PAPER I

THE ENTRAINED SPATIAL MEDIUM GRAVITATIONAL SINK MODEL

BY HENRY C. WARREN JR.

ABSTRACT

Given that light obeys gravity, the Michelson-Morley experiment, which was conducted deep in the earth's gravitational field, is shown to be an invalid test of the earth's drift through a spatial medium or ether, because it occurred deep in the earth's gravitational field.

Gravity is posited to be the result of masses acting as sinks of space (or a spatial fabric) in which a condensation or an absorption of the spatial medium causes a depletion or thinning resulting in a gradient in the density of the spatial fabric near the mass. The gradient results in an inflow of the spatial medium with the velocity of inflow, being inversely proportional to the degree of thinning. A low pressure system serves as an analogy. Mass and energy are carried toward the gravitational body in a passive manner similar to the way continental drift transports continents. The field is vertically, but not rotationally or only slightly so, entrained, being a creation of the gravitational mass and traveling with it.

Inertia is posited to be the result of an accelerated body experiencing a portion of its own gravitational field. Rest mass is posited to be a measure of the strength of the gravitational field.

Light is deflected by two processes, the inflow of the spatial medium and refraction by the spatial medium gradient, even if the photon is treated as a particle. No dispersion occurs because the spatial medium is not physical or atomic in nature and thus does not differentially absorb and re-radiate light of different wavelengths. The medium is essential for photon propagation and because of its perfect or near perfect elasticity does not cause photon to loose energy during propagation. The speed of light through the spatial medium varies inversely with position in a gravitational field and with the state of expansion of the universe.

The gravitational redshift is regarded as a special case of the velocity redshift. Clocks slow and rods change lengths (Paper II addresses this further) in moving frames.

This theory predicts that if an apparatus capable of measuring the speed of light is used within a spaceship on the surface of the earth and then the same spaceship and apparatus are used in space – always oriented normal to the radius of the earth's gravitational field and following a geodesic path - the speed of light will be measured as different in space than at the earth's surface. The 1933 Dayton Miller experiments and the Viking Lander

on Mars Shapiro time delay experimental results were consistent with the expected results here, but the proposed test should be harder to refute.

INTRODUCTION

Einstein and "space"

No one knows what space is, but general relativity warps it and has it steer mass and light. Big Bang Theory expands it. Raisin Bread Cosmology has it carry matter and energy along for the ride. The Dynamic Vacuum perturbs it. Some theorists loop it. Some, including this model, assume that matter and the propagation of light cannot exist outside it. All the foregoing, the concept of a Higgs field, and the existence of phenomena such as the Casimir effect and *permittivity and permeability of the vacuum* suggest that space - or the fabric thereof - is substantive. Further, Bell's Theorem and Alain Aspect's experiments, the Dynamic Vacuum, and the apparent insufficient presence of enough matter to account for galaxies not flying apart, suggest that there exists an underlying spatial reality to which we may be largely "electromagnetically" blind and where processes may exceed the speed of light under certain circumstances, such as near black holes.

The ether is considered passé today because of the Michelson- Morley experiment, but it will be shown from several perspectives below that because light obeys gravity and the experiment occurred deep in an entrained gravitational field, it was an invalid test of drift through an ether.

Einstein believed he had eliminated the need for ether with special relativity, but with general relativity he *in effect* substituted a “space with properties” for that ether. In a 1920 lecture[1], after his theory of general relativity was fully developed, Einstein acknowledged the necessity for ether. In his book, *Relativity*[2], also written after his theory was fully developed, he likewise asserted the need for a medium in which light could propagate. What general relativity did in eff*ect* was to *rename ether and call it space*. This model preferentially uses expressions such as *fabric of space* or *medium in space*, *without spelling out precisely the nature of that fabric or medium*.

Robert Kirkwood[3,4] showed some fifty years ago that a flowing ether model yielded the *Schwarzschild line element* relevant to Einstein's theory. Herbert Ives[5,6] had done the same thing several years earlier. More recently, Tom Martin[7,8] has done so for a model based upon spatial flow of a physical substrate. It is generally accepted that *any theory which produces the Schwarzschild line element will produce the same results as general relativity*[9] for the key tests of said theory. **So this model and any other properly constructed model that is based on the inflow of a spatial medium or fabric, quantum foam, soup, substrate or ether, by whatever other name one chooses to use, can meet all the same experimental tests that led to the acceptance of general relativity (GR).**

In addition to the foregoing and contrary to conventional wisdom, seventeen years before GR was developed, Paul Gerber calculated the correct advancement of the perihelion of Mercury[10]. Paul Marmet's[11] web site contains several other correct calculations. In addition Newtonian physics correctly predicts a gravitational redshift. So all the renowned predictions have been duplicated using classical physics, except the double bending of light and this model accomplishes that.

THE MODEL

Streaming matter and absorption

It is hard not to be struck by diagrams of matter streaming toward neutron stars, "black holes" and the apparent "great attractor" and not to see a similarity between this streaming and continental drift. If the universe was generated by the expansion of all of observable "space" and energy from a big bang, with "space" carrying matter along for the ride as proposed in raisin bread cosmology, then the process ought to be reversible. Thus, any possible big crunch, any formation of black holes, and ordinary gravity cause the universe or portions of it to vary in density and volume, but does not change the overall matter/energy content of the universe.

The sponge analogy

In this discussion the largest mass in a system being examined, such as a sun, is treated as stationary and the surrounding masses, such as planets and specs of dust, are referred to as passive masses, though they may be moving. The terms *body*, *mass*, and *sink* may be used interchangeably with the understanding that masses are gravitational bodies that act as spatial sinks or sources of condensation in this model.

To visualize this gravitational sink process, imagine a powerful spherical sponge with an enormous ability to absorb water placed in a swimming pool. The sponge acts as a sink causing the surrounding water to flow toward the sponge (providing half the curvature predicted by GR).

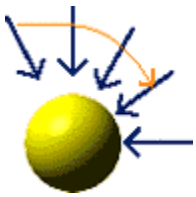


Figure A: Inflowing spatial fabric (blue) contributes Newtonian component of curvature of light (yellow) as it travels near a mass.

The unidirectional (monopole) nature of gravity in this model is due to the absorption or condensation process causing the fabric of space to *flow only towards* gravitational bodies and not away from them.

As the surrounding fabric of space streams toward the massive body, it carries all surrounding masses and energy inward as in raisin bread cosmology (Two dimensional examples would be continental drift and a conveyer belt). Thus, in this model gravitational bodies are regarded as "spatial" sinks

It becomes obvious why *gravity cannot be distinguished from acceleration in this model*. Gravity in this model is due to the acceleration of the fabric of space. It also reveals why *no force is felt by a body in free fall*: there is no relative motion between a free falling body and its surrounding background spatial fabric.

The pattern of inflowing spatial fabric associated with a mass comprises its gravitational field. Force field geometry causes the velocity of the spatial medium to increase as a mass is approached. Thus, *the Inverse Square Law applies as a first approximation of the strength of the field at any point*.

But a mass passing by, in addition to being carried along by the in-flowing stream, also acts like a sponge and absorbs the fabric of space, helping close the gap between the two masses as they both "reel in the rope of space in a tug of war," (or alternatively, responds to the lack of density between them) which accounts for the attraction between two masses being proportional to the product of the masses.

