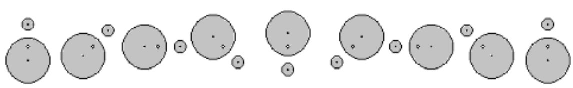
the general science journal

Mass is due to Gravity



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Abstract

We examine the hypothesis that:
Mass is due to gravity *not* gravity is due to mass.

Key Words

Origin of mass, mass due to gravity, electric gravity, gravity due to pulsed charge, orbiting light or energy, black holes, unsolved problems in physics, black hole universe, black hole formulas

Cover

The sine waves of binary orbits.

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 two sided to make a book. Your papers can become pamphlets, easily read and edited.

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1 The Virial theorem

is an energy equation: "for a stable, self-gravitating, spherical distribution of equal mass objects (stars, galaxies, etc), the total kinetic energy of the objects equals half the total gravitational potential energy" [1] or [2]:

$$.5 \cdot m \cdot v^2 = \frac{.5 \cdot G \cdot m \cdot M}{r} \quad \textit{.... the virial theorem ....} \tag{1.1}$$

Multiply by 2/r:

$$\frac{m \cdot v_t^2}{r} = \frac{G \cdot m \cdot M}{r^2} \quad centrifugal\ force = gravitational\ force \tag{1.2}$$

v_t is the tangent orbital velocity. M and m are masses, in orbit with each other, with the radius r between them.
G is the gravitational constant.
This force equation is a variation of the virial theorem. In orbiting systems, centrifugal force equals gravitational force. Center fleeing centrifugal force equals center seeking centripetal force. If the centrifugal force is stronger the bodies drift apart. If the gravitational force is stronger the bodies drift together. The average forces must be equal for the orbits to endure.

Multiply by $\frac{r}{m}$, yielding more variations of the virial theorem:

$$v^2 \cdot r = G \cdot M \quad or \quad \frac{G \cdot M}{v^2 \cdot r} = 1 \quad or \quad \frac{M}{r} = \frac{v^2}{G} \tag{1.3}$$

This is just another way of writing Kepler's third law.

2 Kepler's third law

The period of a circular orbit is p:

$$p = \frac{2\pi r}{v_t} \cdots therefore \cdots v_t^2 = \frac{4\pi^2 r^2}{p^2}$$

Substitute for v_t^2 in the virial theorem equation (1.3) and collect terms:

$$\frac{4\pi^2 r^2}{p^2} \cdot r = G \cdot M \quad or \quad 4\pi^2 r^3 = p^2 G \cdot M \tag{2.1}$$

The cube of the radius is proportional to the square of the period. This is Kepler's third law but we will usually use it in the centrifugal force equals the gravitational force form. This equation and the idea of conservation of energy are both indubitably correct and are central to our arguments.

3 Light in orbit

$$\frac{m \cdot v_t^2}{r} = \frac{G \cdot m \cdot M}{r^2} \quad centrifugal\ force = gravitational\ force \quad (1.2)$$

Starting again from the virial theorem, Kepler's third law or the centrifugal force equals the gravitational force equation (1.2).
Assign the tangent velocity $v_t = c$:
Now the orbital velocity is c and light or energy can orbit at the radius of the Cosmos at $r = c \cdot age$ where the Cosmos is expanding at the radial velocity $v_r = c$:

$$\frac{m \cdot c^2}{r} = \frac{G \cdot m \cdot M}{r^2} \quad or \quad c^2 \cdot r = G \cdot M \quad or \quad \frac{G \cdot M}{c^2 \cdot r} = 1 \quad (3.1)$$

We know that gravity deflects light from numerous cases of gravitational lensing. It is almost trivial to postulate that a deflection of light with one mass could become an orbit of light with a much greater mass. We are looking at Newtonian gravity, not warped space time, keeping light in orbit and causing gravitational lensing.

Relativity is a usually small correction to Newtonian mechanics. Some forget, the everyday realm of Newton includes the deflection of light and black holes. John Mitchell in 1783 predicted dark stars, black holes where their escape velocity exceeds the velocity of light.

