PAPER I

THE ENTRAINED SPATIAL MEDIUM GRAVITATIONAL SINK MODEL

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ABSTRACT

Given that light obeys gravity; the existence of gravitational redshift; and Shapiro time delay, the Michelson-Morley experiment, is shown to be an invalid test of the earth's drift through a spatial medium, because the experiment occurred deep in the earth's gravitational field.

Gravity is posited to be the result of masses acting as sinks of a spatial fabric in which a condensation or an absorption or some other sink 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 gravitational field is 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. The Higgs field or a similar mechanism, with its density gradients and motion, is operational in providing the ability of massive particles to react with the background. This background in turn suggests that our local universe operates within a superverse or megaverse.

Light is deflected by two processes, the inflow of the spatial medium and refraction by the spatial medium gradient. No dispersion occurs because the spatial medium is not 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 photons to loose energy during propagation. The speed of light through the spatial medium varies inversely with position in a gravitational field. The gravitational redshift is regarded as a special case of the velocity redshift. Clocks slow and rod lengths change in moving frames (Paper II addresses this further).

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 concept of a Higgs field, and the existence of phenomena such as the Casimir effect, superconductivity and *permittivity and permeability of the vacuum* suggest that space - or a pervasive fabric or medium in it - is substantive. Some, including this model, assume that matter and the propagation of light cannot exist outside a spatial medium. Further, Bell's Theorem and Alain Aspect's experiments 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 in black holes.

Because of the Michelson- Morley experiment, the ether was considered passé when this model was first written, but it will be shown from several perspectives that because light obeys gravity and the experiment occurred deep in an entrained gravitational field, it was an invalid test of drift through any spatial medium, vacuum, Higgs field or ether.

Comparing the spatial medium of this model to Einstein's "space", versus the ether of Maxwell and that of Newton (as proposed to the Secretary of the Royal Society) and the Higgs field and tying these to superverse concepts.

The model suspects that the confines of the universe contains several media or fabrics - perhaps one for every force field - that co-mingle in a "soup", foam or gas that defines the limits of the universe, superverse or megaverse. It may be that the full volume of the superverse is filled with such a medium, which may be continuous or grainy in nature.

Maxwell's and Newton's mediums, which they called ethers, are necessary for the propagation of photons. Newton's, proposal to the secretary of the Royal Society and to Robert Boyle, also explains gravity as being due to an inflow which thins in inverse proportion to its velocity. The Higgs field is viewed as a medium which fills all of space and with which W and Z bosons interact giving electroweak particles inertia and mass.

Intuition infers that Einstein's "space", with its properties and density gradients (its "warping" as conceptualized by Eddington) may be a Higgs type field. Moreover, this model posits that Higgs field mechanism or something like it can provide the basis for interactions enabling a particle to experience its own gravitational field during acceleration which is why the same analogies and cartoons can be used to explain portions of both the Higgs field and this model.

Photons are tied to the spatial flow by the requirement of a medium in which to propagate as viewed by Maxwell and Newton, but nothing in the model forbids the bulk of the dynamics of the standard model or general relativity.

The Higgs field mechanism permits particles that carry the weak charge to interact with a background medium. An analogy for the Higgs field likens it to people quietly filling a room evenly. A particle with mass is like a celebrity attracting a cluster of admirers who *impede* the celebrity's progress as the field behaves like a viscous liquid. But a rushing crowd can also give *momentum* to the celebrity by pushing the celebrity along as when someone cries fire in a theatre.

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. He did likewise in his book, *Relativity*[2], in which he asserted the need for a medium in which light could propagate. Apparently he never rejected the concept of an ether, but just stopped talking about it. Also he apparently thought that the ether was static. The concept of a Higgs background and other recent work on black holes and Einstein condensates make the concept of an ether which moves, by whatever name one calls it more probable. Indeed, Frank Wilczek has subtitled his book *The lightness of Being* with the phrase *Mass, Ether, and the Unification of Forces* and he has devoted Chapter 8 to his concept of an ether which he calls "The Grid".