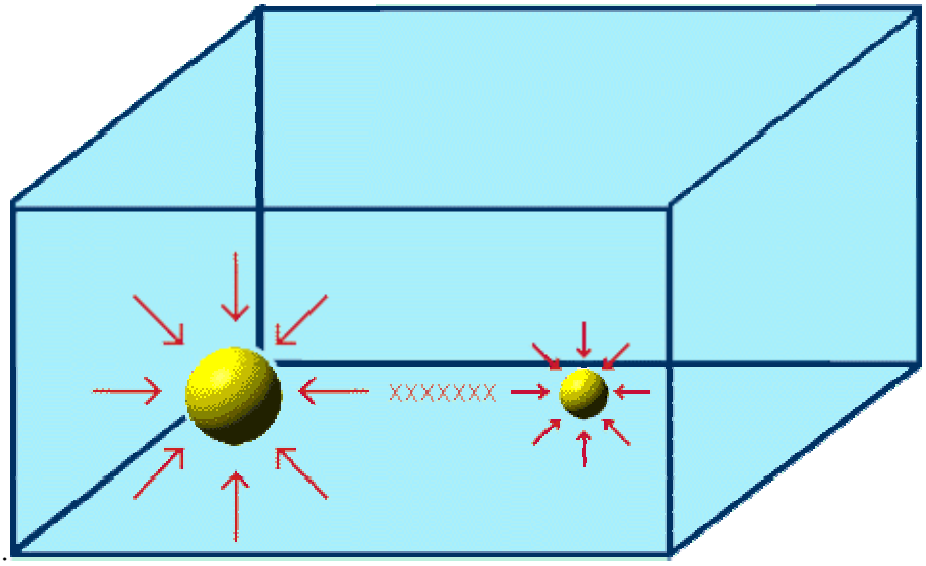


Figure B: Like sponges soak water in an aquarium,
mass soaks up the fabric of space in all directions.
A depletion of spatial fabric is felt at the Xs

But mass gobbles the fabric of space in all directions and the swallowing on the side away from the passive mass offsets the dynamics of that towards the stationary mass. The effect of this action is to allow the inertial mass to passively *drift* along with in-streaming conveyer belt of spatial fabric. Thus, *the mass of the passive body can be disregarded when calculating its falling rate, which is why all bodies do fall at the same rate when*

"dropped" from the same point in a gravitational field. A cannon ball tugs harder on the earth than a feather does, but it also tugs harder on the rest of the universe than does a feather so the opposing effects cancel.

It was noted in the introduction that the math associated with this model produces the **Schwarzschild solution**. Thus most of the predictions of general relativity are also predicted by this theory, including time delay in radar soundings, the deflection of light by a gravitational field, the gravitational redshift, the geodesic effect, and the advance of the perihelion of Mercury.

The Deflection of light

General relativity predicts that the deflection of light by a gravitational field is $4GM/R_0c^2$**.** Einstein stated in his book *Relativity*[2]: "It may be added that according to the theory, *half* of this deflection is produced by the Newtonian field of attraction of the sun, and the *other half* by the geometrical modification ("curvature") of space caused by the sun."

He also observed in the same book: "A curvature of rays of light *can only take place when the velocity of propagation of light varies with position*." (Italics added.) Einstein goes on to note that the constant velocity of light is restricted to special relativity i.e. absent a gravitational field.

Both of the above statements by Einstein were made in 1916 **after** the completion of his theory.

Jim Ogle[12], in August, 2000, pointed out to the author that Newton had posited a model containing ideas similar to those proposed in this model. Newton[13] proposed in a 1675 letter to Oldenburg, the Secretary of the Royal Society, and later to Robert Boyle, that gravity was the result of a *condensation causing a flow of ether with a corresponding thinning of the ether density associated with the increased velocity of flow.* He also asserted that such a process was consistent with all his other work and Kepler's Laws of Motion. More recently Tom Van Flandern[26] has also proposed that a varied speed of light can be associated with a density gradient.

The result is that, after refraction caused by the resultant density gradient is factored in, light bends in a gravitational field twice as much as conventional wisdom holds would be done by Newtonian processes.

An analysis of the deflection of light in view of Newton's and Einstein's thinking provides an opportunity to gain insight into the internal dynamics of gravitation.

Because the gravitational sink operates by causing a condensation or absorption of the surrounding spatial fabric or medium, two things happen.

First, a density gradient is established with the lowest pressure/density gradient near the center of the system.

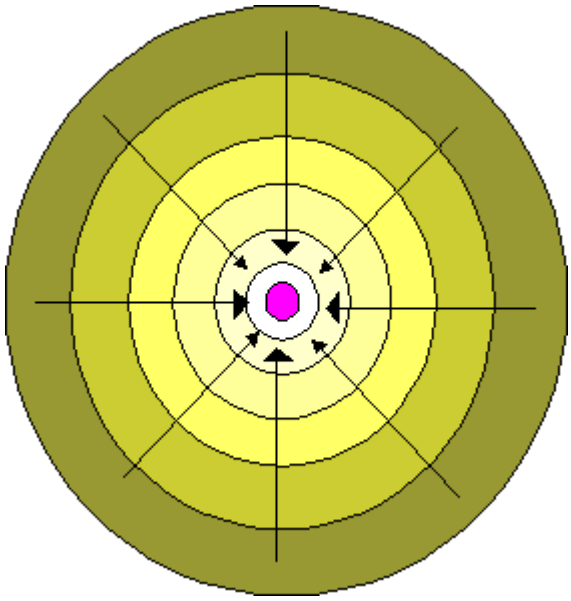


Figure C: Sink in the center is red.
Lighter colors represent lower density.
Arrows represent flow.

Second, in response to the density gradient the medium streams towards the source of the low pressure (water towards the sponge) with the highest velocities occurring near the sink and the lowest velocities occurring distally.

Since both processes are generated by the same sink, they are inversely related to each other with the highest velocities associated with the lowest "densities".

It may seem counter intuitive that the highest velocities occur where the pressure/density is lowest, but this is what happens in all of nature's sinks, such as cyclones or whirlpools. Note the cause and effect relationships. The sink causes the density gradient which in turn causes the increased flow of the spatial medium.

Light can be treated as having both particle and wavelike properties. It is shown below that in this model it makes no difference if light is treated as a wave, a particle or as having both properties.

If one assumes that the photon travels as a wave and that the position of the wave in the inflowing spatial medium can be treated as a massless particle or planet, then both properties of photons contribute to the solution.

Richard Feynman argued in his book, QED, that photomultiplier experiments demonstrated that photons are particles. Then their emission from “spherical” atoms with

magnetic moments and subsequent behavior can be statistically described relevant to the surface area of the atom with results that mimic wave behavior and he shows how refraction results. The diffraction patterns of electrons in slit experiments also show that particles can behave in a manner that can be interpreted as wavelike.

Further, a propagating photon particle would be expected to respond to variations in spatial medium density, curving in a manner that produces results which fit the analysis provided by Einstein below. This would be in addition to the "continental drift" effect of the inflowing spatial medium which comprises the gravitational field. Thus, treating both the particle and wavelike aspects of photons mathematically is justified with half of the bending of light by gravity attributed to each, even if photons are particles.

No detectable dispersion of light occurs in a vacuum or outer space and none occurs in the spatial medium. That is because the medium is not composed of atoms or particles that can absorb photons so the behavior of light in the spatial medium does not correspond to the behavior of light in air. In air and material media atoms or particles interact with light absorbing and re-emitting light differentially so scattering and dispersion occur.

Since in this spatial sink model the spatial medium is viewed as necessary for the propagation of light, the internal velocity of light through the spatial medium will be faster where the density of that medium is greatest and slower in less dense medium. The transmission of sound in a material medium provides an analogy for this aspect of the transmission of light i.e. sounds propagate faster in denser mediums. Thus, differential velocities associated with the differential densities can cause the bending of light without dispersion.

No matter how viewed the apparent fact that photons fail to lose energy as they travel great distances through the spatial medium is the result of the fact that in the Spatial Sink Model the spatial medium is: (1) necessary in order for photons to propagate; (2) non atomic and non electromagnetic in nature; and (3) is perfectly or nearly perfectly elastic. This is consistent with photon's response to the curvature of space in GR, which is said to curve the path of photons while not diminishing the energy of same. If the apparent retardation of the velocity of the Pioneer probes by John Anderson holds[31] it could be reflective of material matter behaving differently from photons in the spatial medium. If space can steer matter as GR and this model propose, stationary space can be expected to retard the flow of matter beyond gravitational effects.