Multiply equation (3.1) by r:

$$m \cdot c^2 = \frac{G \cdot m \cdot M}{r} \quad rest\ energy = gravitational\ energy \quad (3.2)$$

The orbital velocity $v_t = c$, where light and energy orbit at the specific radius $r = c \cdot age$.

Light might follow a circular orbital path, a bent path as in gravitational lensing or a spiral path with a decreasing gravitational force where everything spirals out as the gravitational force decreases with age.

4 Variable G

Multiply equation (3.2) by r/m:

$$c^2 \cdot r = G \cdot M \ \ldots . \ This\ is\ our\ black\ hole\ definition \quad (4.1)$$

Here we take c and M to be constants. If r is a variable and increases with age, as it must as the Cosmos expands, since $r = v_r \cdot age$ or $r = c \cdot age$, then G is a variable and must increase with age. This can be written G = gk·age. gk is the amount that the gravitational constant G increases per second as seen below.

$$G = \frac{c^2 \cdot r}{M} \; or \; G = \frac{c^2 \cdot v_r \cdot age}{M} \; or \; gk \cdot age = \frac{c^2 \cdot c \cdot age}{M} \; or \; gk = \frac{c^3}{M}$$

If G and r are both proportional to age then the orbiting and gravitational energy are constant with expansion including cosmic expansion. Energy is conserved.

$$gk = \frac{c^3}{M} = \frac{gk \cdot age}{age} = \frac{G}{age} = G \cdot H_0 = 1.41E\neg 28 \frac{m^3}{kg \cdot s^3} \quad (4.2)$$

gk appears to vary with mass, and is constant only while the mass of the Cosmos stays constant, in contrast to H_o which is Hubble's variable constant and G which is the variable gravitational constant.

You may have noticed that G has a value of about 1/15 billion:

$$G = 6.673E\neg 11 \frac{m^3}{kg \cdot s^2} \approx \frac{1}{15 \cdot billion} \frac{m^3}{kg \cdot s^2} \quad (4.3)$$

$G = gk$·age, increases by a small amount every year.

$$\frac{\Delta G}{year} \approx \frac{1}{15 \cdot billion} - \frac{1}{15 \cdot billion + 1} = 4.5E\neg 21 \frac{m^3}{kg \cdot s^3} \quad (4.4)$$

Per second:

$$\frac{\Delta G}{second} = gk = \frac{c^3}{M_c} = 1.41E\neg 28 \frac{m^3}{kg \cdot s^3} \quad (4.5)$$

Per year:

$$\frac{\Delta G}{year} = \frac{c^3}{M_c} \frac{31.5E6 \cdot s}{year} = 4.44E\neg 21 \frac{m^3}{kg \cdot s^3} \quad (4.6)$$

In age:

$$G = gk \cdot age = \frac{c^3}{M_c} \frac{4.73E17 \cdot s}{age} = 6.673E\neg 11 \frac{m^3}{kg \cdot s^2} \quad (4.7)$$

How do we detect such a small ongoing increase in the gravitational constant? Do the ancient stars, galaxies and supernova look different?

5 Mass of the Cosmos

$$c^2 \cdot r = G \cdot M \; .\,.\,.\,. \; Our\ black\ hole\ definition\ from \; .\,.\,.\,. \; (4.1)$$

Expand with $r = v_r \cdot age$, $G = gk \cdot age$ *and* $v_r = c$:

$$c^2 \cdot v_r \cdot age = gk \cdot age \cdot M \quad or \quad c^2 \cdot v_r \cdot = gk \cdot M \quad or \quad c^3 = gk \cdot M$$

or:

$$M_c = \frac{c^3}{gk} = 1.91E53 \cdot kg, \; the\ mass\ of\ the\ Cosmos \; [8] \quad (5.1)$$

$6E56 \cdot g$ *or* $6E53 \cdot kg$ according to Ciufolini and Wheeler [9].

$$M_c \cdot gk = c^3 \quad or \quad gk = \frac{c^3}{M_c} \quad or \quad G = \frac{c^3}{M_c} \cdot age \qquad (5.2)$$

As the $M_c = the\ mass\ of\ the\ Cosmos$ goes up the gk goes down when c^3 is a constant.

$$\underset{M_c}{\uparrow} \cdot \underset{gk}{\downarrow} = c^3 \qquad (5.3)$$

As the mass goes up gk, G and gravitational forces go down. If the mass of the Cosmos 'M_c' has increased over time, through impacts and merging with other masses, from outside our dynamic unit Cosmos, then the gravitational 'constant G' would have decreased with every increase in mass while thereafter resuming its increasing with age from its new lower value.

