DARK ENERGY WITH CORRELATIONS TO GRAVITY

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ABSTRACT

Current theories of "dark energy" apply an energy component to empty space. Because of our established understanding of equivalence of mass and energy, this "space/energy" postulate extends an equivalence of mass to space. Evaluations of General Relativity allow us to explore the equivalence principle and how it can be integrated with the "dark energy" model of space and gravity. Simply stated, can graviton theory be integrated with dark energy and yield a "space" that imparts inertial force to mass while maintaining compatibility with both General Relativity and Newtonian gravity?

1. INTRODUCTION

EQUIVALENCE PRINCIPLE

The equivalence principle is the foundation of General Relativity. Einstein formulated his theory by applying the postulate that inertial force and gravitational force are equivalent. With the advent of "dark energy" theory, researchers are now seeking a discrepancy in this equivalency to support certain aspects of the theory. By contrast, the study in this paper holds to Einstein equivalence and expounds upon it. However, the Einstein equivalence principle does not incorporate "force conduction" equivalence. While the theory postulates that inertial force and gravitational force are completely equal, it departs from this principle in attempts to define the fundamental nature of how these forces are conducted. Inertial force is easily defined as a relative accelerated motion between space and mass. However, gravitational force is postulated, but not proven, to be a force conducted by theoretical massless particles called gravitons. While gravitons have never and may never be detected, we view this as an invitation to extend the equivalence principle to 100% equality which includes the fundamental nature for the conduction of this force: i.e., relative motion of mass to space.

This idea is perhaps better presented as a mathematical expression:

$$Inertial\ mass = gravitational\ mass$$

Our intent is to extend the equivalence principle further to include the physics of conduction of the two forces, so we replace each side of the equation with the conduction expression:

$$relative\ motion\ of\ mass\ to\ space = field\ exchange\ of\ massless\ gravitons$$

As we can see now at a glance, when extended to the "conduction of gravity," the equivalence principle appears to have been abandoned. The left side of the equation is fundamental. However, the right side of the equation remains unproven. The graviton remains only as a theoretical particle with little hope of its experimental confirmation. Perhaps we can move forward in our deduction if we extend the equivalence to 100%. Our first equation, when extended, then changes the right side which is gravitation force, to read as:

$$relative\ motion\ of\ mass\ to\ space = relative\ motion\ of\ mass\ to\ space$$

The right side of the equation…"gravity," now is considered equivalent to the left side and is viewed as a relative motion of mass to space. This line of reasoning invites us to postulate a conduction of gravity by the accelerated motion of space at the surface of every ponderable mass. Modern "dark energy" theory also invites this line of reasoning. Perhaps the energy value of space can be considered to represent the elusive graviton. While this analysis revisits the dated "inertial space" theory of gravity, if we are going to acknowledge an equivalence of space to energy, and therefore mass, then perhaps this postulate merits a modern, updated consideration.

2. A RELATIONSHIP OF SPACE TO MASS

If we entertain the concept that "dark energy," or more precisely, empty space has an energy component, then we are guided to a postulate that defines an equivalency between mass, energy and space. Logic may be a useful tool to guide us to conclusions regarding the intrinsic relationships that exist between mass, energy and space, however, our conclusions are supported or reinforced if we can take a known mathematical relationship that delivers us predictable physical results and derive from that relationship the mathematical support for a postulate. In my studies of the kinship of space to mass I have applied Newton's law of gravity and proceeded from there.

$$g = G\frac{m_1 \cdot m_2}{r^2} \qquad (2.1)$$

Newton's law tells us is that the force of gravity is equal to a given amount of mass at a given distance. However, Newton did not have the benefit of Cavendish's work to establish a value for the gravitational constant. Newton did not know the value of G. What Newton established was the proportionality of mass to gravity. The gravitational constant "G" was a result of the insight and deduction of Cavendish and is generally given as:

$6.67\times10^{-11} N \cdot m^2 / kg^2$.