The first half: The bending of light due to wavelike refraction.

In 1911 Einstein[14] calculated the refraction of light in a gravitational field due to the effect of the differential velocities on the wave front of light and obtained the value $2GM/R_0c^2$ for the angle of deflection. It does not matter that Einstein later adopted a constant velocity for light in a gravitational field out of frustration rather than conviction and for reasons not accepted here. The math is still good and describes this model's refraction component accurately. These calculations are repeated below.

Einstein asserted that the velocity of a light varied with position in a gravitational field according to the formula:

$$\text{Eq. 1:} \quad c = c_o\left(1+\frac{\phi}{c^2}\right)$$

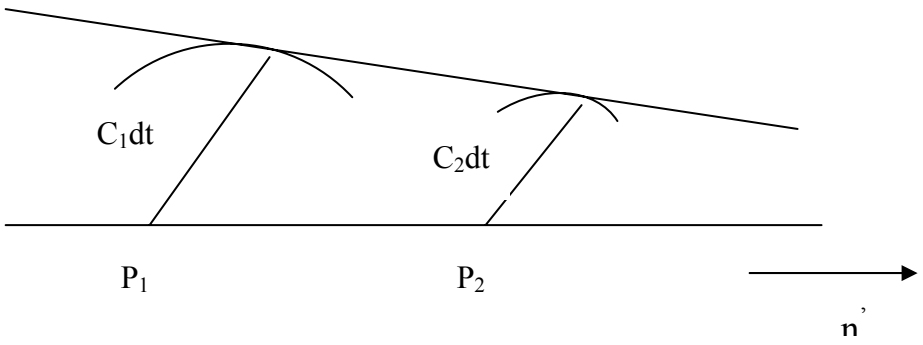


Fig. D

Then analyzing the propagation of light as a wave front transiting across a gravitational field (up in the above diagram) in which the velocity of light was less for the portion of the wave that was deeper in the field (to the right) than the portion transiting distally, he calculated:

$$\left(c_1 - c_2\right)dt = -\frac{\partial c}{\partial n'}dt$$

Here ń is not the refractive index, but the radial direction, r, toward the increasing gravitational field.

He then calculated the deflection per unit of path as:

$$-\frac{1}{c}\frac{\partial c}{\partial n'}$$

Or per the first formula above:

$$-\frac{1}{c^2}\frac{\partial \phi}{\partial n'}$$

He notes that the difference between all the "c's", regardless of subscript or absence thereof, is very small so he cancels as he sees fit.

He gets for the deflection:

$\alpha = -\int \frac{\partial \phi}{\partial n'}ds$, which is the same as: Eq 2 $\alpha = -\int \frac{GM}{r^2c^2}ds$, after letting n' = r

After an analysis of the following triangle Eq. 3 is derived.

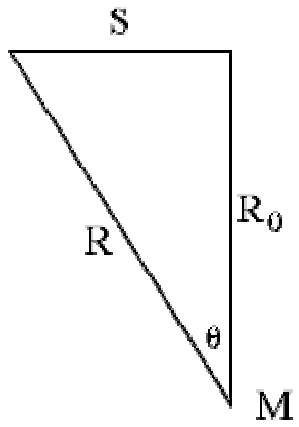


Figure E

Eq. 3 $$\alpha = \frac{1}{c^2}\int_{\theta=-\frac{\pi}{2}}^{\theta=+\frac{\pi}{2}} \frac{gM}{r^2}\cos\theta ds = 2\frac{gM}{c^2 r_0}$$

The above triangle is rotated from its presentation in Einstein's text for better comparison later. Also Einstein used "k" for the gravitational constant instead of the "g" used above. The above equation is commonly written as a double integral using dr, dθ, which is what will be done later in this document when comparing results.

Thus this first of the expected $2GM/R_0c^2$ values is due to refraction associated with differential velocities of light caused by the gravitational field.

The second half: The bending of light due to its particle like aspect.

These calculations can be done using a lengthier process based on the analysis of a conic section yielding the same answer as above, as was first done by Soldner in 1801[15], but a simpler method is applied here based on the shortcut used by Einstein above. Both procedures yield hyperbolas.

Imagine a triangle with the top a vector describing a straight path from left to right across a gravitational field. Let S=ct. At right angles pointing down is a shorter vector describing the distance a particle would fall during the time light would travel the distance S. Label this vector ½ gt^2. As Einstein did, let S = the unit distance, thus t=1/c. Complete the triangle letting the angle to the left be ψ .

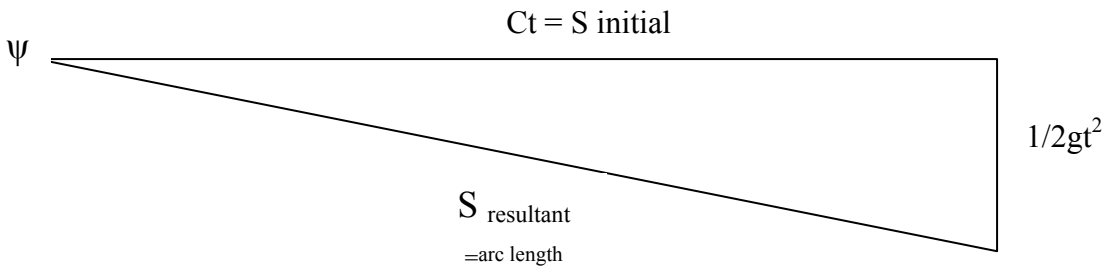


Fig F

Then $\frac{dct}{dt} = c$ And $\frac{d\frac{gt^2}{2}}{dt} = gt = \frac{GM}{r^2 c}$.

Thus for small angles $tan\varphi = \sin\varphi = \frac{\frac{GM}{cr^2}}{c} = \frac{GM}{r^2 c^2}$ which is the same as Eq 2.

Integrating the incremental deflection ψ gives the total deflection α.

$$\text{Eq. 4} \quad \alpha = \frac{1}{c^2}\int_{r_0}^{r}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{GM}{r^2}\cos\theta d\theta dr = 2\frac{GM}{c^2 r_0}$$

Eq. 4 is simply another form of Eq. 3 and thus gives the same answer as that derived for the wave like aspect of the photon. **This is the second of the expected $2GM/R_0c^2$ values.** Combining these two calculations gives:

$$\text{Eq. 5} \quad \alpha = \frac{4GM}{c^2 r_0}$$

Velocity relationships and other properties of the spatial medium

The following Table A is designed to reveal properties of a theory in which:

a. A mass acts as a sink for a spatial medium;

b. A thinning of the spatial medium surrounding the sink results;

c. An inflow of the spatial medium toward the sink is produced;

d. The inflow drags light toward the sink increasing the "external" velocity of inflowing light by the velocity of spatial inflow;

e. The thinning inhibits the "internal" propagation of light through the spatial medium by an amount which is the inverse of the "external" velocity.

Further the table and related calculations will be used to tie the data in the table to Eq. 1.

Table A: Incremental behavior of light in gravitational fields.

