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An Epiphany On Gravity

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Abstract: The laws of physics are invariant with respect to frame of reference because the cumulative probability density of a particle cloud is an unity for any frame of reference. It is theorized with supporting data herein that time dilation causes gravity and not the other way around. With a stationary particle, it is demonstrated how a particle's probability cloud can become distorted under time dilation. This distortion of the probability cloud causes the center of mass to shift in the direction of time dilation. This effect, in the presence of a continuous non-linear time dilation well, is called "gravity". It will also be shown that the error between the gravitational escape velocity and the equivalent Lorentz time dilation velocity is less than ± two parts per million.

Keywords: gravity, gravitational theory, quantum mechanics, time dilation, particle cloud.

INTRODUCTION

Quantum mechanics[1] states that for a free particle (e.g. free electron), "a wave function (wave packet) may be constructed that puts the main probability near a position, x_o, and near momentum p_o." The uncertainty principle, dictates that position and momentum cannot be simultaneously determined accurately, and that their uncertainties are related by

$$\Delta x \Delta p \geq \tfrac{1}{2} \hbar \quad . \qquad (1)$$

Since the mass of a free electron is known, the uncertainty principle dictates an uncertainty of both position and velocity simultaneously.

AXIOMS

Axiom 1: ***Principle of the Particle Probability Cloud.*** This axiom states that a particle can be represented by a probability cloud. The probability of detecting a particle at any point within its probability cloud is a value between zero and one. That is, there is a possibility of passing right through a particle without detecting it. However, the cumulative probability of detecting the particle at any point and within any duration, in its probability cloud must be one.

Axiom 2: ***Principle of Probability Density Invariance.*** This principle states that every mass particle, at rest, is a probability cloud with a probability density of ρ, that is invariant in velocity-space (s_x/t_x, s_y/t_y, s_z/t_z) corresponding to x, y, and z axes in spacetime, and allows for different amounts of time dilation, t_x, t_y, and t_z, along each axis of x, y, and z respectively.

Axiom 3: ***Probability Volume.*** The volume occupied by a particle in velocity-space, is the volume of its probability function or probability cloud. Therefore, any frame of reference has to observe the cumulative probability of detecting the particle in its probability cloud.

Axiom 4: ***Principle of Mass Density Invariance.*** This principle states that the mass of a particle is equivalent to its volume occupied by the particle's cumulative probability in velocity-space.

PRINCIPLE OF PROBABILITY DENSITY INVARIANCE

The probability of detecting a particle in the region of space s_x, along the x-axis, within a time duration d_x, is given by, $P(s_x/d_x)$. Similarly, $P(s_y/d_y)$ and $P(s_z/d_z)$ are the probabilities associated with the y and z-axes respectively.

The cumulative probability of finding this particle is one,

$$\text{Cum } P(s_x/d_x,\ s_y/d_y,\ s_z/d_z) \ = \ 1 \qquad . \tag{2}$$

Since the probability distribution is identical along any axis, the cumulative probability is formed by the rotation about y and z-axes, which must be one. Therefore, the volume formed by the probability function is,

$$(4/3)\ \pi\ P(s_x/d_x)^3 \ = \ 1 \qquad . \tag{3}$$

Or,

$$P(s_x/d_x),\ \rho \ = \ [1/(4/3)\ \pi]^{-3} = \ 0.024189, \text{ a constant.} \tag{4}$$

That is, the probability density in velocity-space is independent of the nature of the particle's probability function and is invariant, when the particle is at rest.

THE TIME DILATION EFFECT

Since "the laws of nature are the same in all frames moving with constant velocity with respect to one another"[2], one can substitute an external observer with a stationary observer who is internal to the particle's probability cloud. In effect we have shifted from observing the particle as a probability cloud to observing the probability cloud itself from within.

Let's say that time is normal on the left half of the particle probability cloud and dilated on its right half. Figure 1 below, depicts the distortion that is introduced by time dilation for a stationary particle along the x-axis on the right half of the particle probability cloud. Dilated time allows the right half of the particle probability cloud to spread further out in space than the left half.

