoles per meter.

By adjusting the phase of parallel beams of light, as seen in, helical electromagnetic waves [2], rotating the polarization, the beams may be made to attract or repel each other. This is demonstrated in this Nature [32] article or this Discover [33] article.

3.22 Precession of ellipses into ellipsoids in atoms

Atomic scale ellipses with oppositely charged ends precess into ellipsoids. See Precession in atoms [17]. The electrostatic torque, imposed on the elliptical dipoles of the atoms along their length by the other series dipoles, causes a perpendicular precession of the elliptical orbits of the electron and proton into ellipsoids which rotate like beads on a string. We see atoms as spherical not as orbiting in a plane like the planets. The interaction of charges cause forces. The radial movements of the charges also generate forces, currents and magnetic fields.

3.23 Origins of flux by Thomas L. Martin Jr.

in the '*Physical Basis for Electrical Engineering*' [36]

> "It now becomes convenient to assign a synthetic reality to the flux lines, although they are a creation of the mind only and do not exist physically, it is convenient to assume that flux lines do exist and to use them to describe the regions about charged bodies. Thus, we assume the following statements are true:
>
> - Charged bodies are the sources of lines of electric flux.
> - Flux lines emanate from bodies carrying positive charge.
> - Flux lines terminate on bodies carrying negative charge.
> - The flux lines are directed parallel to the force exerted on a positive test charge.
> - The total number of flux lines associated with a charged body is proportional to the flux density and test charge.
>
> The flux lines are used to represent systematically the flux about a charged body.

The flux and charge are really just two different ways to describing the same phenomenon.

The charge q describes the properties at a point.

The flux and flux density describe the properties some distance away from the point occupied by q.

Thus flux and q are just different manifestations of the same physical quantity, so electric flux = q."

"It is convenient to picture the insulator as being full of dipoles randomly oriented by thermal Brownian motion under normal conditions.

When an electric field is applied, we assume that it causes the dipoles to rotate until they come into alignment with the electric field. Actually, all of the dipoles in the material may be induced and present only when the electric field is applied.

In so doing they produce new lines of flux, and induce additional charges on the capacitor plates. This causes the total accumulated charge q' on each plate to be larger than the vacuum case without the dielectric even though the potential difference remains the same.

qi = induced charges

q' = q + qi, the new value of the charge.

C' = q'/V = (q + qi)/V, the new value of the capacitance.

This capacitance is larger than that obtained with vacuum between the plates.

When some insulating material is included between the plates of a capacitor, the situation depicted above in figure (22) results. You can easily see that the extent of increase of the capacitance is controlled by the character of the insulating material between the plates.

The capacitance increases as the density of dipoles increase because this raises the number of induced charges.

$Dv = \epsilon_0 \cdot E$, flux density in vacuum,

$$\frac{charge}{area} = \frac{charge^2}{force \cdot area} \frac{force}{charge}. \tag{3.3}$$

$Dm = \epsilon_m \cdot E$, flux density in dielectric,

ϵ_m is the dielectric constant of the dielectric material between plates.

Dm = Dv + Dp,

flux density in vacuum + flux density from dipoles.

$\epsilon_m \cdot E = \epsilon_0 \cdot E + Dp$,
$\epsilon_m = \epsilon_0 + \frac{Dp}{E}$,
divided by E the electric field intensity.
$kr = \frac{\epsilon_m}{\epsilon_0} = 1 + \frac{Dp}{Dv}$,
divided by ϵ_0.

The ratio of the capacitance obtained with some insulating material between plates to the capacitance with vacuum insulation is the relative dielectric constant kr."

$kr = \frac{C'}{C} = \frac{q+qi}{q} = 1 + \frac{qi}{q} = \frac{\epsilon_m}{\epsilon_0} = 1 + \frac{Dp}{Dv}$
For vacuum the relative dielectric constant kr is equal to one.

For water the relative dielectric constant kr = 78 at zero frequency. The force between capacitor plates is divided by kr = 78 when the space between the plates is filled with water.

At optical frequencies of 10E14 to 10E15 hertz the kr = 2 for water.

Conductors are infinitely polarizable so their kr approaches infinity at zero frequency.

At the higher frequencies of the atomic dipoles, 6E15 hertz, there is an increased force between the charges.

We take from this that charge is induced by the presence of a dielectric in a potential field. The dielectric is an array of dipoles. We have forces due to induced charges and forces due to long series dipoles.

Some of these induced charges, those that are caused by the polarization of gravity, are the gravitational charges we have been looking for.

Charges induced by dipoles have an attractive force proportional to the inverse square of distance and can therefore be the source of gravity.

The dielectric is a grouping of dipoles. The dielectric induces charges as the dielectric becomes polarized by the potential field of the voltage. The dielectric induces charges as the dielectric becomes polarized.

Dipoles have an attractive force proportional to the inverse forth power of distance so individual dipoles can not be the source of gravity. It is the long series of dipoles which generate the inverse square force between the masses.

Long series dipoles have large $q \cdot d$ products and proportionally large forces. The force on dipoles is proportional to the $q \cdot d$ product, the charge on the end of the dipole times the length of the dipole, and dE/dx the inhomogeneous electric field caused by similar dipoles in other masses.