		FALLING LIGHT				RISING LIGHT			
A	B	C	D	E	*F*	G	H	I	
Pt.	V_g	V_g/C_o	$V_f = \epsilon$	V_p	Incremental	C_f	V_r	C_r	
	% of c_o		$(Co+v_g)/c_o$	1 / Vf	*ratios:*	V_p x V_f	$(C_0-v_g)/c_o$	V_p x V_r	
1	0%	0	1	1	*D dn. or E up*	$1c_o$	1	1	
					1.1				
2	10%	0.1	1.1	0.9090909		$1c_o$	0.9	0.8181818	C_o
					1.09090909				
3	20%	0.2	1.2	0.8333333		$1c_o$	0.8	0.6666667	C_o
					1.08333333				
4	30%	0.3	1.3	0.7692308		$1c_o$	0.7	0.5384615	C_o
					1.07692308				
5	40%	0.4	1.4	0.7142857		$1c_o$	0.6	0.4285714	C_o
					1.07142857				
6	50%	0.5	1.5	0.6666667		$1c_o$	0.5	0.3333333	C_o
					1.06666667				
7	60%	0.6	1.6	0.625		$1c_o$	0.4	0.25	C_o
					1.0625				
8	70%	0.7	1.7	0.5882353		$1c_o$	0.3	0.1764706	C_o
					1.05882353				
9	80%	0.8	1.8	0.5555556		$1c_o$	0.2	0.1111111	C_o
					1.05555556				
10	90%	0.9	1.9	0.5263158		$1c_o$	0.1	0.0526316	C_o
					1.05263158				
11	100%	1	2	0.5		$1c_o$	0	0	C_o

The table looks at 11 points in space from deep space with zero gravity to the surface of a hypothetical black hole.

Initially the reader is asked to focus on the impacts of gravity on falling light, i.e. columns A through E.

Note that the reference speed of light is unity and that for ease of analysis velocities for falling bodies were chosen as 10% increments of the speed of light. Thus each of the velocities are decimal fractions of the speed of light, though to save space only columns G and I have Co written after them. Of course in our solar system no body comes close to generating even the lowest velocity used in the table.

Column C expresses the velocity of gravitational flow that would occur for an object dropped to that point from infinity as a decimal of the speed of light C_o in deep space absent a (or at the minimum possible) gravitational field.

Column D assumes that light is dragged by the falling spatial medium (substratum, quantum foam, or ether) to create an *external* velocity of falling light that is the sum of C_o

and the gravitational velocity. This would be the measured velocity if that velocity was not caused by and associated with a concomitant thinning of the spatial medium. The quantities (c_o+v_g) are divided by c_o to permit entries as simple digits and decimals. The subheading $v_f = \epsilon$ reflects the fact that the column is being asked to do double duty to save space. The rationale will become clear later.

Column E calculates the inverse impact of the impeding of the flow of light by the thinning of the spatial medium. Column E should probably have been listed twice with the first time labeled as u, the propagability of the medium, and the second V_p, the *internal* velocity of light through the medium. Since the numbers were the same only one column was used to save space.

Column G reflects the fact that the measured velocity of falling light remains constant when both the increased gravitational velocity flow of the medium and the decreased ability of propagation through the medium are considered.

Column F is the dramatic column in many respects. Note that its data is offset from and lies between the other rows. If one divides the value for any point of Column D into the value below it one will get the same number as if one divides the corresponding values in column E in reverse order. The same holds true for any range of values for any corresponding two points. For example, in Column D dividing point 7 into point 11 i.e. 2/1.6 = 1.25. Likewise in column E dividing point 11 into point 7 i.e. 0.625/0.5 also = 1.25.

Mathematically the result in column F is obtained as follows.

The fraction $\frac{c_0 + v_{g2}}{c_0 + v_{g1}}$ describes the operations in column D, while $\frac{\frac{1}{c_0 + v_{g1}}}{\frac{1}{c_0 + v_{g2}}}$ describes those in Column E. So, the second entity becomes the same as the first after division. The numerator and denominator in the second fraction are reflective of the values V_p in the table. Thus values Vp_1 and Vp_2 of column E are comparable to Einstein's C_1 and C_2 in fig D.

Furthermore, in "The Principle of Relativity"[14], Einstein showed that $V_g/C_0 = \varphi/C_0^2$. Thus, $C_0 + V_g = C_0(1 + V_g/C_0) = C_0(1 + \varphi/C_0^2)$ which is the same as Eq.1, after the proper re-labeling has occurred to conform to this model's usage.

Thus, the data in Table A and the formulas derived from it are entirely consistent with Einstein's math and the concept that the deflection of light by a gravitational field is due to two process, (1) the Newtonian behavior which one would expect by treating light as a particle; and (2) the diffraction of light caused by the variation in the density of the spatial medium (substratum, quantum soup, quantum foam, ether, etc).

Several consequences and predictions suggested by Table A and associated math

1. Table A leads to some interesting conclusions and predictions regarding measured values of light velocities in a gravitational field and the possible existence of black holes**.**

The *measured* velocity of falling light at any given point in a gravitational field is. $c_f = v_p v_f = \frac{c_o + v_g}{c_o + v_g} = 1$. That is C_o, after multiplying by C_o convert from a decimal to a whole number value.

But the *measured* velocity of rising light becomes $c_r = v_p v_r = \frac{c_0 - v_g}{c_0 + v_g} c_0$ after conversion.

Thus the table provides a mechanism for a black hole, so it is consistent with modern theory in that respect.

2. Another consequence is that the velocity of light may be slightly incorrectly calculated as all the measurements of the velocity of light of which the author is aware involve an *over and back* process using mirrors or reflection off a foreign body**.** Thus the measurement is performed in a gravitational field or where light is entering and exiting one or more gravitational fields - at least three in radar sounding experiments.

Let D stands for the distance from the surface of a gravitational body to a mirror located distally in a gravitational field on a satellite of insignificant mass.

Let T_c be the total time for light with a *measured* constant speed c, to make the round trip from the surface of the earth to the satellite and back, then $T_c = 2D/c$.

But if T_v is the total time for light *in this model* to traverse the same total round trip, the total time is calculated as follows. Eq. 6 $T_v = \frac{D}{c_o(\frac{c_o - v_g}{c_0 + v_g})} + \frac{D}{c_0} = \frac{2D}{c_0 - v_g}$

But V_g is the integral of the acceleration g, so letting r_s be the distance from the center of the earth to the satellite and r_e the radius of the earth: $v_g = -\int_{r_e}^{r_s} \frac{GM}{r^2} dr = GM(\frac{1}{r_s} - \frac{1}{r_e})$.

Substituting this value into V_g in Eq 6 gives: Eq. 7 $T_v = \frac{2D}{c_0 - GM(\frac{1}{r_s} - \frac{1}{r_e})}$.

Since the gravitational field of the earth and the other bodies in the solar system are very weak, this potential miscalculation may be insignificant over short distances**.**

This may especially be true for experiments operating over small horizontal distances on the surface of the earth. Also, in an experiment involving two weak overlapping gravitational fields the offsetting fields probably make this error insignificant. Indeed, it may be extremely difficult to identify the error without specifically looking for it, which may be why it has not been noticed before. Thus the table and the math associated with it predict that – at least in weak gravitational fields – the measured velocity of light will be constant or very nearly so. It will certainly be constant for any given radial distance or geodesic in a gravitational field. But in the vicinity of a black hole differences in the measurements of the velocity of falling and rising light would be noticeable. **The constancy of measurement discussed here is not that to which special relativity applies.** That is addressed in the next two sections.

The velocity and gravitational redshifts

Experiment has demonstrated that a faster moving atom will radiate with longer wavelengths than a slower moving one. Based on accelerator experiments modern quantum mechanics assume that photons are absorbed and emitted from the electron or whatever particle is under consideration. So on one level it makes sense to treat the situation directly. It takes time for a particle to emit a photon. A photon being emitted into a stationary background medium, be it Einstein space, the vacuum, or the spatial medium of this theory, from a moving particle will be stretched more than a photon emitted from a stationary electron. It follows that greater velocity will cause more the stretching, resulting in greater redshift, than would slower velocity. Likewise a faster stream of flowing space passing a stationary particle will result in a greater redshift than will a slower stream. So in this model the velocity redshift and the gravitational redshift are different sides of the same coin.