In view of all the foregoing let us take the issue head on and reexamine the null results of the Michelson - Morley experiment. Given general relativity's bending of light, the gravitational redshift, and the Shapiro time delay, all of which are conclusively documented experimentally, it is ridiculous to expect an experiment conducted on the surface of the Earth and thus deep in the Earth's gravitational field to be able to detect the Earth's drift through any ether. Indeed the results were not truly null. 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 Higgs field, itself, can be considered an ether.

What general relativity did in eff*ect* was to *rename ether and call it space*. The proposed 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). Further, the proposed model assumes that GR and the standard model of QM are both fundamentally correct. Given

certain incompatibilities between GR and GM and the desire to reconcile them and the 60 to 120 orders of magnitude error in expected vacuum energy, it is hoped that the proposed model will be given a hearing.

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, consistent with absorption and emission of radiation as routinely observed in particle accelerators.

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 do not require a change the overall matter/energy content of the universe. **But recent indications that the energy density of space remains constant with expansion does require an explanation!** Two analogies help: (1) Let the sun represent the superverse and with sunspots representing local universes. In this case the expansion of a sun spot is also associated with the supply of new energy from below the surface of the sun. (2) Let the beads of a projector screen or the pixels of a TV (or computer) to represent the background energy level provided by a superverse, whose bead or pixel density does not change as an image upon their respective surfaces expands or contracts. Since the superverse is presumably enormously larger than a local universe, projected images on the respective screen would ideally be substantially smaller than the screen.

The sponge analogy gravity in a local universe

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 of light predicted by GR).

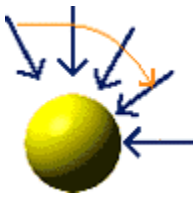


Figure A: Inflowing spatial fabric (blue) contributes Newtonian component of curvature of light (yellow arrow) as it travels near a mass.

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. The viscosity of the medium and the stickiness of the medium can be attributed to the Higgs mechanism.

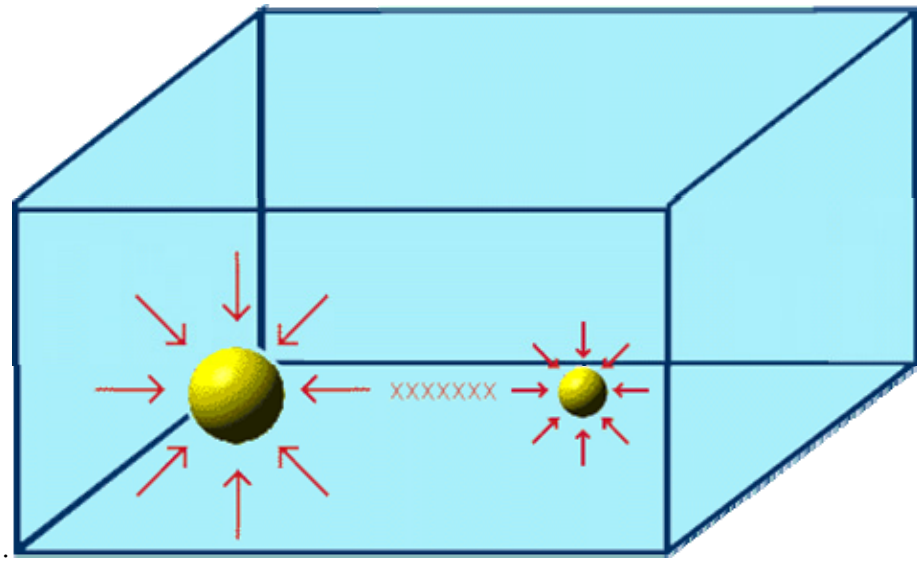


Figure B: Like sponges soak water in an aquarium,
mass soaks up the fabric of space in all directions.
A depletion of spatial fabric is felt at the Xs

It becomes obvious why *gravity cannot be distinguished from acceleration in this model*. Gravity in this model is due to the acceleration of a 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 attract the medium of space (or alternatively, responds to the differential momentum of the internal and distal density gradients) which accounts for the attraction between two masses being proportional to the product of the masses.