The radial movements of the charges in figure (26), also generate forces, currents and magnetic fields. Other atoms would only see an oscillating electric flux. An oscillating charge is an oscillating electric flux which can produce an oscillating magnetic flux which can produce an oscillating electric flux which is the same as a flux of charge. It takes a finite amount of time or delay for an electric flux to transform into a magnetic flux or vice versa. Induction takes time. The sum of these delays, which are proportional to frequency, are what causes the speed of light. The speed of light is the speed of light. The speed of light is caused by the rate at which the electric and magnetic fields sequentially advance and transform into each other. Forces are transmitted near instantly. See Helical Electromagnetic Waves [2].

3.24 Characteristics of the electron-proton pair

$$D = charge\ density = \frac{charge}{area\ of\ sphere} = \frac{q}{4\pi r^2} \tag{3.4}$$

for a charge q and sphere of radius r.

$$E = \frac{D}{\epsilon_0} = \frac{force}{charge} = \frac{volts}{meter} = \frac{q}{4\pi\epsilon_0 r^2} \tag{3.5}$$

E is the electric field strength.

$$permittivity = \epsilon_0 = \frac{charge^2}{force{\cdot}\, area\ of\ sphere} \tag{3.6}$$

$$force = q{\cdot}\, E = \frac{q^2}{4\pi\epsilon_0 r^2} \tag{3.7}$$

The force is between two charges q like an electron and proton in a Bohr atom or a dipole. $E{\cdot}\, q$, the force exerted by an electric field E on a charge q. The electric field of one charge pushes or pulls on the other charge. The distance between the charges is r.

$$energy = \frac{q^2}{4\pi\epsilon_0 r} \tag{3.8}$$

The energy is a scalar like temperature. As the attracting charges approach each other r decreases and the energy goes up. The energy is zero when the charges are infinitely far apart. Energy is stored in the force between the charges.

$$E = \frac{q}{4\pi\epsilon_0 r^2} = \frac{force}{charge} = \frac{volts}{meter} \tag{3.9}$$

$$\frac{q}{4\pi\epsilon_0 r} = \frac{energy}{charge} = volts \tag{3.10}$$

A voltage V is measured at a distance r. The voltage increases as r decreases.

$$V = \frac{c_e}{4\pi\epsilon_0 r_c} = \frac{m_e \cdot c^2}{c_e} = 510999 \frac{kg \cdot m^2}{A \cdot s^3} \tag{3.11}$$

Here $r = r_c$ the classical radius of the electron.
$q = c_e$ the charge of the electron.
The rest energy of the electron is $.5 \cdot million \cdot electron \cdot volts$.

$$r_c = classical\ radius\ of\ the\ electron = \frac{c_e^2}{4\pi\epsilon_0 \cdot m_e \cdot c^2} \tag{3.12}$$

$$m_e \cdot c^2 = rest\ energy\ of\ the\ electron = \frac{c_e^2}{4\pi\epsilon_0 r_c} \tag{3.13}$$

$$V = \frac{c_e}{\frac{4\pi\epsilon_0 r_c}{\alpha^2}} = 27.21 \frac{kg \cdot m^2}{A \cdot s^2} \tag{3.14}$$

Half of this is 13.6 V, the ionization voltage of the electron when r $= r_c/\alpha^2$ the smallest Bohr orbit.

$$C = capacitance = \frac{q}{V} = \frac{c_e}{V} = \frac{charge}{voltage} = \frac{charge^2}{energy} = Farads \tag{3.15}$$

If C $= 4\pi\epsilon_0$r then the Farads increase with r the distance between the charges.

$$C = \frac{4\pi\epsilon_0 r_c}{\alpha^2} = 5.888E\neg 21 \frac{A^2 \cdot s^4}{kg \cdot m^2} \tag{3.16}$$

If r $= r_c/\alpha^2$ the smallest Bohr orbit. q $= C' \cdot V'$.

While the charges separate in the dipole, the Farads increase with r while the internal voltage decreases. The charge stays the same without any external voltage.

q + qi $= C' \cdot V'$. qi = induced charges.

However, if while the charges separate an external voltage an energy/charge from other atoms is applied, then the charge is increased since the energy is increased.