Michelson –Morley and special relativity

A widespread misconception holds that the null results of the Michelson-Morley experiment eliminated the existence of any ether and served as the basis for a constant speed of light. *This could not be further from the truth! A vertically entrained ether theory is fully consistent with the null results as Michelson*[17] *and Lorentz of the Lorentz-FitzGerald formula firmly believed.*

Given: 1. That gravitational fields are entrained, as demonstrated by Einstein's own rubber sheet demonstration i.e. roll the bowling ball and the depression rolls with it; 2. That light obeys gravity as both Newton and Einstein posited and experiment confirms; and 3. That the experiment occurred entirely on the surface of the earth over a small physical distance in which the variation in the gravitational field was small; a null or more accurately a slight result as found in the experiment is not surprising. The later sections Spatial Fabric sinks and Relative Motion and Inertial Mass further amplify why a null result would be expected.

In a heated defense of the1933 Dayton Miller experiments, James DeMeo[24] asserts that in combination the small Michelson-Morley drift and the greater drift of the Dayton Miller experiments, which was performed at a higher altitude, support an entrained ether

The contraction, as proposed by Lorentz to explain the unexpected null results of the Michelson-Morley experiment, suggested that the arm of the experimental apparatus aimed in the direction of motion shortened.

Once it is realized that the Michelson-Morley experiment did not speak to the issue of the stationary ether or the constant speed of light, it also becomes apparent that the experiment did not speak to the issue of rod lengths. This issue is explored further in Paper II.

In this instance, the Lorentz-FitzGerald Formula captures *an experimental artifact* between what was expected and what occurred due to the *entrainment* of the gravitational field and the fact that light obeys gravity.

Gravity and Inertia

It is an empirical fact that gravitational fields are entrained, being the creations of the generating masses and traveling with them. This can be easily demonstrated by use of Einstein's so called rubber sheet analogy, which is a defective analogy for explaining that gravity is the result of warped space as it uses circular logic. That is, it uses gravity to explain gravity. It is in fact a demonstration of gravity in action. Thus it can be used to demonstrate that the gravitational field is tethered to the gravitational mass. As one moves the bowling ball across the sheet the "gravitational well" moves with the ball. This model posits that the *entrainment is vertical, but not rotational*, which is consistent with the results of the Michelson - Gale experiment and the behavior of the Foucault pendulum.

Einstein referred to gravity as an *apparent* or *fictional* force, much as coriolis and centrifugal forces are apparent forces being but expressions of inertia. But gravitational action has two components, an *active* component and a *passive one*.

If true forces are defined as being active and apparent or fictional forces as passive, then the first component, in which space is "curved" in GR or absorbed in this paradigm, is a *true force.*

The second, in which mass follows the path of least resistance in GR *or drifts with the flow* in this paradigm, can be considered an *apparent or fictional force.*

Spatial Fabric Sinks and Relative Motion

As massive (gravitational) bodies act as spatial fabric sinks, absorbing or condensing the spatial medium omni-directionally, the radial (i.e. vertical) dynamics of the flow of the spatial medium into a massive body forms a gravitational *field* which as a first

approximation obeys the Inverse Square law. The absorption process *entrains* the streaming spatial medium for a distance that is dependent upon the strength of absorption, with the entrainment being tightest near the body and weakest further from it. That is, the field tends to be anchored, tethered or frozen to the gravitational body and travels with it. This is the simple result of Cause and Effect and the fact that the field is a creation of the gravitational body. Thus, the gravitational body (mass or sink) and its associated field form a unit which operates as a *system*.

The system tends to *passively drift* or flow with the "background spatial fabric" (spatial fabric not associated with the system's own gravitational field) because its interactions with the background spatial medium are equal in all directions and it has no reason to behave otherwise. If neither it nor the background is accelerating the system experiences no relative motion with regard to that stream. Thus a gravitational body - with zero forward momentum of its own and absent the application of forces other than gravity - which experiences the gravitational field of a stationary mass, will passively travel with the inflowing spatial stream associated with the gravitational sink of the stationary body.

But, because of the Inverse Square Law, a gravitational stream accelerates and relative motion occurs between a local passive body (one located in the field of a more massive "stationary" body) and the moving background stream as a result. How other forces operate is not well understood, but other forces also cause accelerations and any acceleration causes a relative motion between the affected mass and the background spatial fabric.

However, these local passive masses possess *their own* gravitational fields and omni-directional inflow patterns. The result is that the *relative motion is not or is only minimally detectable* in the immediate vicinity of the local passive mass. This is because the relative motion of the system is mediated by its gravitational field which has a gradient that obeys the Inverse Square Law. While the gravitational field can be regarded as reaching to infinity, a zone or margin is reached where the impact is negligible that serves as a functional outer limit. For example, in Einstein's rubber sheet demonstration a distance is reached where the rubber sheet looks level. Near a mass the gravitational field is strong and under the tight control of the sink and equal inflow of the fabric of space prevails.

Toward the outer limits the field is so weak that no meaningful relative motion occurs between the system and the background, so resistance to uniform flow by the background medium is nil. *All the adjustment for relative motion occurs transitionally between the functional outer limits of the field and the immediate vicinity of the mass.* One way to understand this behavior is to consider the behavior of the vortexes which flow from the wings of a jet aircraft. *A small plane landing too close behind a jet can get in serious trouble. A plane a little further back is not bothered by the vortex. When one looks up at a jet flying overhead, one does not feel the vortex.* This is consistent with Van Flandern's [(26)] proposition that gravitational forces have a limited effective range.

Inertial Mass

Although at a far distance the motion of the system has little or no impact on the surrounding spatial fabric, as the system is approached the surrounding spatial medium increasingly gets caught up in the dynamics of the system, at first resisting then going with the flow. The process is modulated by spatial momentum attempting to maintain constant flow into the massive body from all directions. Gravitational mass can be thought of as the absorptive power of the sink or the sink's strength which is reflected in the impact of a gravitational body and its associated field on the larger surrounding background spatial fabric. In the rubber sheet demonstration the size of the depression in the sheet would be an indicator of this impact. But that impact (or depression) is also a measure of the need for the background spatial fabric to adjust to the system, even though the gradient associated with the system allows the impact on distant background to be nil and the uniform motion of a non-accelerating body to occur without resistance. *To put things succinctly, the background spatial fabric not only has to adjust to the movement of a material body, but to its gravitational field as well.*

The last statement is consistent with Chris Llewellyn Smith's[20] observation regarding the Higgs field in a July 2000 Scientific American article, "*The stronger a particle interacts with the field the more massive it is*." His series of graphics and associated text resemble this paradigm's mechanism for inertia and mass described below.

A short but relevant detour is in order here Standing out like a sore thumb is the fact that the field quanta of the weak force, the W^+, W^- and Z^0 bosons have mass - some 100 proton masses - while those of the electromagnetic and strong forces have none. Enter the Higgs field to the rescue. It is postulated to permeate all of space, as does this models spatial medium, and carry weak isospin charge to which the W^+, W^- and Z^0 bosons interact in a way that gives them effective or apparent mass. Indeed it is theorized that the masses of all particles may have this phantom like quality, being only effective or apparent in nature[34].

That weak force bosons have mass explains the so called weakness of weak force. From the de Broglie equation: $\lambda = \frac{h}{\rho}$ where $\rho = mv$ particles with great mass have very short wavelengths. Thus theorists surmise that the weak force is not weak at all, but that the short wavelengths of these bosons limiting their spheres of influence to very short distances.

It may be that the assertion that the Higgs field[32] is a form of an aether that is responsible for inertia, but does not affect light needs to be rethought, given that inertial and gravitational mass are equal and that light obeys gravity. The proposition may be based on two concerns: (1) That the experiments failed to measure the effect on light of the drift of the earth through the aether; and (2) that photons supposedly do not have mass. Reasoning has already been presented which reveals that the Michelson-Morley experiments were inherently incapable of making such a measurement, so the first concern has been covered.