In my theoretical analysis of the equality of space to mass I have removed "G" and present the proportionality of gravity to mass and distance.

$$g \propto \frac{m_1 \cdot m_2}{r^2}$$

The next step is to reduce the gravity equation to consider the force exerted by one dominating mass:

$$a \propto \frac{m}{r^2} \qquad \text{with } a = meters/\sec^2$$

Our intent is to unveil a possible proportional relationship between mass and space, therefore, we perform a dimensional analysis of Newton's law of gravity:

meters =	*distance* =	[L]
seconds =	*time*=	[T]
r =	*distance* =	[L]
m =	*mass* =	[M]

Analyzing the dimensions of Newton's law of gravity, we have:

$$[L]/[T]^2 \propto [M]/[L]^2$$

Rearranging dimensions we have:

$$\frac{[L]}{[T]^2}\cdot[L]^2 \propto [M]$$

Now we carry "[T]" to the right side and we are left with:

$$[L]^3 \propto [M][T]^2$$

$[L]^3$ represents space; i.e., length *x* width *x* height, so we have:

$$space \propto mt^2 \qquad (2.2)$$

Could it be possible that space has a direct proportionality to mass and time? Newton's law of gravity would seem to imply that it does. However, this equation leaves us with another question: is there a way to extend this relationship to an equality? For that extension of thought we need to delve deeper into our understanding of space. Our current knowledge of space is almost entirely defined by General Relativity. Relativity very precisely allows us to calculate the extent of the curvature of space due to mass. In our efforts to apply "dark energy" conversion to mass, we thus need to transform our Einstein curvature measurement into a volume of space directly related to mass. This can be accomplished by (for the sake of geometric convenience) visualizing the curved space as not curved or warped, but rather as space that is flowing into the object of ponderable mass. Visualize that a flow of space is moving inward into the Earth. Geometrically, both models are equivalent. In other words, a passing beam of light would experience the same rate of deflection in both physical concepts: curved space and geometrically equivalent flowing space. However, we need to introduce a postulate that defines a property of matter that perpetuates a conversion interaction between space and matter to account for the flow.

3. DYNAMIC MATTER POSTULATE

Our current viewpoint of "dark energy" implies an equivalence to matter. Equation (2.2) further strengthens the postulate that space and matter can be interchangeable, just as relativity established that matter and energy are two different manifestations of the same thing. In section (9) of this paper we show how the proportionality of equation (2.2) can be extended to equality.

There are additional established theories that support a continued exploration into a "dynamic nature" of matter. These include the Big Bang theory of the creation of the universe and Kaluza-Klein theory.

With the application of General Relativity, it has been established that all of the matter of the Universe existed as an infinitely small singularity prior to the big bang. Current popular thinking is that in the brief flash of the Big Bang, all matter of the Universe was transformed

from the singularity or infinitely small volume to one constant volume of matter that has not varied for the 13.7 billion year life of the Universe. It is a fair exploration of thought to speculate that matter was not transformed from the given singularity to one constant size, but perhaps it was born at a much smaller size than it currently occupies, and has been increasing in size for the life of the Universe. The current popular "static" viewpoint of matter following the Big Bang is contrary to the dynamic nature that is observed in all physical structures. Our "dark energy" view of space provides a beginning foundation for a mechanism that can provide a source of energy for a very slow and continuously positive expansion of matter. This postulate is advanced in this paper and is considered an alternative to "dark matter" theory. It addresses the gravity anomalies for which "dark matter" was conceived, and in addition has theoretical support based in General Relativity and the variance of matter, i.e., matter can be reduced in volume and ultimately to a singularity.

This postulate invites resistance for many, yet it is similar in structure to the postulate of 110 years ago that matter could spontaneously transform to energy. We ask the question, could "space" spontaneously transform into matter? In the final analysis there exist three basic components to our Universe: matter, energy and space. It is reasonable to explore the equality of all three. And it thus follows if matter and energy are equal and spontaneously interchangeable, then they would also share this property with space. If a spontaneous, very slow expansion of matter is indeed ongoing, it would be difficult to detect. This is because our yardsticks would be growing with all ponderable masses that surround us.

4. TIME

Time occupies an unusual position in theoretical physics. There is minimal solid physical theory to quantify the nature of time. Time is slowly and continuously moving in a positive direction. A postulate presented here is that this nature of time is directly coupled to the aforementioned continuous slow and positive expansion of matter. Relativity has given us the understanding that time is directly coupled to space and motion. If matter is slowly expanding in a continuously positive direction, then there is a perpetual motion relative to space that may define the physics associated with time. It provides a relativistic supported geometry that may help establish a physical explanation of the engine of time.

5. FIVE DIMENSIONS

Modern Kaluza-Klein theory has been applied to predict that a fifth dimension may exist and if so, it may manifest itself as a variance in mass. The theory that most embodies this postulate is "Space, Time and Matter" theory. Much research has been put forth by P.S.Wesson and others formulating the mathematics of this theory [1][2]. This paper presents the geometry of the fifth dimension that corresponds with the Kaluza-Klein-Wesson math. The significant contribution by Wesson et.al. is that the Kaluza-Klein compactification requirement of the fifth dimension is removed. What emerges is a fifth dimension that defines a variance in matter. If we consider that mass is expanding in a slow forward direction, and energy conservation is maintained by the "dark energy" space that is being converted to mass, then we no longer have a static four dimensional universe. Any event would need a fifth coordinate to define it completely. This fifth dimension or coordinate can be defined geometrically as a dynamic nature of space. This also helps to define geometrically the scalar field that emerges from the field equation. The Wesson [1] mathematical interpretation satisfies the classical tests of General Relativity which adds support to a fourth approximation of Gravity Theory.