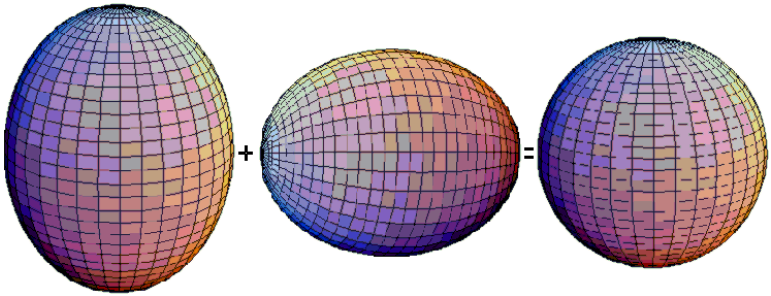


Figure 23: Variable shapes of dipoles

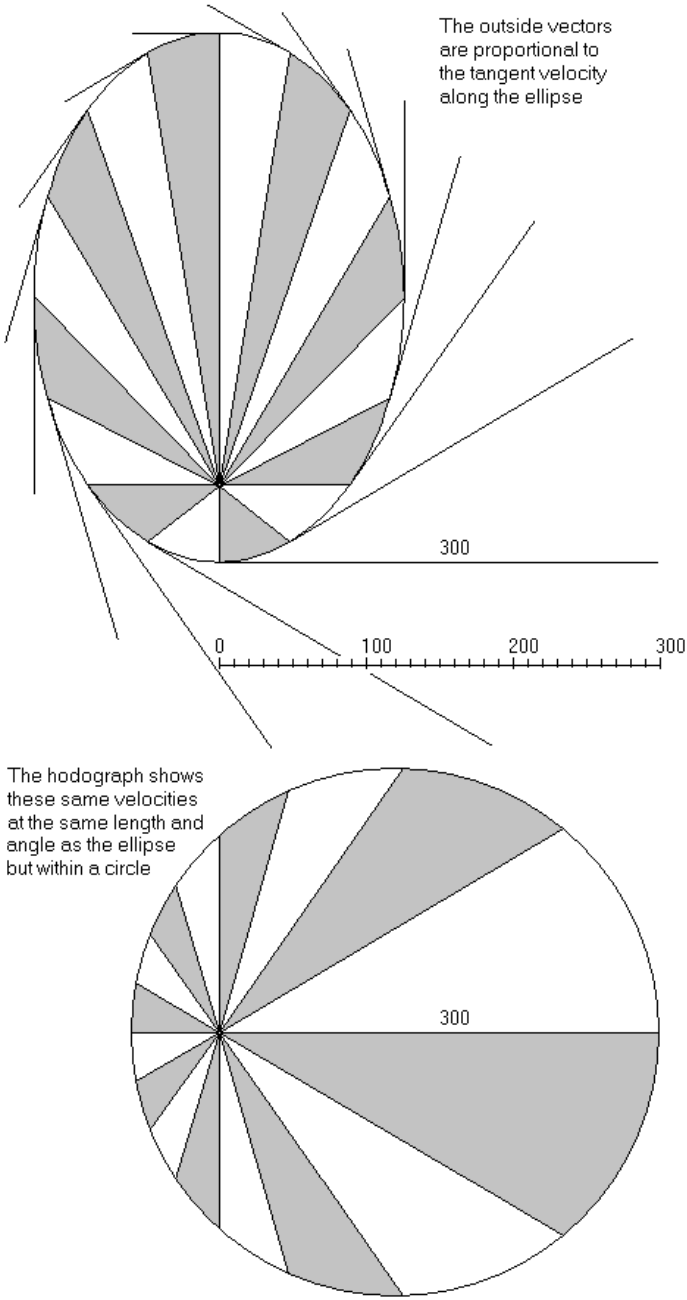
3.25 Atoms modeled as bipolar ellipsoids and sphere

On the left in figure (23), centrifugal force stretches the atom. Inertial centrifugal force pulls the proton away from the center of its atom which polarizes the atom proton out or on a planetary scale facing away from the Sun. This stretches the atom vertically here. The inhomogeneous charge density of the elliptical orbit traced out by the electron and proton within the atom leaves the atom with elliptical ends with opposite charges. These opposite charges attract each other into long rows with charged ends just like series iron filings on magnets. We have loop dipole forces and series dipole forces which work together to create planetary forces.

In the middle in figure (23), gravity flattens the atom. In a similar but perpendicular argument to centrifugal force, gravity causes atoms to become flattened into bipolar ellipsoids. Their charged ends are perpendicular to the gravitational force and they are parallel to the surface of the planet. They are the result of being flattened not stretched. The oppositely charged ends of atoms flattened by gravity attract their neighbors and they assemble into concentric rings of atoms. The rings are like lines of latitude which wrap around the planet. The rings are parallel to the surface of the planet. These rings have no exposed ends so their charge is mostly hidden in the rings.

On the right in figure (23), when the centrifugal force equals the gravitational force the atoms are spherical. There is an equilibrium between the orbital centrifugal and gravitational forces, along the orbital path, like the astronauts in free fall in space, their polarizations cancel and they become unpolarized spherical atoms. They are almost free of both gravity and centrifugal force. When there are no accelerations the atoms are nearly spherical. They are al-

ways subject to inertia, $force = mass \cdot acceleration$, because any acceleration polarizes their atoms with respect to the background universe. Does this mean the background universe is charged? Indubitably! This is a charged example of Mach's principle.



Ellipse tangent velocity and hodograph

4 Dipole forces

The force between isolated charges is greater than the force between low eccentricity dipoles except when the dipoles are close together.

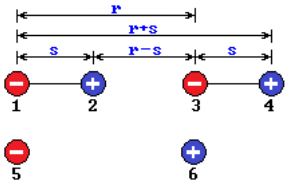


Figure 24: Forces between dipoles and isolated charges

$$s = 1.058E\neg 10 \cdot m, \approx two\ times\ the\ Bohr\ radius$$

The force between charges, 5 and 6, and dipoles, 12 and 34, are equal when, r $\approx$ 4.439 times s. When r is less than this the dipoles are stronger than the charges. When r is greater than this the charges are stronger than the dipoles.