Regarding photons supposedly not having mass, theorists now posit that the photon is a composite entity, composed, mathematically at least, of some 77% of the B^0 quanta and some 23% of the W^0 quanta while the Z^0 boson has the inverse proportions. This reasoning explains the effective mass that is observed for photons in nature and from it one might expect that the Higgs field would influence photons.

At any rate, whether or not the search for the Higgs bosons which is now underway is successful or not, it would appear that this model speaks to the issue in a meaningful manner. *But there is an additional dynamic associated with the operation of inertia.*

Experimental demonstrations

Three sets of experimental demonstrations that the author uses in lectures illustrate some of the foregoing dynamics and set the stage for concepts to follow.

The first involves the old carpenter's trick for driving the head of a loose hammer or hatchet head tightly onto the handle. Contrary to intuition the most efficient way to do this is not to hold the apparatus upright and pound on the hammer head, but to turn the whole apparatus upside down. Then, while holding onto the handle with one hand, hit the protruding end of it handle briskly with another hammer. The handle is driven firmly into the head before the head can move.

The second involves hanging two weights in identical fashion from threads and then tying threads of the same strength to the bottom of the two weights. Then one of the bottom threads is pulled quickly, making sure it lacks tension before the jerk. Invariably, the jerked thread breaks below the weight. Then the remaining bottom thread is gradually pulled downward. Invariably, the thread above this weight breaks. In the case of the jerk the weight resists the accelerating movement, so the full brunt of the pull is felt by the bottom thread, while in the case of the gradual pull the weight has begun to respond to the pull and is slowly moving so that now the top thread is feeling both the applied pull and the additional pull of the moving weight.

The third experiment involves doing a form of Einstein's so called rubber sheet analogy; while making clear that it is a demonstration of gravity in action. Embroidery hoops, across which elastic material has been stretched, are used. If a light marble is used that barely dents the material and the hoop is moved to the right, the marble rolls off the hoop to the left. That is the hoop moves out from under the marble. This is consistent with the foregoing experiment. But a heavy enough weight will form a deep impression i.e. forming a "gravitational well". Now as the hoop is moved slowly to the right so does the ball and so does the "gravitational well". Now if the hoop is moved rapidly to the right from a standstill, creating acceleration, the gradient of the material behind the ball steepens relative to that in front. If instead of moving the hoop the ball is rolled from a standstill, the depression moves with the ball (entrainment), but now the steepest material gradient is in front of the ball.

Using two light marbles, while holding the hoop still, makes it obvious that there is an effective limit for the impact of the marbles upon the surface of the material, as both marbles remain motionless if spaced far enough apart.

All three of these experimental demonstrations suggest that inertia involves a time delay and an active resistance to acceleration. Now, after some clarification of terms, the dynamics of inertia can be more fully understood.

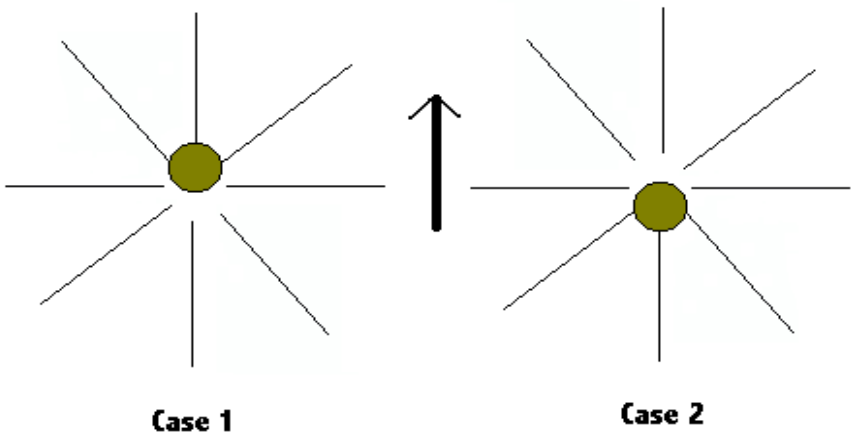
Acceleration and Inertia

Just as gravity has two components, in the Entrained Spatial Medium Gravitational Sink Model, so does inertia in its broadest definition.

> The *passive* component is described by a component of *Newton's first law of motion*: "An entity will continue at rest or in uniform motion in a straight line, unless a force acts upon it." Cause and Effect require that all entities behave thus. This component has nothing to do with mass, per se, and applies to light and the fabric of space as well as to massive bodies.
>
> The *active* or resistive component is that which is associated with the concept of mass, momentum, and the vector component of inertia called centrifugal force. Newton's Second and Third Law's are reflective of this active component of inertia.
>
> Newton's Third Law, which can be called the *Action-Reaction* principle, is tied to the concept of the *Conservation of Momentum*. This model posits that the fabric or medium of space has momentum which obeys the *Action-Reaction* principle. As noted in the previous section the background spatial fabric has to adjust to the whole system composed of the mass and its field.
>
> When most people refer to inertia, they are usually referencing Newton's Second law, *mathematically expressed as* F = ma, that is the resistance of inertial bodies to being accelerated. This is the element for which gravitational and inertial masses are said to be equal by general relativity.
>
> In this model the acceleration associated with a gravitational field results from the condensation causing a thinning of density near the sink upon which First and Third laws operate to create an inward flow.
>
> The key to understanding this active or resistive component of inertia is to realize that it is **due to a displacement between a gravitational body (mass or sink) and its own gravitational field causing it to experience a portion of its own field which acts as a force opposing the acceleration**. *The displacement occurs because of Newton's First Law, and the finite speeds and time delays associated with the transmission of and reactions to forces* as explained below.

This insight is owed to Petr Beckmann's book "Einstein Plus Two[10] in which he describes a similar process associated with electromagnetic inertia. He notes that the field about a stationary charge or a charge in uniform motion is frozen to it and such a charge does not feel its own field, whereas an accelerated charge catches up to or crosses and feels its own field. Beckmann uses this dynamic in his analysis of the orbital mechanics of charged particles and Quantum Mechanics.

Figure G



MASS SINK AND FIELD DISPLACEMENT

Iertia and Acceleration and Time Lapse

During stationary or uniform motion the mass remains in the center of its own gravitational field. Cause and Effect dictate that this be so, as the field is the sink's creation. Thus, *mass does not experience its own field during uniform motion*.

But when a gravitational body (mass or sink) is accelerated there is a **time lag**[26] between when it and its associated field adjust to the new situation, because the field is still at the location of its emission or traveling in some direction at a constant velocity. The result is that the *mass experience a part of its own gravitational field, which will attempt to restore the mass to its central place in the system*.

Because it is not well understood how forces other than gravity operate, the process will be examined from two perspectives with the same result.

Case1. If it is assumed that the accelerating force can operate upon the body without disturbing the field, the body will accelerate forward and drag the field along. But the field, having its own momentum, will take some small amount of time to respond.

The result is the mass now overtakes a portion of its own field and experiences the back flowing stream more than the forwardly directed stream. The net internal force by the field is counter to the forward acceleration of the mass. This scenario may be applicable to charged particles. This case is the same as seen in the embroidery hoop demonstration when the ball was pushed rapidly so it accelerated and had to overcome a steeper gradient in front of it.

Case2. This is the more likely scenario for acceleration due to gravity. The force operates via the fabric of space, accelerating a stream containing the gravitational body and its field (or a portion thereof). In this case, the field starts to pass the body and the forwardly directed stream is felt more than the backward one. But a time delay occurs before the gravitational body can respond. This delay process represents the inertial resistive force. Case 2 is the same as in the rapidly moving embroidery hoop demonstration where the steeper gradient formed behind the ball and pushed the ball forward.