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. These dynamics are enhanced by the Higgs or Higgs like mechanism. 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 spatial medium between it and Earth than does a feather, but it also tugs harder on the rest of the spatial medium than does a feather so the opposing effects with the aid of the Higgs result in the cannon ball moving with the inflowing field.

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. 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 analogy to form a density gradient is a *true force,* which is likely dependent on the Higgs mechanism.

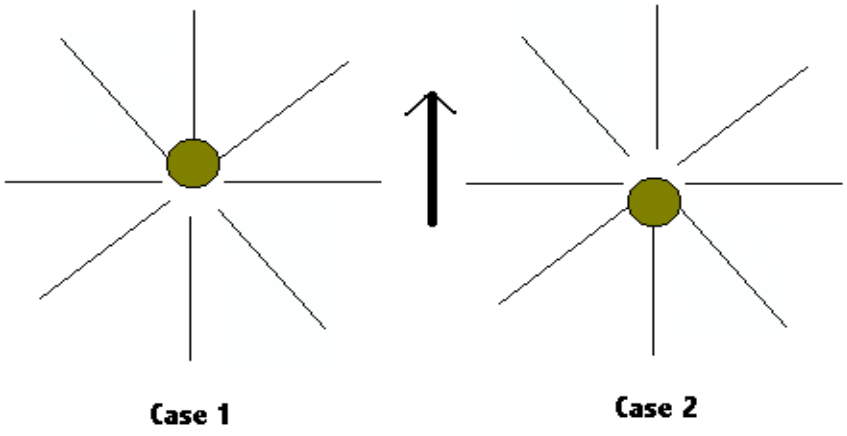
The second, in which mass follows the path of least resistance in GR *or drifts with the flow* in this paradigm, can be considered an *apparent or fictional force.*

> 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 the*

finite speeds and time delays associated with the transmission of and reactions to forces as explained below. This mechanism applies equally to this model and general relativity.

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

Inertia 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, just as the gravitational well is a GR mass' own 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 due to the Higgs mechanism. 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. I demonstrate this using an embroidery hoop in which a metal ball is pushed rapidly so it accelerates and has to overcome a steeper gradient or bulge in front, which may be analogous to a Higgs boson.

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 can be demonstrated by accelerating the embroidery hoop where the steeper gradient (Higgs boson) forms behind the ball and pushes 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 and may be analogous to the Higgs boson in both cases.

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.

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.

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.

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

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 of the medium 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 of the medium associated with the lowest "densities" of the medium.

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.

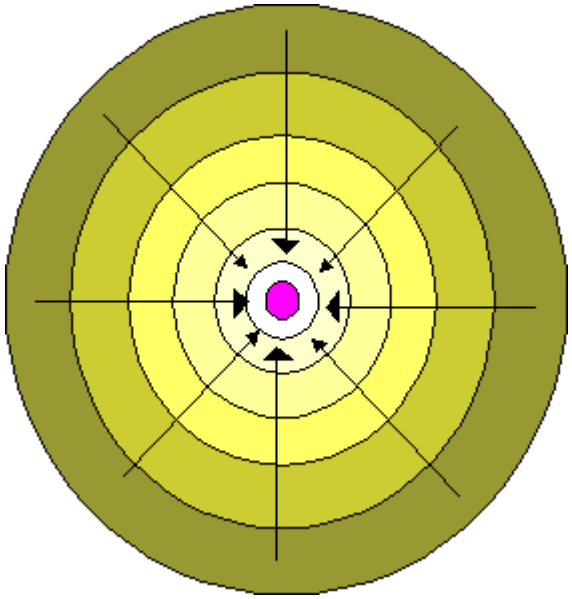


Figure C: Sink in the center is red.
Lighter colors represent lower density.
Arrows represent flow.