6 Electrons and protons in orbit

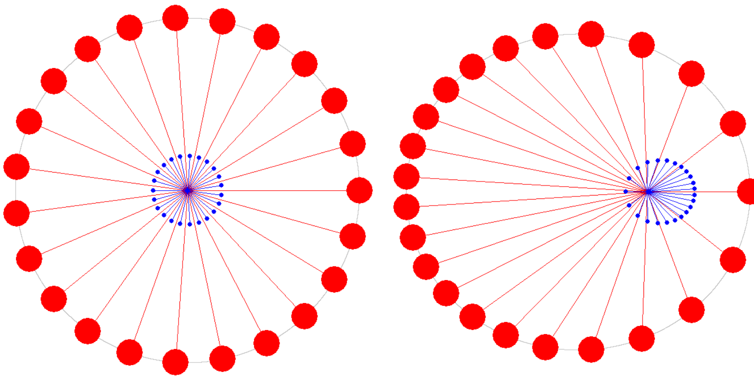
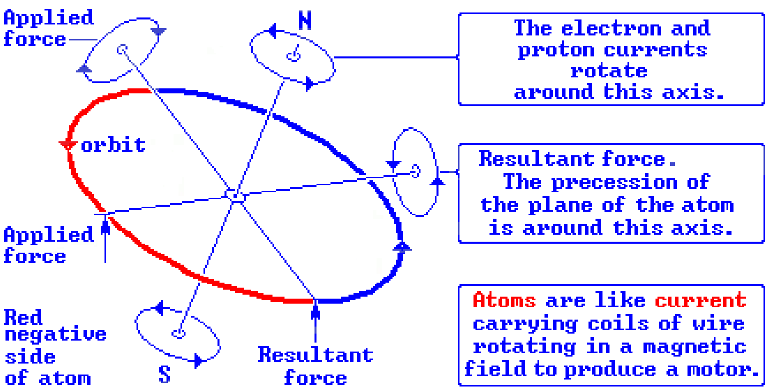


Figure 1: Dipole orbits

On the left : The electrons and protons have the same angular momentum. There is no charge disparity. They are confined to orbit in a plane.

On the right : The electrons slow at their apogee end. The protons slow at their apogee end. This results in dipoles with a different charge at each end. This charge disparity allows precession into ellipsoids.

7 Precession of ellipses into ellipsoids



When an applied force, caused by an electric or magnetic field, tries to tilt the plane of rotation of the atom, the resultant force, like the forces on a gyroscope, is applied 90 degrees ahead of and in the direction of rotation, producing precession. The current through a capacitor is 90 degrees ahead of the voltage. To simplify directional control, helicopters use a mechanical linkage that places cyclic pitch change 90 degrees ahead of the applied force. Moving the cyclic tilts the rotor.

These charged elliptical rings precess into ellipsoids like beads rolling on a string, see figure (2). Their charged poles would attract the opposite charged poles of similarly polarized ellipsoidal atoms. This is the origin of van der Waal's forces.

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.

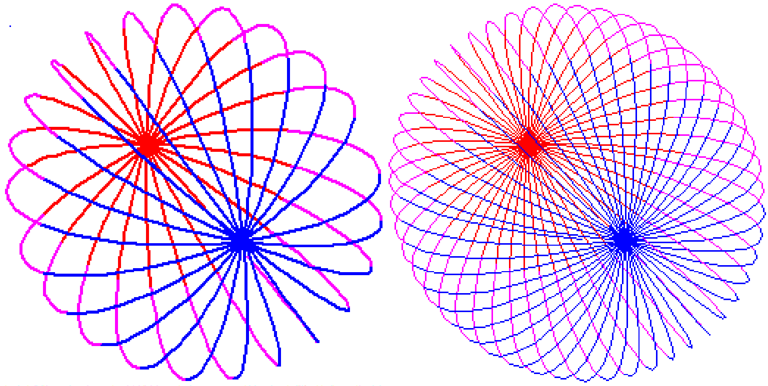


Figure 2: The dipoles precess, the orbital planes rotate like beads rolling on a string, along their plus minus, series dipoles, axis.