The important point is that the same result occurs in both cases. This is analogous to thinking in terms of positive current flow in a wire or hole flow in a transistor instead of negative electron flow.

Nature provides other examples or analogies of the foregoing processes. Any time there is relative motion between a body and a medium, the steepened gradient is reflected in the form of a pressure wave forming in one direction with a thinning or stretching of the medium in the other. For example, if one places a beach ball in a pond and pushes it forward a bow wave forms in front of the ball. This would be analogous to Case 1.

If one were to hold the beach ball still in a flowing stream a "stern" wave would form on the upstream side with a comparable depletion of stream flow on the downstream side. Let the ball loose and after a short time delay it will flow with the stream. This scenario is analogous to Case 2. The bow wave phenomenon is just an indicator that the beach ball is experiencing delayed action during relative stream flow.

Inertial mass increase with velocity, Lorentz-FitzGerald, and gravitational charge

Relative motion of a gravitational body-field system through the background is easily accommodated at slow velocities because of the negligible impact of the field on the background and vice versa at the margins of the system. As velocities approach the speed of light the ability of the system to modulate between the gravitational body and the background and the ability of the background to accommodate such motion declines because the necessary communication of forces cannot exceed the speed of light. At high velocities a particle or body simply travels further during the time adjustment to its motion is attempted. Thus the gradient in the embroidery hoop demonstration steepens or a pressure wave builds in the stream examples. These are reflective of powerful relative motion, resulting in resistive behavior consistent with ideas attributed to the postulated Higgs field.

It may be that increasing velocity somehow increases a mass's ability to absorb the fabric of space. This could occur through processes similar to the case 1 and 2 scenarios writ large. That is, the process of accelerating a mass increases its interaction with the surrounding special fabric causing an increase in the absorption or condensation process.

The author does not pretend to know how the condensation process occurs. In the October 2009 Scientific American article *Black Stars Not Black Holes* it is proposed that space itself inside black stars can provide structural support preventing them from turning into black holes. Other quantum mechanical processes are involved such as polarization of virtual particles in space, but it seems that the process is not inconsistent with the sponge analogy used in the present model.

Or some type of lock and key or Velcro type process may involved as might be the case with aetherons or the vibrating strings or gravitons of some string theories. The Bose-Einstein condensate[28] is suggestive of such a process.

Massive bodies could be just concentrated spatial fabric with the ability to link to other spatial fabric. This would be consistent with GR theory that the spatial fabric exerts gravity.

Beckmann[10] argues that gravitational and inertial mass are equivalent only at rest and that gravitational charge like electric charge is constant and that it is only the inertial reaction that changes with increased velocity. Processes associated with the concept of renormalization and high momentum particle accelerator experiments do allow for the measurement of electron charge to vary[34], but even Feynmann called renormalization a "dippy" process so the author *would be interested in any experiment that measures whether a mass accelerated to higher velocity also increases its gravitational charge*. If gravitational and inertial mass are equivalent at all velocities this should occur.

The closest analogy of warped space that can provide a mechanism that increases gravitational charge involves a process similar to that called *squat*. Squat is a velocity dependent phenomena that causes moving ships to sit lower in shallow water.

DISCUSSION

In summary

1. The ether of Newton's correspondence and Einstein's space share some properties in common in that both can influence the behavior of light and mass.

2. This model's analogue of using the velocity of sound in a material medium for the behavior of light in space has been experimentally demonstrated[41].

3. Because it occurred deep in the earth's gravitational filed, the Michelson-Morley experiment was incapable of measuring the drift of the earth through space.

4. GR, Newton's corresponence, and the present model create spatial gradients, while Newton and the present model create spatial flow as well.

5. If Eddington's spatial gradients are true and if recent calculations showing that Bose-Einstein condensates and space in the vicinity of event horizons of black holes behave as liquids, then spatial flow will occur.

6. Thus the present model in which the bending of light is half due Newtonian spatial flow and half due to spatial gradients is not inconsistent with GR.

7. The present model's Table A on P11 is linked directly to Einstein's Eq.1on P8.

8. The proposition that inertia is the result of a mass experiencing its own field is applicable to Newton, GR and the present model.

9. Gravitation is proposed to be the result of both a true and a fictional force. The true force creates spatial gradients (warps space) and results in its flow. The fictional force is the result of particles going with the spatial flow and responding to spatial gradients.

10. The velocity of light is at times masked by its interaction with the spatial medium. That of falling light is measured as constant while that of rising light is measured as retarded. The velocity of transverse light following geodesics varies with position in a gravitational field.

11. A consequence of this theory is that as the universe varied in spatial density through time, the speed of light also varied. Light is posited to have been much faster shortly after the Big Bang and to have decreased with expansion. That the permittivity of the vacuum ϵ_0 is believed to be dependent on spacetime geometry is consistent with this model's assertion that the *velocity of light varies with the state of expansion of the universe*.[(18)(26)] Indeed, recent tests and analysis suggest that the speed of light may have slowed over time.[(33)]

12. The flatness problem i.e. the issue of whether or not the universe is open or closed, which is really a rate of expansion problem and not a shape of the universe problem, is said to be resolved by a variable speed of light[(25)].

13. The horizon problem clearly is solved by the variable speed of light as proposed in this model as communication in any early big bang universe would have occurred at a near infinite speed.

14. Experimental evidence indicates that the universe is presently flat[(23)]. It may be that the universe at one time had a curved geometry and was flattened by inflation. But a variable speed of light provides a possible mechanism for the universe having always been flat.

15. The ramifications of the preceding paragraphs for the calculations of the size and age of the universe could be profound.

16. The proposed model would seem to lend itself to the use of a particle based graviton[29] than does general relativity and it is much easier to bridge relativity and quantum mechanics using hidden variable[30] type reasoning which is being revived by some today.

17. Since all velocities and physical processes are referenced to C_o in this model and to c in both special and general relativity, *an ultimate reference frame, which has varied over time, is implied*. That ultimate reference frame is the universe, itself, possibly with the cosmic background radiation standing in as proxy for that reference frame for any given state of expansion. Local variations in density would occur depending on the distribution of gravitational entities and other factors and all entities would respond to local conditions, but on the grand scale the universe and the background reference it provides can be considered homogenous.

18. This model posits that where gravitational fields overlap the depletion of the spatial fabric will be the result of the combined effects of both fields at all locations where they overlap. Thus, at the nodes where two massive bodies offset each other there will be no gravitational flow, but the combined depletion of the spatial fabric will result in the velocity of light and propagation of forces through such a node being appropriately retarded.

Some alternatives

This model was motivated by the recognition that the rubber sheet analogy used circular logic and fact that general relativity, while attributing gravity to the curvature of spacetime, did not state how masses curved space. In the words of Tom Van Flandern[26] general relativity merely changes the question from "Why do objects attract each other?" to "why do masses curve spacetime?"

In an effort to come to grips with these issues I explored a couple of alternative scenarios before expanding on the gravitational sink model. I will discuss these before discussing the ramifications of the present model further. It will become apparent that the present model is really a variation, modification, or tweaking of General Relativity.

The shrink wrap gradient analogy (an excellent analogy for GR)

Several years ago I was working on the electrical system of a boat and used shrink wrap to protect the electrical connections. Shrink wrap works by shrinking when heat (energy) is applied. This could serve as an analogy for a Eddington's thinking on p109 of his 1920 book *Space, Time, & Gravity* in which masses somehow shrink the spatial medium in their vicinity creating a density gradient.

Eddington, a strong early advocate of Einstein theory, asserted that light is slower near the sun than then farther away because of a spatial density gradient. Thus a wave front passing by is slewed toward the sun. By assuming an inverse relationship between the velocity of light, he calculated the refractive index obtaining the same 4m/r deflection as Einstein's theory. It appears that, because of the way he calculated it, his refractive index includes the effects of both the present model's gradient and spatial flow. At any rate in view of his thinking, I am amazed that people look askance when I propose the same thing today.