The average density of the Cosmos is $\approx$ 10 *protons per* m^3 = 2.15 *dipoles per meter or* .464 *meters apart*. Isolated charges are 10,964,085,005 times stronger than the dipoles.

In the interplanetary medium, in the vicinity of the Earth [35], 5 *particles per* cc^3 = $5E6$ *per* m^3 = 171 *dipoles per meter* for a spacing of $r = .00585 \cdot meters$. r is the distance between the dipoles. The force of isolated charges here is 13,823,251 times that of a dipole pair.

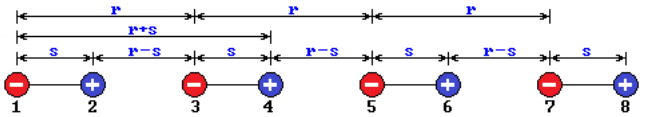


Figure 25: Force between dipoles

$$r = .00585 \cdot m$$

$$\frac{c_e^2}{4\pi\epsilon_0} = 2.3070795551E\neg 28 \frac{kg \cdot m^3}{s^2}$$

The attractive forces between charges 1 & 4 and 2 & 3, equals the repulsive forces between 1 & 3 and 2 & 4

$$force1 = \frac{c_e^2}{4\pi\epsilon_0}\left(\frac{1}{(r+s)^2} + \frac{1}{(r-s)^2} - \frac{2}{(r)^2}\right) =$$

or

$$force1 = \frac{c_e^2}{4\pi\epsilon_0}\left((r+s)^{\neg 2} + (r-s)^{\neg 2} - 2\cdot(r)^{\neg 2}\right) =$$

$$= \frac{c_e^2}{4\pi\epsilon_0}\cdot 0.00199798576796\frac{1}{m^2} \tag{4.1}$$

The force between two opposite charges, not dipoles, r apart is :

$$\frac{c_e^2}{4\pi\epsilon_0}\cdot\left(\frac{1}{r^2}\right) = \frac{c_e^2}{4\pi\epsilon_0}\cdot 29,220.5420411\frac{1}{m^2} \tag{4.2}$$

The force between opposite charges, equations (4.2)/(4.1) is 14,625,000 times larger than the dipole force.

The attractive forces between charges between charges 1 & 6 and 2 & 5, equals the repulsive forces between 1 & 5 and 2 & 6

$$force2 = \frac{c_e^2}{4\pi\epsilon_0}\left((2r+s)^{\neg 2} + (2r-s)^{\neg 2} - 2\cdot(2r)^{\neg 2}\right) =$$

$$= \frac{c_e^2}{4\pi\epsilon_0}\cdot 0.000249748221904\frac{1}{m^2} \tag{4.3}$$

$$force2 = \frac{force1}{2^3} = \frac{force1}{8} \tag{4.4}$$

The attractive forces between charges between charges 1 & 8 and 2 & 7, equals the repulsive forces between 1 & 7 and 2 & 8

$$force3 = \frac{c_e^2}{4\pi\epsilon_0}\left((3r+s)^{\neg 2} + (3r-s)^{\neg 2} - 2\cdot(3r)^{\neg 2}\right) =$$

$$= \frac{c_e^2}{4\pi\epsilon_0}\cdot 7.39994748074E\neg 5\frac{1}{m^2} \tag{4.5}$$

$$force3 = \frac{force1}{3^3} = \frac{force1}{27} \tag{4.6}$$

The forces decrease with the third power of the center-to-center distance r. We can sum the forces: $force1 + force2 + force3 + \cdots$

$$force1\cdot\left(\frac{1}{1^3}+\frac{1}{2^3}+\frac{1}{3^3}+\frac{1}{4^3}+\frac{1}{5^3}+\frac{1}{6^3}+\cdots\right)=force1\cdot 1.202008$$

$$force1\cdot\left(1+\frac{1}{8}+\frac{1}{27}+\frac{1}{64}+\frac{1}{125}+\frac{1}{216}+\cdots\right)=force1\cdot 1.202008 \tag{4.7}$$

The forces add up so the total force is
force1+force2+force3+$\cdots force100 = force1\cdot 1.202008$
force1+force2+force3+$\cdots force1000 = force1\cdot 1.20205640677$
The sum of the forces add up slowly. It is only 1.202008 after the first 100 series dipoles.

4.0.1 Force decreases as the dipoles become shorter

Looking at figure (25). In the following four examples:
$r = .01\cdot m$, the dipoles are a centimeter apart, center to center.
s is the length of the dipole from electron to proton.

$$When\ s = .00001\cdot m\ then\ the\ force = k\cdot .06\frac{1}{m^2}$$

$$When\ s = .000001\cdot m\ then\ the\ force = k\cdot .0006\frac{1}{m^2}$$

The electron-proton dipoles are 10000 times smaller at $1E\neg 10\ m$ so

$$\frac{s}{10}=\frac{force}{100}\ so\ \frac{s}{10000}=\frac{10\cdot force}{100\cdot 10000}=\frac{force}{100000}=k\cdot\frac{.0006}{100000}\frac{1}{m^2}=$$

$$k\cdot 6E\neg 9\frac{1}{m^2}=\frac{q^2}{4\pi\epsilon_0}\cdot 6E\neg 9\frac{1}{m^2}=2.301E\neg 24\frac{kg\cdot m}{s^2} \tag{4.8}$$