8 Bohr Atoms

We see two binary hydrogen atoms in the figure (8). Their two rotating electron-proton dipoles line-up momentarily only twice during each in-phase orbit. One or two neutrons may also accompany the proton. It is the shortness of this pulse of momentary alignment which makes gravity so much weaker than other charge interactions which are continuous.

Binary systems can generalize Bohr's planetary atom with an unmoving center proton to a system where electron-proton dipoles rotate around their common center of gravity producing concentric electron and proton currents with magnetic fields around those currents producing forces due to moving charge [49].

Forces in equilibrium hold the atom together.

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

It is the sum of these pulsed forces which create gravity and inertia. Dipoles are tiny machines which illuminate much of nature. 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.

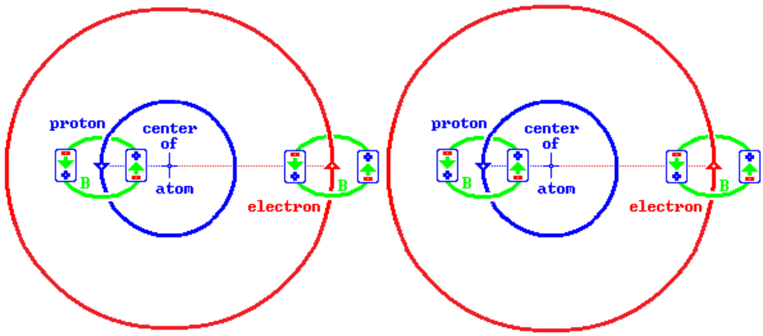


Figure 3: Two Bohr hydrogen atoms align in series.
Like clock hands they align at 9:15 and 180 degrees later at 3:45. The magnetic fields and charges create a pulse of attraction as they swiftly pass eash other and interact when they line up in-line. The protons are offset from the center as is our sun in the solar system or any binary system.

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

9 Gravity is caused by pulsed in-line forces

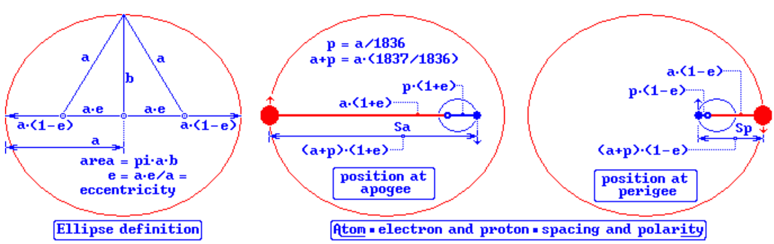


Figure 4: Dipole Spacing

The electrons and protons in an atom are most separated when they are at apogee in the middle drawing in figure (4). They are least separated when they are at perigee in the drawing on the right in figure (4). When the electrons are at apogee the protons are also at apogee on their own much smaller elliptical orbit.