Presently, attention focused on fields and waves instead of particles. Be it a wave or particle or both, a propagating photon 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 associated with the "continental drift" effect of the inflowing spatial medium which comprises the gravitational field. For ease of borrowing some calculations done by Einstein, the particle and wavelike aspects of photons are handled separately with half of the bending of light by gravity attributed to each.

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.

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 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.

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 which have been modified in this document. The math is still good and describes this model's refraction component accurately. These calculations are repeated below.

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

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

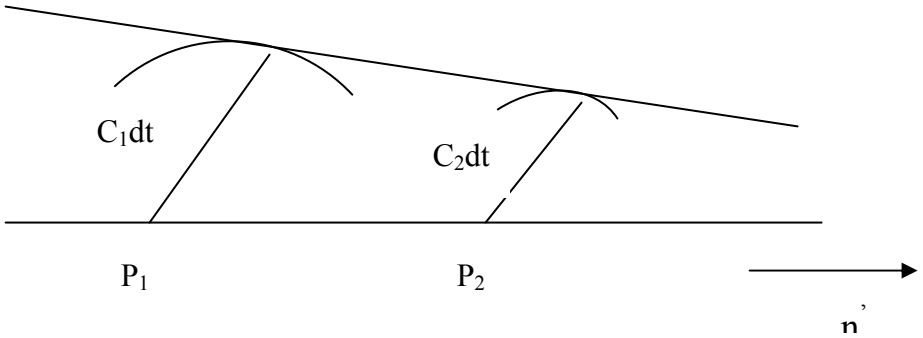


Fig. D

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:

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

Here ń is not the refractive index, <u>but the radial direction, r</u>, 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 $\alpha = -\int \frac{GM}{r^2 c^2} ds$, after letting n' = r

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

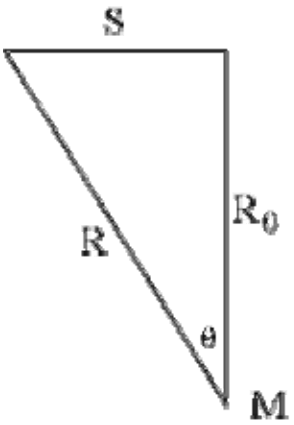


Figure E

Eq. 3 $\alpha = \frac{1}{c^2}\int_{\theta=-\frac{\pi}{2}}^{+\frac{\pi}{2}} \frac{gM}{r^2}\cos\theta\, d\theta = 2\frac{gM}{c^2 R_0}$

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 .

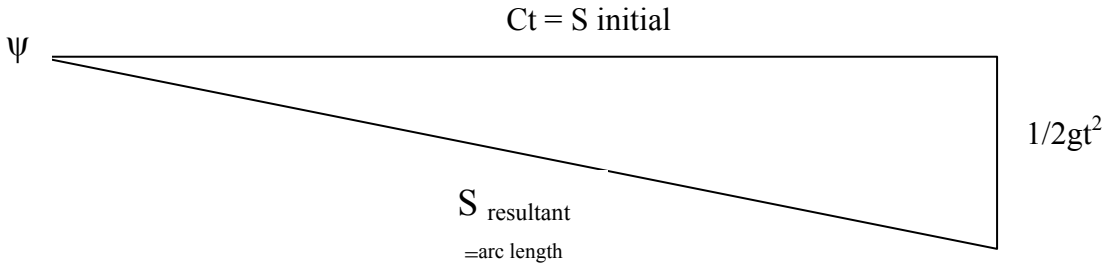


Fig F

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 help a layperson* visualize 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	$V_f = c$	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 none of the bodies in our solar system come close to generating the velocities 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 any 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.

The two ways the results in column F can be expressed algebraically are as follows.