The acceleration is force/mass.

$$2.301E\neg 24\frac{kg\cdot m}{s^2}*\frac{1}{proton\ kg}=$$

$$2.301E\neg 24\frac{kg\cdot m}{s^2}*\frac{1}{1.6726219E\neg 27\ kg}=1377.478\cdot\frac{m}{s^2} \tag{4.9}$$

The velocity is calculated from the centrifugal force equals the electric force.

$$\frac{mass \cdot velocity^2}{radius} = 2.301E\neg 24 \frac{kg \cdot m}{s^2}$$

$$velocity = \sqrt{2.301E\neg 24 \frac{kg \cdot m}{s^2} \cdot \frac{radius}{mass}} \tag{4.10}$$

The radius is s, for the electron and s/1836, for the proton.
The constants of motion:
$specific\ mechanical\ energy\ per\ unit\ mass =$
$E = v^2/2 - G(m + M)/r.$
$specific\ angular\ momentum = h = r\ cross\ v$

4.0.2 Force increases as the orbit goes from perigee to apogee

See figures (27) and (28). The Bohr radius is $\frac{r_c}{\alpha^2}$.

$s = Bohr\ radius = \frac{r_c}{\alpha^2} \approx 50E\neg 12\ meters.$

The eccentricity of the orbit is e.

The apogee distance, sa, $\frac{r_c}{\alpha^2} \cdot (1 + e) \approx 50E\neg 12 \cdot m \cdot (1 + e)$.

The perigee distance, sp, $\frac{r_c}{\alpha^2} \cdot (1 - e) \approx 50E\neg 12 \cdot m \cdot (1 - e)$.

The s distance at apogee, sa, is greater than the s distance at perigee, sp, so the length of the dipole and forces are greater at apogee.

4.0.3 Force increases as the eccentricity increase

If the eccentricity is zero, e=0, then, sa/sp=1. The orbit is circular. There is no force or charge difference between apogee and perigee. There is no polarization of charge or force. As the eccentricity increases, the s distances increases so, the forces increase.

If the eccentricity is:
e=.0025, then the force ratio, $sa/sp \approx 1.01$. The force at apogee is one percent stronger than at perigee.
e=.025, then the force ratio, $sa/sp \approx 1.10$. The force at apogee is ten percent stronger than at perigee.
e=.25, then the force ratio, $sa/sp \approx 2.825$. The force at apogee is 2.825 times stronger than at perigee.
e=.50, then the force ratio, $sa/sp \approx 9.35$.
e=.75, then the force ratio, $sa/sp \approx 51.6$.
There is a dramatic increase in the ratio of forces, sa/sp, with eccentricity, as a orbit becomes more elliptical.

5 Gravity is caused by pulsed in-line forces

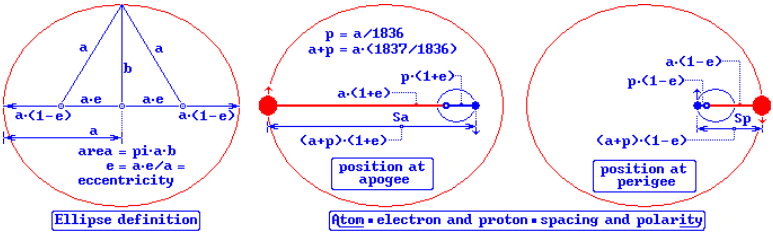


Figure 26: Dipole Spacing

The electrons and protons in an atom are most separated when they are at apogee in the middle drawing in figure (26). They are least separated when they are at perigee in the drawing on the right in figure (26). When the electrons are at apogee the protons are also at apogee on their own much smaller elliptical orbit. The electrons and protons are moving slower when they are at apogee.

5.1 Position at apogee

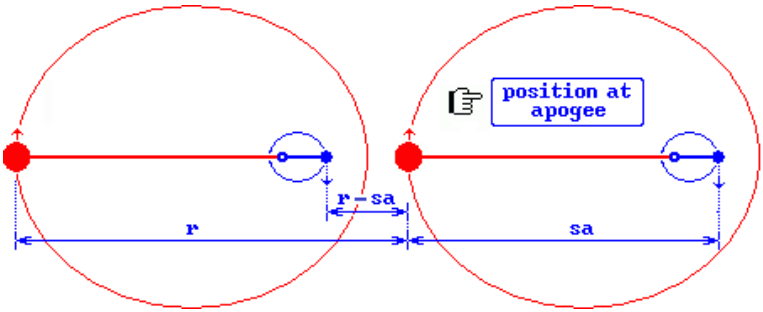


Figure 27: Position at apogee

See figures (27) and (28). The dipoles are rotating in phase like the always moving hands of two clocks. See the animation at [37] and [38]. The attracting electrons and protons are moving in opposite directions. They pass each other moving very fast and align for only a moment when passing. The momentary alignment generates a very short pulse of force when the dipoles line up in series.

The force increases with the length of sa and sp.

The forces between neighbor atoms are stronger at apogee.

The charges are moving slower at apogee than at perigee. See figure (3.25).