The Space, Time, Matter equations are presented here. We let English letters run 0 – 4, and identify coordinates via $(0,123,4) \equiv (t, r\theta\phi, \varphi)$. Greek letters run 0 – 3, and the units chosen make the speed of light and the gravitational constant c = 1, G = 1. The field equations in terms of the Ricci tensor are:

$$R_{ab} = 0 \qquad \text{(a,b = 0 – 4)} \qquad (5.1)$$

These equations are conveniently interpreted if we write the 5D metric tensor g_{AB} as a 4 x 4 block $g_{\alpha\beta}$ plus an extra diagonal term $g_{44} \equiv \epsilon\Phi^2$ where $\epsilon = \pm 1$ and Φ is a scalar function. In setting $g_{\alpha 4} = 0,$ we have used up 4 of the 5 coordinate degrees of freedom, leaving one that we will use below to define a hypersurface condition to go from 5D to 4D. Then the 15 equations [1] can be shown to decompose into 10 field equations, four conservation equations and a wave equation [2]. The last five equations are automatically satisfied by any solution of equation (5.1) like those considered below, so we will not treat them explicitly. The first 10 equations can be written in terms of the 4D Einstein tensor as:

$$G_{\alpha\beta} = 8\pi T_{\alpha\beta} \qquad (\alpha, \beta = 0-3) \qquad (5.2)$$

These are formally the same as Einstein's equations of general relativity. However, the effective or induced 4D energy-momentum tensor is now given in terms of 5D geometrical quantities by:

$$8\pi T_{\alpha\beta} = \frac{\Phi,\alpha;\beta}{\Phi} - \frac{\epsilon}{2\Phi^2}\left\{ \frac{\overset{*}{\Phi}\overset{*}{g}_{\alpha\beta}}{\Phi} - \overset{**}{g}_{\alpha\beta} \overset{*}{g}^{\alpha\lambda} \overset{*}{g}^{\beta\mu} \frac{\overset{*}{g}^{\mu\nu}\overset{*}{g}_{\mu\nu}\overset{*}{g}_{\alpha\beta}}{2} + \frac{g_{\alpha\beta}}{4}[\overset{*}{g}^{\mu\nu}\overset{*}{g}_{\mu\nu} + (g_{\mu\nu}\overset{*}{g}_{\mu\nu})^2] \right\} \qquad (5.3)$$

In equation (5.3), a comma denotes the 4D partial derivative, semicolon denotes the usual 4D covariant derivative, and an over star denotes the partial derivative with respect to the extra coordinate. We see that the existence of 4D matter depends crucially on the extra metric coefficient $\left(\epsilon\Phi^2\right)$ and derivatives with respect to the extra coordinate (ψ). The fact that g_{ab} can depend on x^4, that ϵ can be positive or negative, and that ψ is not presumed cyclic distinguish the Wesson approach from that of other Kaluza-Klein theories [3]. In the event that g_{ab} is independent of x^4, it may be shown using equation (5.3) that $T^{\alpha}_{\alpha} = 0$ [2]. Identifying T^0_0 with density ρ and $-(T^1_1 + T^2_2 + T^3_3)/3$ with the pressure p of a perfect fluid, this means that the $p = \rho/3 (\overset{*}{g}_{\alpha\beta} = 0)$. That is, independence of the 4-metric from the extra coordinate implies a radiation-like equation of state of matter. However, most solutions of equation (5.1) for the g_{ab} will have $\overset{*}{g} \neq 0$, so that matter described by equation (5.3) will have a different equation of state. Wesson et.al. have shown that recovery of all of the "equations of state" commonly used in astrophysics and cosmology does occur [4]. The approach Wesson adopted does not

restrict the consequences of the 5D field equations (5.1) in any way, and via equations (5.2) and (5.3) we therefore obtain a geometrical description of 4D matter that supports the perpetual matter expansion via space/dark energy conversion.

This also adds support to a "dynamic matter" postulate. It was shown in 1921 by Edwin Kaluza that a five dimensional model unifies the electromagnetic and gravitational forces. The theory has languished because of the lack of success in demonstrating how a fifth dimension is geometrically manifested. However, if matter is slowly and continuously expanding in a positive direction, this would require a spatial fifth dimension to define any given event in our Universe.