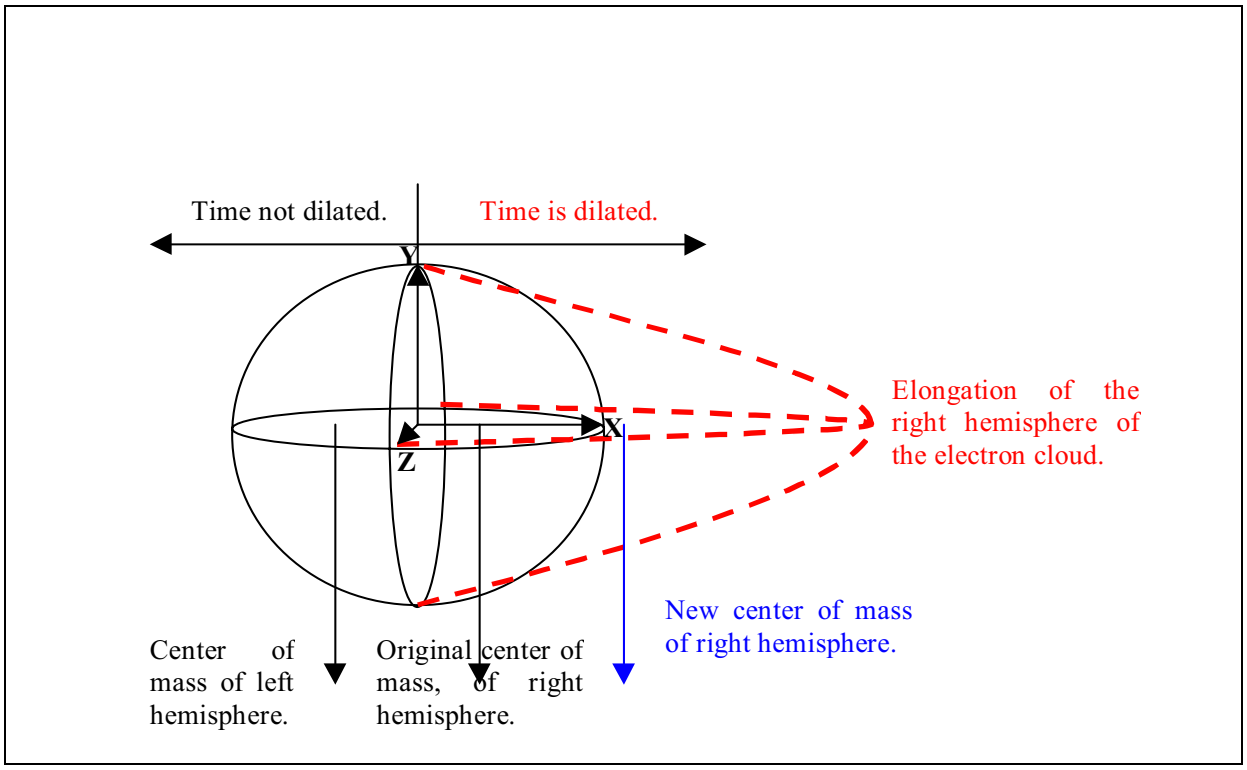

Figure 1. Time dilation distorts a particle's probability cloud with respect to its own frame of reference.*

That is, even though the probability of detecting the particle on the left half is $P(s_{xo}/d_{xo}, s_{yo}/d_{yo}, s_{zo}/d_{zo}) / 2$, the probability of detecting the particle on the right half is now $P(s_{xd}/d_{xd}, s_{yd}/d_{yd}, s_{zd}/d_{zd}) / 2$, where the subscript 'o' represents undilated time and 'd' represents dilated time.

Since time dilation occurs only along the x-axis, for any coordinate in the y-z plane in the left half, there is an equivalent coordinate in the right half, such that $s_{yd} = s_{yo}$, $s_{zd} = s_{zo}$, $d_{yd} = d_{yo}$, and $d_{zd} = d_{zo}$ along the y- and z-axes. Therefore, the probability function for the right side reduces to $P(s_{xd}/d_{xd}, s_{yo}/d_{yo}, s_{zo}/d_{zo}) / 2$.