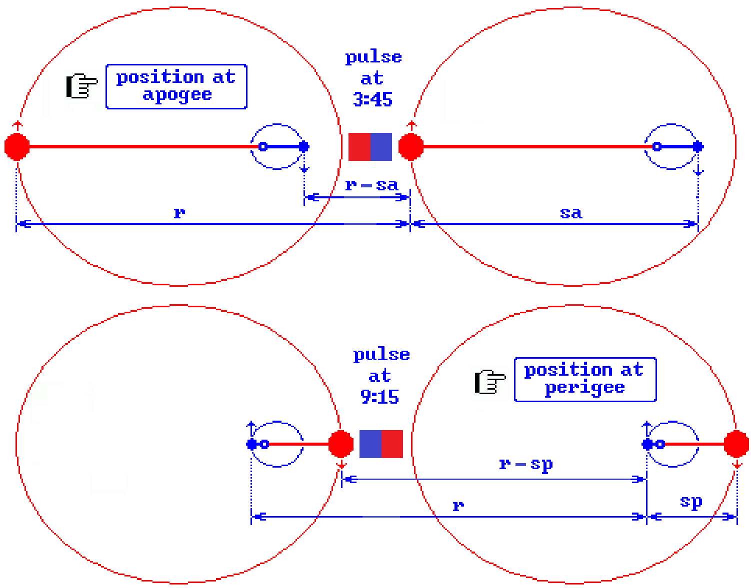


Figure 5: Dipole positions at apogee and perigee

9.1 Position and pulses of dipole pairs

See figure (5). Electrons and protons in separate dipoles remain the same distance apart. Their attractive and repulsive forces are not pulsed. They are continuous but we also have pulsed forces:

For simplicity consider: the dipoles as rotating in phase like the always moving hands of two clocks here at 3:45 at apogee and 9:15 at perigee. The flag between the dipoles is the pulse of force when they align.

The electrons and protons in the separate dipoles are moving in opposite directions in their orbits as they pass each other. The arrows show their direction. They pass each other moving very fast. They align for only a moment when passing. The momentary alignment generates a very short and very tiny pulse of force when the dipoles line up in series.

The forces between neighbor dipoles are stronger at apogee.

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

The force increases with the length of sa and sp.

The charges are moving slower at apogee than at perigee so the dipoles line up for a longer period of time so the duration of the pulse of force, the impulse, is longer at apogee.

$force = \neg acceleration \cdot mass$, as the charges approach apogee, their tangent and radial velocity decrease so the acceleration is negative.
$force = +acceleration \cdot mass$, as the charges approach perigee, their tangent and radial velocity increase so the acceleration is positive. We have a pulse of force as the acceleration goes through zero and changes sign. This is called a jerk (m/s^3).

The acceleration of the force is the duration of the pulse s, times the jerk m/s^3, or ($s \cdot m/s^3 = m/s^2$). See the animation at [50], [51] and [52].

These pulsed Coulomb force equations are of the form:
$c_e^2/(4\pi\epsilon_0 r^2)$, where r is the radial 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.

10 Why is gravity so weak?

Looking at figures (5). The forces on both the top and bottom of the long axis of symmetry of the ellipses are equal and opposite so they cancel. The only points where these internal orbital forces do not cancel is at the points of inflection.

The acceleration, the rate of change in orbital and radial velocity, is 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 car as we hit the brake pedal and then the gas pedal to go around a corner with gusto. We feel the jerk of a train.

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* $kg \cdot m/s^2$.

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

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.

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

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 to produce an impulse of force is very tiny. Each dipole, when aligned with its partner, produces $c_e/2.242E39$ 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,

$$\frac{1}{7200^2}\ \frac{1}{6.57E15^2} = \frac{1}{2.242E39} \tag{10.1}$$

This is the ratio of gravitational to Coulomb forces. One might say the chances of two dipoles interacting gravitationally is $1/2.242E39$.

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 series dipoles.

Random motion could produce these $1/2.242E39$ Brownian interations. It is convienient to show the interactions of gravity as due to in-phase rotations of dipoles but clearly the interactions are rare enough to be random.

11 Mass is due to gravity?

Gravity is likely due to the pulsed dynamic charge of electron-proton pair sets when they align momentarily in atoms. Therefore, mass is also likely due to charge.
See Electric Gravity [10]

If mass is due to gravity rather than gravity due to mass, would it explain rest energy equals gravitational energy in the following equation (3.2)?

$$m\cdot c^2 = \frac{G\cdot m\cdot M}{r} \quad rest\ energy = gravitational\ energy$$

We have a choice in the following equation (5.1) :

$$M_c = \frac{c^3}{gk} = 1.91E53\cdot kg,\ the\ mass\ of\ the\ Cosmos$$

Either:

$$gk = \frac{c^3}{M_c} \quad or \quad c = \sqrt[3]{M_c\cdot gk} \quad or \quad M_c = \frac{c^3}{gk} \tag{11.1}$$

It is not too big a step to say; "Mass is due to gravity and gravity and inertia are due to pulsed charge."

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