If mass has an intrinsic property of expansion, this not only satisfies our geometric requirement for a fifth dimension, it also may provide us with a natural constant. Currently, we only observe two natural constants; the speed of light and Planck's constant. It has long been recognized that an independent third natural constant would resolve many aspects of subatomic physics. An intrinsic expansion of matter may address the speculation that this natural constant could be a length as described by nuclear physicist Kenneth Ford [5].

6. GRAVITY

If we extend the equivalence principle so it defines that both inertial force and gravitational force are due to a relative accelerated motion of mass to space, and we explore the postulate that matter is dynamic and its expansion is perpetuated by a conversion of "dark energy" space to matter, then we can extend our postulate to define a mechanism for the conduction of gravitation force. Isaac Newton felt it was a major failing that he did not develop an explanation of the physical mechanism that conducts gravity. In a similar fashion, although Einstein defined gravity as a curvature of space, he did not successfully explain how matter interacts with space to induce a curvature to its structure. Any new extension of theory that endeavors to explain how gravitation force is conducted must incorporate Keplar, Newton and Einstein and enter the position of the fourth approximation of gravitation force. In no way does the study presented in this paper contradict these previous developments of gravitation theory.

7. CURVED SPACE OF GENERAL RELATIVITY

In his efforts to apply relativity to gravitation force, Einstein concluded that space must be curved. Or more precisely, light would need to travel a trajectory that was not straight if the effects of relativity and time dilation were to be accommodated. His deduction resulted in a model of space that is curved or warped. Is warped space the only geometric solution that accommodates the effects of Relativity? If matter is expanding with time and "dark energy space" is being drawn into the hadrons of matter and converted to matter, we now have space flowing into all objects of a ponderable mass. Imagine space flowing into a star like our sun. This model of flowing space is geometrically equivalent to Einstein's warped space. We can apply this geometric equivalency and still have the postulate presented herein in total agreement with General Relativity. If we are to ponder ideas in an effort to understand our Universe, then it is fair to consider our model of space as flowing rather than warped. This then allows us to establish a relationship between space and matter that provides the conversion "constant" to insert into equation (2.1) that will make it an equality.

8. DARK MATTER

Rotational anomalies have been observed in galaxies and galaxy formations. Astronomers have found that the outer areas of galaxies are rotating at greater velocities than expected. The very broad conjecture has been offered that there exists a halo of dark matter surrounding galaxies thus providing the mass necessary for the rotational velocities observed. The primary problem with this concept is that there is minimal observational data or proven theory that supports the existence of dark matter. Dark matter has been offered primarily because there should be more gravitational mass to account for the galactic rotations. Cosmologists studying these rotational velocities estimate that the amount of additional matter required is 10 to 100 times the amount that is observable.

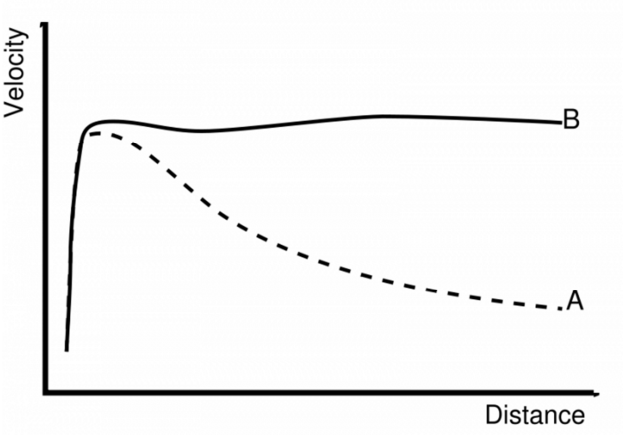

Fig. 8.1 Rotation curve of a typical spiral galaxy: predicted (**A**) and observed (**B**). Dark matter can explain the velocity curve having a "flat" appearance out to a large radius.

Recent explorations for detecting dark matter have been inconclusive [6]. We have outlined a postulate herein that departs from dark matter and introduces the concept of a "dynamic matter." Can dynamic matter theory be applied to explain the anomalous rotations of galaxies? If matter is perpetually and very slowly increasing in a positive direction, how does this manifest itself in the dynamics of distant galaxies? First, we have to consider younger matter, (i.e., matter that is far away such as a distant galaxy.) The particles of matter in this distant younger galaxy are smaller than the matter in our own galaxy. Angular momentum analysis of anomalous rotational velocities of several distant galaxies has allowed us to estimate a number for the decimal percentage rate of this postulated perpetual growth of matter. It is:

$$\Delta m_d = (9.512 \pm .005) x 10^{-9} \ / \ year$$

With this increase, galactic rotational velocity is decreasing as mass of stars and the relative distances between stars increases. This is a result of Newton's law of "conservation of angular momentum." What this implies is that as one looks back in time at the distant galaxies, one is looking at younger galaxies with matter that had less mass. That is to say, the number of

quarks and hadrons in the stars remains the same but their mass increases with time. For the "dynamic matter" analysis we need to apply this phenomenon to the rotational velocities.