The cumulative probability of observing the stationary particle must be one. Therefore,

$$0.5 \text{ Cum } P(s_{xo}/d_{xo}, s_{yo}/d_{yo}, s_{zo}/d_{zo}) + 0.5 \text{ Cum } P(s_{xd}/d_{xd}, s_{yo}/d_{yo}, s_{zo}/d_{zo}) = 1 \quad . \qquad (5)$$

That is, the probability cloud is symmetrical about the x-axis, and given that the left half is a hemisphere, the right half will be an ellipsoid such that,

$$(0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^3 + (0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^2\ P(s_{xd}/d_{xd}) = 1.0 \quad , \qquad (6)$$

and substituting for (3)

$$P(s_{xd}/d_{xd}) / P(s_{xo}/d_{xo}) = 1.0 \qquad . \qquad (7)$$

or

$$P(s_{xo}/d_{xo}) = P(s_{xd}/d_{xd}) = [1/(4/3)\ \pi]^{-3} \qquad . \qquad (8)$$

The probability of detecting a particle within its particle cloud, within a duration, d_{xd} or d_{xo}, is independent of the time dilation distortions, and thus giving rise to the gravitational distortions it experiences. Therefore,

$$s_{xo}/d_{xo} = s_{xd}/d_{xd} \quad \text{or} \quad s_{xd} = s_{xo}\,(d_{xd}/d_{xo}) \qquad . \qquad (9)$$

Let us call equation (9) the *Probability Invariance Transformation* (PIT) equation for a stationary particle in velocity-space. This PIT equation can also be interpreted as equivalent to the stretching by tidal gravity[3], as the time dilation causes a stretching of a particle.

$$\text{Thus,} \quad s_{xd} > s_{xo} \quad \text{when} \quad d_{xd} > d_{xo} \qquad . \qquad (10)$$

The probability cloud has extended itself to compensate for the time dilation with respect to its own frame of reference, given an invariant probability density in velocity-space.

The center of mass of the left hemisphere and right ellipsoid are $(3/8)\ s_{xo}$, $(3/8)\ s_{xd}$ respectively. By the *Principle of Mass Density Invariance* both sides have the same mass, the center of mass of the particle has shifted $(3/8)(s_{xd} - s_{xo})$ to the right. The new center of mass S_{CM} is

$$S_{CM} = (3/8)\ s_{xo}\,(d_{xd}/d_{xo} - 1) \qquad . \qquad (11)$$

Therefore, the particle's probability cloud center of mass has shifted further to the right, in keeping with the direction of time dilation. Note that this shifting is linearly dependent on time dilation. The gravitational effect can be summarized as follows:

1. Time dilation distorts the shape of a particle's probability cloud in the direction of increasing time dilation.
2. This distortion of a particle's probability cloud results in the shifting of the center of mass of the particle in the direction of increasing time dilation.
3. The net effect is that the center of mass of the particle moves in the direction of increasing time dilation.
4. This effect in space is called a gravitational field.

In a gravitational field, time dilation on the right hand side is replaced with $d_{xo}\cdot t_R$, and on the left hand side with, $d_{xo}\cdot t_L$, where d_{xo} is the duration of the probability cloud in the center of the particle. t_L and t_R represent the time dilation from a point at an infinite distance from the source of gravity. ($t_L \neq t_R$ for non-linear time dilation) such that,

$$(0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^2\ P(s_{xL}/(d_{xo}\cdot t_L)) + (0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^2\ P(s_{xR}/(d_{xo}\cdot t_R)) = 1.0 \qquad (12)$$

substituting (3),

$$P(s_{xL}/(d_{xo}\cdot t_L)) + P(s_{xR}/(d_{xo}\cdot t_R)) = 2\ P(s_{xo}/d_{xo}) \qquad . \qquad (13)$$

That is, the probability gained on one side must be compensated for by the same amount, as a probability loss on the other side of the stationary particle. The new right shifted center of mass of the stationary particle in a gravitational field is

$$S_{CM} = (3/8)\ (s_{xR} - s_{xL}) \qquad . \qquad (14)$$

Using (9),

$$S_{CM} = (3/8)\, s_{xo}\, (t_R - t_L) \quad . \qquad (15)$$

For the short distance of the particle's size, the change in time dilation, $t_L - t_R = \delta t$, and the distance moved by the particle, $\delta s = S_{CM}$, such that

$$\delta s = (3/8)\, s_{xo} \cdot \delta t \quad , \qquad (16)$$

that is, the distance moved by the particle is a function of the change in time dilation at that point. Note that the change in time dilation, δt, is not the same as the duration taken to move. To put it another way, when time dilation is constant, with respect to a particle's frame of reference, the particle is stationary with respect to its own fame of reference. When time dilation is non-linear, the particle is displaced and therefore experiences motion with respect to its own frame of reference.