The dipoles line up for a longer period of time at apogee.

The duration of the pulse of force is longer at apogee.

The electron in one atom is closer to the proton in the next atom when they are at apogee.

These pulsed Coulomb force equations are of the form, $c_e^2/(4\pi\epsilon_0 r^2)$, where r is the center to center distance between the atoms. c_e is the charge of the electron or proton. ϵ_0 is the permittivity. e is the eccentricity of the ellipse.

5.2 Position at perigee

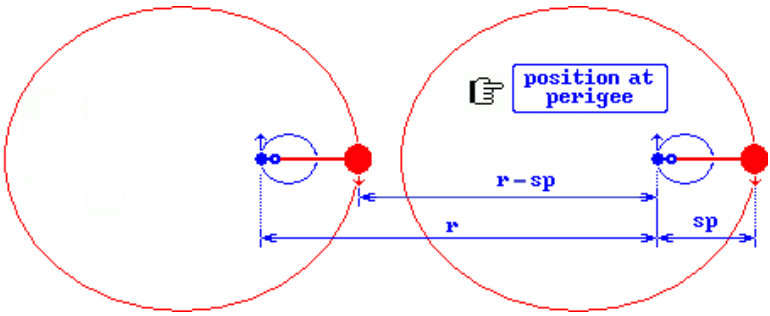


Figure 28: Position at perigee

The dipoles are rotating in phase like the always moving hands of two clocks in figure (28). See the animation at [37].

Electron-electron and proton-proton repulsive forces are not pulsed. They are continuous.

force = -acceleration mass, as the charges approach apogee, their tangent and radial velocity decrease so the acceleration is negative.

force = +acceleration mass, as the charges approach perigee, their tangent and radial velocity increase so the acceleration is positive.

5.3 Why is gravity so weak?

Looking at figures (27) and (28). The forces on both the top and bottom of the axis of symmetry of the ellipses are equal and opposite so they cancel.

The only points where the orbital forces do not cancel is at the points of inflection.

The rate of change in orbital and radial velocity are zero at apogee and at perigee. The acceleration of the charges go through zero and change sign so there is a point of inflection.

d/dt(length) = velocity = m/s

d/dt(velocity) = acceleration = m/s^2

d/dt(acceleration) = jerk = m/s^3

The charges jerk at the points of inflection. We feel the jerk of a train or when driving as we hit the brake pedal and then the gas pedal to go around a corner.

Does the Cosmos jerk? Indeed, it does.

A jerk m/s^3 times a duration s equals an acceleration m/s^2 times the mass kg equals a force kg$\cdot m/s^2$.

It is this tangent jerk of the orbiting atomic charges which causes a perpendicular and radial gravitational force when they jerk in concert with another similarly oriented dipole.

A tangent velocity vt causes a perpendicular and radial centrifugal force kg$\cdot vt^2$/r and a radial acceleration.

We have a pulse of force, an impulse, when the acceleration of charge is zero, when the charges jerk, at both ends of their orbit. These pulses of force are oppositely directed.

Near perigee the charges accelerate and then decelerate.

Near apogee the charges decelerate and then accelerate.

Short interaction times of forces causes the weakness of gravity. Gravity is pulses of force when the dipoles line up momentarily in series.

These forces are weak because the dipoles primarily interact only when they are in a line.

They are only in a line for a moment twice in each revolution of the binary pair when they produce momentary pulses of force along the line of interaction.

The chance of two dipoles lining up long enough to produce a charge of ce is 1/1.111E18. Each dipole, when aligned with its parner, produces c_e/1.111E18 of pulsating charge which we see as gravity and inertia.

The distance apart for the electron and proton on their elliptical orbits vary. The force between series dipoles is strongest when the chain of dipoles is longest and when the dipoles are most elliptical.

The dipoles are rotating at 6E15 hertz. The attracting electrons and protons are moving in opposite directions. They pass each other at 6E15 hertz squared.

If we say the dipoles align for 1/20 of a degree in each revolution

or 1/7200 of a revolution. Then we have,

$$\frac{1}{7200^2}\ \frac{1}{6.57E15^2} = \frac{1}{2.242E39} \tag{5.1}$$

This is the ratio of gravitational to Coulomb forces.

Gravity is so much weaker than electrostatic force because of the short duration of the in-line interaction of the pulses of force between the in-phase series dipoles.

5.4 Memories

Do you have memories of centrifugal force as a child? Of being slung out from the center of a merry-go-round, while you held on for dear life? Centrifugal force polarized your atoms. It was the charge of the Cosmos that tried to throw you from the merry-go-round. Our polarized atoms holds us to the Earth. This is a profoundly small polarization of charge in each atom. Small charges produce big forces.

5.5 Does this answer the big questions?

Is mass due to gravitational charge?

Is inertia due to gravitational charge?

When atoms are accelerated, are they polarized proportional to the acceleration, with this acceleration polarization opposed by the gravitational charge of the universe?

Is centrifugal force the pull of the background universe on the atoms polarized by the acceleration of rotation? It does seem possible.

Inertia and mass are related to gravity. Linking charge, gravitation and centrifugal force together is particularly important. These three bedrocks of physics were previously unrelated. Can this be proved?