The most direct version results in the spatial fibers shrinking more near the mass than distally. Thus density of the spatial fabric is presumed to be densest near the mass. The math associated with this version assumes that denser spatial fabric slows in order to bend light toward the mass, i.e. the light must jump across more hurdles (nodes) to propagate the same absolute reference distance. Sounds a little bit like quantum loop theory doesn't it?

Apparently because of Newton's reluctance to publish Einstein and Eddington were both unaware of Newton's ether inflow with an inverse thinning proposition or they might have proposed a mirror image scenario in which that the gradient is reversed even if the flow of space is ignored. Think of Einstein's cherished rubber sheet analogy. *The rubber sheet is stretched in the vicinity of the bowling ball*.

Part of the problem with Eddington's ideas from this author's viewpoint is that he asserts that the effect of the sun's gravity on a fast particle or light is to repulses it. I think that the present model handles this situation much more accurately.

The elevator analogy also breaks down for fast particles as he asserts that they fall faster then slower particles.

Instead of tying the additional deflection of light to faster speed of the particle, the present model ties it to faster spatial inflow which is caused by a sink thinning space creating a spatial gradient.

The Casimir Effect

Once I realized that the Michelson – Morley apparatus was inherently incapable of detecting ether drift, I realized that the dismissal of a spatial medium could well be in error. From there I started by trying to explain gravity using a model based solely on the Casimir effect and shadowing. It may be worth taking a detour and to discuss the *Casimir Effect Paradigm* briefly. I still have a soft spot for and am still open to the Casimir Effect playing a modulating role on the proposed model with one eye on it possibly helping bridge the gap between gravity and electromagnetic phenomena.

> Massive bodies have been shown to *serve as shields* for each other from vacuum dynamics on their distal sides with the result that they are driven together. *As they direct the flow of the fabric of space towards themselves*, massive bodies would

project a *zone of shielding from* dynamics on their distal sides, casting a shadow of calm - a zone of protection - on their proximal sides. The size and "strength" of the zone of protection would be dependent on the size of the respective masses and their separation.

The present model behaves much as a model based on shielding, but instead of using the Casimir effect to explain gravity, it posits that gravity by thinning the space between two masses causes, or contributes to, or modifies the Casimir effect. Experiments dealing with the Casimir effect have attempted to factor out the effect of gravity between the plates involved. But the present model posits that *the thinning of the spatial fabric between two massive bodies could also impact the vacuum dynamics between them, providing a mechanism for the operation of the Casimir effect*. So the Casimir effect is tied to gravity. At a minimum the Casimir effect suggests that the fabric of space is something real.

A void in the Fabric of Space

In a website paper *Can Gravity Be Induced*, Stephen Goodfellow[(42)] proposed that gravity is the result of a true void being created in the fabric of mass/energy/space. In view of the experiment in which a void in a cloud of rubidium atoms uses sound to simulate the behavior of light in space, this idea deserves further exploration. Presumably material particles could represent or are surrounded by voids in the fabric of space. The present model does effectively do this as the result of condensation or absorption.

A PROPOSED TEST OF THE THEORY

Observation 8 above is testable, but an even more direct test is possible, namely whether or not the speed of light varies with position in a gravitational field. The Viking Lander on Mars was used for a test that came close, measuring the Shapiro time delay with results that were accurate within with an accuracy of 0.1 percent. But the Viking experiment, though made perpendicular to the radii of the gravitational field of the sun, did not distinguish between Einstein's early thinking that the speed of light varied with position in a gravitational field and his later thinking that frames located in different positions in a gravitational field would measure identical speeds of light.

To nail this down it is important to conduct an experiment in which the relationship between the speed of light and position is direct and neither is inferred from other experiments or theory. Identical measurements made on the surface on the earth and then in orbit should provide an unambiguous test.

Methods seem to be available now to measure the speed of light in space using apparatus that can fit inside a spaceship. This theory predicts that if an apparatus capable of measuring the speed of light is used within a spaceship on the surface of the earth and then the same spaceship and apparatus are used in space – always oriented tangent to geodesics or a circular orbit about the earth (thus always normal to the radius of the earth's gravitational

field) - and the surface of the earth, the measured speed of light will be faster in space than at the earth's surface.

To be clear, I propose that light falling in a gravitational field and that following a geodesic is measured as having constant speeds, but that rising in a gravitational field will be slowed as evidenced by the Shapiro time delay. I also predict that light following two geodesics, one in orbit and one on the surface of the earth show different measured speeds with light being measured as faster in orbit than at the surface. I also predict that in over and back type measurements, radial measurement will be slower than tangential measurements.

Depending on the design of the experiment there may or may not be a net impact on measurements of the speed of light due to the interplay of these factors. Should the test result be the reverse of predictions and the speed of light measured as slower in space than on earth, then attention should be given to the interplay between these factors.

Since GR per conventional wisdom assumes that relativistic effects are such that a constant speed of light is maintained, any difference in the measured speed of light is unexpected. Thus any difference would support this model's proposition that the speed of light varies with position in a gravitational field.

Skinning the cat

Apparently Steven Weinberg had the same doubts about the adequacy of a pure geometric model to tell the whole story as did the author, as he based the mathematical formulations in his book *Gravity and Cosmology*[21] upon the principle of equivalence.

Lee Smolin[27] has made a similar observation. "…The metaphor in which space and time together have a geometry, called the spacetime geometry, is not actually very helpful in understanding the physical meaning of general relativity. That metaphor is based on a mathematical coincidence that is helpful only to those who know enough mathematics to make use of it.

Kip Thorne[22] in his book *Black Holes & Time Warps* devotes a number of pages in chapter 11 to the concept that if clocks and rulers are "rubbery", that is they really do slow and change lengths as proposed in this model, then flat space "appears curved" and the same experimental results are predicted.

The Future

The author would like to reiterate here his preference for the terminology "medium in or of space" when referencing spatial flow in this model, because he is uncertain whether it is the stuff of space itself which is flowing and varying in density or "gravitons" or something else to which we are electromagnetically blind.

The reason that the energy remaining in the vacuum at $0^{o}C$ is not directly detectable is that the fabric or medium of space is non electromagnetic in nature. Also, the fabric may be more complicated than conventional wisdom holds as evidenced: by the handed rules of electromagnetism, which suggests that nature has a personality at the most fundamental level; the apparent dualism of the photon and other particles; and the necessity for string theorists to resort to a number of extra dimensions in their attempts to unify general relativity and quantum mechanics. It might be that the needed extra parameters are due to the complexity of the structure of space itself or of media therein.

It may be that there is a background fabric which may be a continuum, a granular fabric, a weave, cellular in nature, or a combination of thereof, with different particles interacting differentially with different types of spatial fabric or medium. Certainly the idea of hidden variables is worth serious consideration and is entirely consistent with the proposed model. It would also seem that space must exhibit some sort of restoring force or gravitational fields would remain long after masses have moved on.

There is some evidence now that the rate of expansion of the universe is speeding up. Either it is or it is not, but I would like to see what the impact of the variable speed of light associated with the density gradients both spatially and temporally as proposed in this model has upon those calculations.

Further, the dictum of special relativity that forces cannot propagate faster than the speed of light, leads to the conclusion that a*s the speed of light is approached electrons peel off, nuclei fall apart, and material matter disintegrates into photons, which is consistent with both Einstein's belief that particles such as electrons are held together by gravity and his equivalence of energy and mass.* This may be contrary to what conventional wisdom understands SR predicts. It is consistent with a velocity redshift.

The experiment proposed above is justified given the search for ways to unify GR with QM and the impacts upon the flatness and horizon problems.

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