OBSERVATIONS

The four axioms stated earlier in this paper, can be summarized into the First Principle of Equivalence, that velocity and time dilation are equivalent, and governed by Lorentz transformation[4], equation (17). What about a gravitational field? Does the Lorentz time-dilation-velocity transformation still hold?

$$t_v = t_o / \sqrt{(1 - v^2 / c^2)} \quad . \qquad (17)$$

Rearranging (17),

$$v = c \sqrt{(1 - t_o{}^2 / t_v{}^2)} \quad . \qquad (18)$$

For a gravitational field, t_o is undilated time at an infinite distance from the source of the gravitational field. t_v is time dilation at some point in the gravitational field where a very small body is free falling, from infinity, into this gravitational field. This interpretation of (18) allows only time dilation as the source of motion. Assuming that at infinity, $t_o = 1$, (18) reduces to,

$$v_f = c \sqrt{(1 - 1/t_v{}^2)} \quad , \qquad (19)$$

where v_f is the free fall or equivalent Lorentz/time dilation velocity when time dilation is t_v, assuming that this relationship holds. Let's put some numbers to this equation. Table 1 below presents mass, radius, acceleration, time dilation, gravitational escape velocity (v_e), and the equivalent Lorentz/time dilation velocity (v_f), of a small body free falling to the surface of any of the planets in our solar system.

Object	Mass	Radius	Gravity at Surface	Gravitational Escape Velocity	Time dilation	Equivalent Lorentz/Time Dilation Velocity	Escape - Equivalent Velocity Error
	M	R	g	v_e	t_v	v_f	$v_e - v_f$
	kg	m	m/s^2	m/s	s	m/s	
Sun	2.00E+30	6.90E+08	274.98	621,946	1.00000215195969	621,946	0.0000000%
Mercury	3.59E+23	2.44E+06	3.70	4,431	1.00000000010922	4,431	0.0000153%
Venus	4.90E+24	6.07E+06	8.87	10,383	1.00000000059976	10,383	0.0000018%
Earth	5.98E+24	6.38E+06	9.80	11,187	1.00000000069626	1,187	-0.0000080%
Mars	6.58E+23	3.39E+06	3.71	5,087	1.00000000014395	5,087	0.0000245%
Jupiter	1.90E+27	7.14E+07	23.12	59,618	1.00000001977343	59,618	0.0000002%
Saturn	5.68E+26	5.99E+07	8.96	35,566	1.00000000703708	35,566	-0.0000002%
Uranus	8.67E+25	2.57E+07	7.77	21,201	1.00000000250060	21,201	-0.0000005%
Neptune	1.03E+26	2.47E+07	11.00	23,552	1.00000000308580	23,552	-0.0000019%
Pluto	1.20E+22	1.15E+06	0.72	1,178	1.00000000000772	1,178	0.0001586%

Table 1. Gravitational Escape Velocity versus Equivalent Lorentz/Time Dilation Velocity*

Notes: Gravitational Escape Velocity = $\sqrt{2GM/R}$ (20)
(source: http://theory.uwinnipeg.ca/mod_tech/node58.html)
Gravitational Time Dilation = $1/\sqrt{(1-2GM/(Rc^2))}$ (21)
(source: http://www.itss.raytheon.com/cafe/qadir/q993.html © 1997 Dr. Sten Odenwald)

Source: Mass and radius of planets – University of Michigan, http://www.windows.ucar.edu
Surface gravity – Handbook of Chemistry and Physics, 78th edition

Table 1 also shows that the error between v_e and v_f, is less than ±2 parts per million. That is, the velocity of a body falling into a gravitational field is governed by the time dilation it experiences at any given point in the gravitational field. Lorentz time-dilation-velocity transformation still holds. This is strong evidence that time dilation is the source of gravity and not the other way around. Therefore, the *Second Principle of Equivalence* is that acceleration and non-linear time dilation, gravity, are equivalent. That is, the acceleration experienced by a falling body is governed solely by the change in time dilation in the gravitational field.