Atoms stick together like magnets. An atom has neighbors. The neighbor atoms impose an electric force. Atoms become bipolar with oppositely charged ends when they are subjected to forces.

The atoms along an axis of attraction or acceleration, increase in length and decrease in diameter, as they become ellipsoid. This is an increase in mass along that axis and a decrease in mass perpendicular to the axis.

The atoms become ellipsoid as they are stretched, forced or flattened. As masses are moved there is gravitational energy stored in the space between the ellipsoid atoms or the gravitational energy may be stored within the atom by the separation of the charges.

The charged ends on one atom attracts the oppositely charged ends of its neighbors. This is like capacitors. Two oppositely charged plates attract each other, store energy and make a capacitor. The atoms with charge neutrality are not capacitors. They are inert like parallel plate capacitors without a battery.

The bipolar atoms act like capacitors with a tiny charge. The tiny charges have Coulomb forces. The forces adds up to gravity. Does this mean that gravity is a bulk property of atoms? Does anything smaller than an atom experience gravity?

Particles have no gravity. There is no gravity. There is only charge. What we call gravity is a group property of charged orbiting particles. Quarks are also charged orbiting particles. This view of nature has many consequences which need to be explored.

6 Anti-matter attraction and repulsion

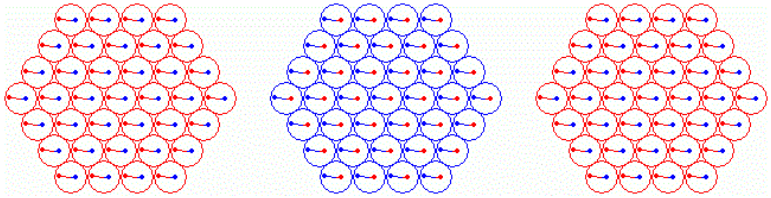


Figure 29: Anti-matter

The outer blobs are matter in figure (29). The middle blob is antimatter. The rotation of the dipoles are in-phase and share a common phase angle. See the animation at [42]. The matter dipoles attract each other in-series and repel the antimatter. The antimatter dipoles attract each other in-series and repel the matter. Antimatter would be repelled to the edge of the Cosmos. A natural segregation of matter and antimatter. CERN has isolated anti-hydrogen. I look forward to the identification of the gravitational repulsion of matter and antimatter in the next ten years if the dipole charges in anti-matter are opposite those of ordinary matter. How does inertia work with anti-matter?

6.1 Out-of-phase matter attraction and repulsion

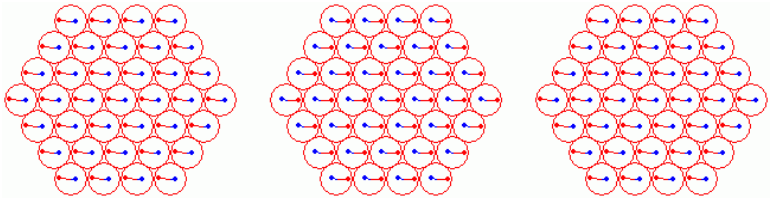


Figure 30: Out of phase matter

These are blobs of matter in figure (30). The middle blob is out-of-phase with the other blobs. The outer matter dipoles attract each other in-series and repel the out-of-phase matter in the center. See the animation at [43]. This repulsion is the same as that shown by the antimatter above. You can see that the right amplitude of out-of-phase matter would cancel the attractive force

of the matter leading one to contemplate the shielding of gravitational and electrical forces.

7 The future? Shielding of Mass and Inertia

Since the forces of gravity and inertia are caused by the oscillating forces between charges, it is possible to shield for the forces. It is easy to shield for electromagnetic waves inside a conductive can. Shielding forces between dipoles is not so trivial because of the very high frequencies involved and because all the dipoles are in phase like the hands of two clocks. Only momentarily, twice in each revolution, do the dipoles line up. Gravity is the result of these momentary pulses of attraction when the dipoles line up at apogee. Any device to cancel gravity must be 180 degrees out of phase with the dipoles causing gravity. It has the polarity of its dipoles reversed relative to the gravitating bodies. Atoms absorb and emit energy in photons at a certain frequency. Our technology is in the terahertz or 1E12 hertz range. We will need 6 petahertz or 6E15 hertz. If Ray Kurzweil and Moore's Law are correct we can reach the 6 petahertz required for usable oscillators to operate at the atomic frequency around 2024. A 6 petahertz frequency applied to a dielectric inside a plate capacitor with the right amount of oscillating charge, polarity and phase on the plates might cancel the oscillating charge caused by the Sun, Earth and background universe. When the oscillating charges in the capacitors are inverted and balanced by a phase locked loop, the effect of gravity and inertia might be shielded, reduced or eliminated. One might reduce the shielding in a certain direction and be attracted in that direction. We hope it can run a space ship. We are at the plate capacitor oscillator stage. An advanced technology could do the same thing with a tiny box.