For D: $\dfrac{\dfrac{c_0+v_{g11}}{c_0}}{\dfrac{c_0+v_{g7}}{c_0}} = \dfrac{c_0+v_{g11}}{c_0+v_{g7}}$ is operational, while for E: $\dfrac{\dfrac{1}{c_0+v_{g7}}}{\dfrac{1}{c_0+v_{g11}}} = \dfrac{c_0+v_{g11}}{c_0+v_{g7}}$ is.

The numerator and denominator in the E reciprocal fraction reflect the values V_p in the table so 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.

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 $T_v = \dfrac{2D}{c_0 - GM(\frac{1}{r_s} - \frac{1}{r_e})}$.

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.

Reference Frames, Particles and Uncertainty

In terms of similarities and difference between GR and QM and possible bridging concepts the following deserve attention.

The experimentally documented Right Hand rule (or LH depending on particle) of electromagnetism tells us something meaningful about nature. The R H rule insures that charged particles implement a Cartesian reference frame in their own infinitesimal vicinity. The reference fields serve as fractals upon which larger systems are based. With distance field lines may curve, but right angle components maintain their relationships. Charged particles snap to the measuring field accordingly.

That so called “point particles” exhibit spin argues that they are not in fact point particles. There probably is no such thing as particles with less than three dimensions in spite of the ability to treat them mathematically as if they were. Math is the language of science and the key to much scientific description of reality, but math is not reality itself and like all other languages is not immune from misstatement.

Taken together the forgoing tells us that there is a dynamic existence at an infinitesimal scale. Dynamics occur at this infinitesimal scale which we cannot detect because the right probes are not available or to which we are simply “blind”. At this scale electrons and quarks et cetera, have personalities. It is at this scale that nature makes its key decisions.

This is the true basis for the so called uncertainty principle and the need for a wave function in Schroedinger’s equation: $-\dfrac{h^2}{8\pi^2 m}\dfrac{d^2}{dx^2}\psi(x) + V(x)\psi(x) = E\psi(x)$.

A point of conflict between GR and QM is how time is handled. There is an effort by Julian Barbour and his allies to get around this by modifying both. For now the author treats time as a component of tracking causation. It does not travel backwards.

DISCUSSION

I was delighted by the discovery of the Higgs boson as I have always seen the spatial medium or fabric of this model as compatible with a Higgs like field. I have never been bothered by the proposed spatial medium of this model acting in an inverse or obverse manner to the proposed Higgs mechanism. Both Eddington and the Higgs mechanism appear to be based on the assumption that the density of space or the Higgs field is greatest toward a gravitational body, whereas this model uses a mirror image. A little thought however reveals that once one realizes that the primary role of the Higgs mechanism is to tie inertial and gravitational processes to background behavior, then the reversing the density gradients, as Newton and I and as nature routinely does, presents no problem.

The standard model of quantum mechanics (QM) regards the photon as an alloy [(34)]of two quanta being roughly 80% Bº and 20% Wº. This helps the Higgs mechanism explain why the photon obeys gravity. The proposed model accomplishes this by positing that photons depend on the spatial medium or Einstein's space in order to propagate. 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)]. Thus when Einstein's space expands the photon is stretched.

The present model's Table A on P14 is linked directly to Einstein's Eq.1 on P11. The table reveals that 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.

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. General relativity's warping of space is its counterpart to a true force and that is not dealt with adequately in GR. The Higgs mechanism is an attempt to do this, but the proposed model does it better. However, the proposed model is more than happy to accept the assistance of a Higgs mechanism. But the proposition that inertia is the result of a mass experiencing its own field is applicable to Newton and GR as well as the present model.

It was proposed in the text that the right (or left hand rule depending on the charge) for electromagnetism could speak to reference frames at infinitesimal scales where quantum phenomena are measured. In addition the preference for left handedness by the weak interaction combines to argue that deep down nature has a personality such that at

infinitesimal scales the uncertainty principle may not be quite so uncertain. Along with spin, these also argue against carrying the concept of point particles too far.

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