EXPERIMENTS

I am exploring an alternative process on how energy is converted to force. I believe that this is a two-step process. First, electric and magnetic fields create time dilation. Second, time dilation causes acceleration or gravity. These experiments, to create force directly from energy, appear to be consistent with electromagnetic field theory of $\mathbf{F}=q_t[\mathbf{E}+(\mathbf{vxB})]$.[5]

To date, I can demonstrate weight loss of up to 0.9g or +/-3% when both electric and magnetic fields are present. (I have been able to observe 98% weight loss for 3 seconds, but this result is not yet repeatable.) Weight change reverses when the polarity of either the electric or magnetic field is reversed. Weight continues to change even after these experimental electrical circuits are powered off (see Figure 2). These circuits take more than three hours after power off, to return to original weight. My research leads me to believe that I am observing the folding of spacetime to change weight. Therefore, this paper hopes to spark new theoretical approaches to gravity that are not centered about gravitons, Higgs particle[6], or superstings.

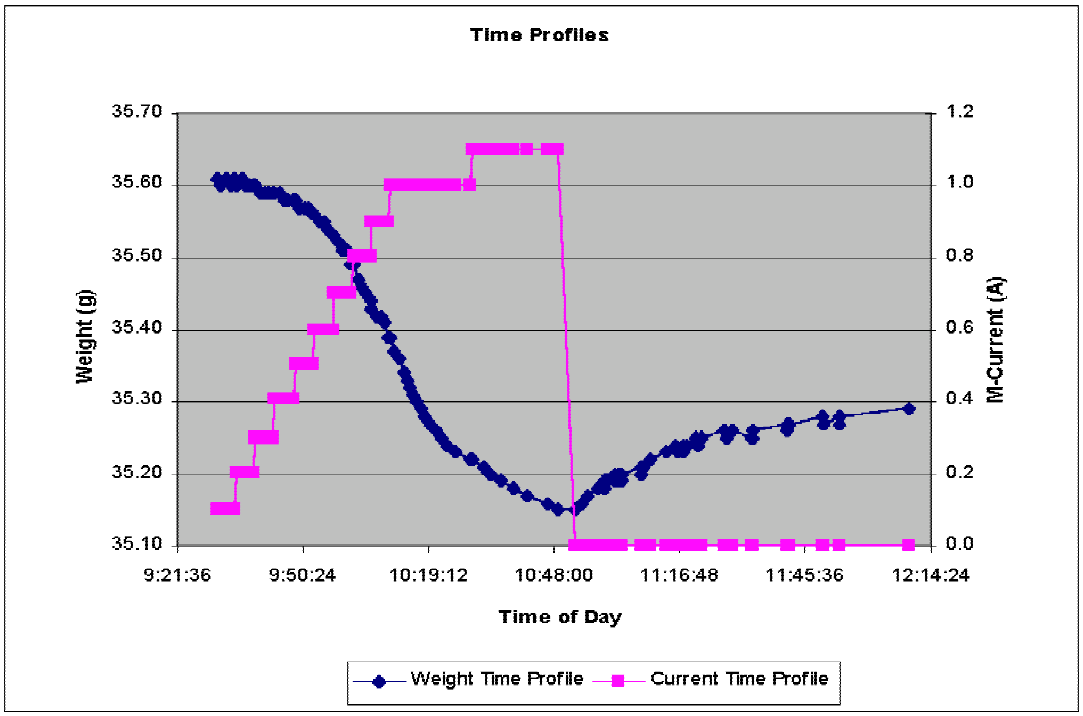

Figure 2. Experimental results (March 2000): Experimental circuit weight and magnetic field current versus time.*

DISCUSSION

This paper suggests several important points that need to be proved by experimental evidence. They are:

1. Mass, as we understand it, may not be the source of gravity. Given the time dilation approach to gravity, one infers that electromagnetic fields and not mass is the source of gravity. Therefore, it is the interaction between charged particles in the atomic structure, nuclear structure, and mass particles that cause gravity. At present, scientific methods have not sought to distinguish whether the origin of gravitational fields is due to mass or particle/atomic structure.
2. New materials. If it is atomic structure alone, that causes gravity, it may be possible to develop new materials that have gravity shielding or enhancing effects.
3. Space propulsion. This paper also suggests that there is a much closer relationship between electromagnetism and spacetime than previously thought. Therefore, as suggested by my experimental findings, one should eventually be able to develop radically new propulsion technologies that are propellantless.
4. Wormholes. If electromagnetic fields can be utilized to fold spacetime, then a technology to develop artificial wormholes could potentially be developed.

CONCLUSION

This paper suggests a paradigm shift on gravity. It provides an approach to developing a theory on gravity that will enable the development of radically new technologies for space propulsion systems using time dilation as a means of propulsion. In a later paper (after acquiring patents), I will describe how electric and magnetic fields create time dilation to induce force.

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