7.1 Machines and gravity

In a machine of the type in figure (31), the machine could not survive the failure of their shielding mechanism at high velocity. If it failed the ship could go from a residual mass of a few grams to a mass of thousands of kilograms in the time it takes for the circuit to fail. When a fuse blows, the ship disappears like a nuke. An unpleasant fact is that the space ships could be used as a bomb if the pilots went nuts and were willing to kill themselves and us. The ships could be accelerated to the speed of light and crashed into the Earth. Their ten thousand kilograms would become a mass times c squared extinction event. Hiroshima generated 5E10 joules. This would be 9E20 joules. This is eighteen billion Hiroshima's. So

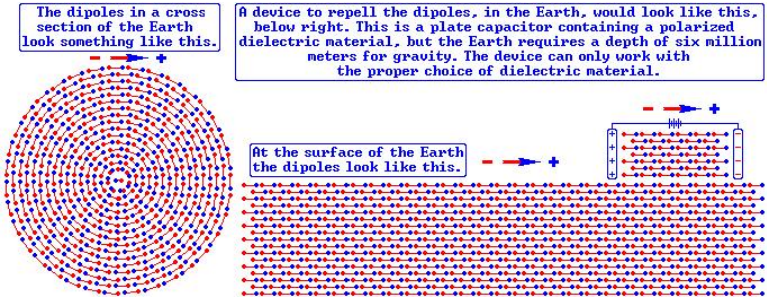


Figure 31: Anti-gravity machine?

much for the progress of man, unlimited energy and for exploring space by shielding of mass and inertia.

d/dt(—) is the rate of change of whatever is in the parenthesis. When you see,
force = d/dt(—) say,"force equals the rate of change of —".
Newton said force is the rate of change of momentum.

$$force = \frac{d}{dt}(momentum) \tag{7.1}$$

"force equals the rate of change of momentum." and
$momentum = mass \cdot velocity.$
It is written in several ways with mass and velocity separated.

$$force = \frac{d}{dt}(mass \cdot velocity) \tag{7.2}$$

"force equals the rate of change of, mass times velocity."

$$force = mass \cdot \frac{d}{dt}(velocity) \tag{7.3}$$

"force equals the mass times the rate of change of velocity."

$$force = mass \cdot acceleration \tag{7.4}$$

Acceleration is the rate of change of velocity.

$$force = \frac{d}{dt}(mass) \cdot velocity \tag{7.5}$$

"force equals the rate of change of mass, times velocity."
This is how conventional rockets work, by the rate of change of mass times velocity, dumping high speed mass out the back. If

there is a huge change in mass in seconds then there is a gigantic acceleration which rips the ship apart. We can write,

$$force = force$$

$$mass \cdot acceleration = \frac{d}{dt}(mass) \cdot velocity$$

If all the mass becomes unshielded in a hundredth of a second, and the velocity is c/100 then

$$mass \cdot acceleration = \frac{mass}{0.01 \cdot second} \frac{c}{100} \tag{7.6}$$

the mass cancels,
$acceleration = 300 \cdot million \cdot meters/second^2$.
The acceleration of gravity on the Earth is $9.8 \cdot meters/second^2$. This acceleration is 30 million times the gravity of Earth. A severe flattening and nuclear event occurs.

7.2 Using shielding of mass and inertia

When you push something to get it going or to stop it, it is accelerated. Inertia is at work. It is the gravitational mass of the universe which pushes back against the acceleration. What else could there be to push back? A residual mass is the mass that is left when the mass is shielded. It is the mass available for inertia to act against. It is the mass that would be used to calculate the force if the mass is shielded. A shielded mass has the kinetic energy of the residual mass times half the velocity squared. We have a small mass and kinetic energy with a residual shielded mass, and a huge mass and kinetic energy with an unshielded mass at the same velocity. If the shielding fails at velocity, there is a huge increase in energy. Its not nice to fool mother nature. Nature responds quickly to the sudden appearance of a fast moving mass without the proper kinetic energy. It is a vaporization event.

Particles can be easily accelerated inside the shielded ship since they have no mass and no inertia. Ionized gases are easily accelerated to the speed of light when they have no mass. When they acquire mass upon leaving the shielding of the ship the particles turn first into a plasma and then into gamma rays. This could work as an impulse drive and generator. It might be close to one hundred percent conversion of mass to energy. To get a ship up to the speed of light, without the shielding of mass, would require all of the ships mass being converted to energy. That is what mass times c squared means. However, here we are dealing with a residual mass which is the very small mass left after shielding. A ten

thousand kilogram ship might have a residual mass of one gram. A small residual mass means a small fuel requirement. A force divided by a small mass means a big acceleration so the ships could accelerate fast. Shielded tanks of pressurized gas could become plasma or gas to gamma ray converters. These could be gamma ray guns as well as rocket motors. It would be necessary to harvest the currents from the plasma to generate the copious quantities of high frequency electricity required for the Drive. The gamma ray exhaust when the ships were close to the Earth might be seen by satellites which look for gamma rays or nuclear test explosions. A beam of accelerated shielded particles from pressurized gas or knocked loose from a solid by a laser, might create a plasma on its way to becoming gamma rays out of the stern as the particles loose their shielding. The small shielded mass and kinetic energy of the particles becomes a huge energy as the particles loose their shielding. Some of the plasma can be collected in a generator while it is still somewhat within the shielding of the ship. The generator is basically a magnet and two electrodes to collect some of the copious ion and electron flow in the plasma.

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