Observations with infrared imaging have shown that the stars at the center of the Milky Way are much younger than the outer stars [7]. This is contrary to theory that older stars inhabit the center. Measurements show an age of 10 to 15 million years for the interior stars compared to several billion years for the outer stars. These new observations that date the age of stars at the center of our galaxy add support to the theory that new stars are being created via the Hawking black hole return of energy to the universe.

Age variations of stars within the Milky Way have also been established by measurements of two stars in globular cluster NGC 6397 [8]. From this research, the elapsed time between the rise of the first generation of stars in the entire Galaxy and first generation of stars in the cluster was deduced to be 200 million to 300 million years. Globular clusters generally occupy the outer ring of galaxies and contain the oldest stars. By applying the postulate of Dynamic Matter, we can predict that a variation in the age of two similar stars also results in a variation of their masses, yet each still maintains the same photon output. In other words, two stars of different age yet identical with regard to the number of atoms and resulting photon output, will have different masses. This is because the older star has existed longer within the Dynamic Matter effect and therefore its atoms have greater mass. We can calculate the respective resulting masses. We apply the Δm constant derived from anomalous galactic rotational velocities:

$$\Delta m_d = (9.512 \pm .005) x 10^{-9} / year$$

If we consider two stars with an age variation of 200 million years, we have:

$$\frac{m(t)}{m_0} = e^{m_d \cdot period} \qquad (8.1)$$

$$\frac{m(t)}{m_0} = 2.7183^{9.51x10^{-9} \cdot 2x10^8}$$

$$= 6.69$$

This is the multiple of mass. The mass of the outer stars would be approximately seven times the mass of the interior stars.

If we consider two stars with an age variation of 300 million years, we have:

$$\frac{m(t)}{m_0} = 2.7183^{9.51x10^{-9} \cdot 3x10^8}$$

$$=17.34$$

This is the multiple of mass. The outer stars would be approximately 17 times the mass of the interior stars.

The Milky Way is believed to have dark matter equal to about ten times the mass of the visible stars. As we can see from the above calculations, Dynamic Matter addresses the problem of the non-proportional rotational velocities of galaxies. The globular cluster stars, if heavier per the dynamic matter affect, demonstrate the possibility of heavier visible matter in the outer areas of galaxies. The theory of dark matter has been troublesome. While the additional gravity

offered by the theory does address the rotational velocity anomaly, the theory that predicts dark matter is incomplete. In addition, scientists have been unsuccessful in detecting dark matter [6]. The need for "dark matter" is eliminated and is replaced by "dynamic matter", of which there exists theoretical support derived from Relativity and the Big Bang [9].

Also related to this effect are the galaxy clusters such as the Coma cluster, which do not appear to have the required mass to hold the cluster together at the velocities that the galaxies are moving. Where is the missing mass for these clusters? The variable mass due to Dynamic Matter could be applied to explain the missing mass.

9. EQUIVALENCE OF DARK ENERGY TO MATTER

The formula for computing the curvature of space, as given to us by Einstein is:

$$B = \frac{\kappa M}{2\pi r} \qquad (9.1)$$

with "*B*" the *sine* of the angle of deflection, "κ" is Einstein's coupling constant and "r" is radius or distance. Solving for the Sun we have:

$$B = \frac{1.87x10^{-26} \cdot 1.98x10^{30}}{2\pi \cdot 6.955x10^{8}}$$

$$= 8.47x10^{-6}$$

This value represents the *sine* of the angle of light as it is deflected by the Sun's gravitation. We can take this resulting vector and divide it into two components: horizontal and vertical. The magnitude of the horizontal vector is the speed of light. The magnitude of our vertical component, the one directed inward toward the Sun, is equal to our value of "*B*" times the speed of light.

$$v = 8.47x10^{-6} \cdot 3x10^{8}$$

$$= 2542 \text{ meters/sec}$$

We have derived a vertical component of our angle that represents the velocity of space inward to a star or planet. When averaged over the diameter of the sun, the vertical component becomes 545 meters per second.

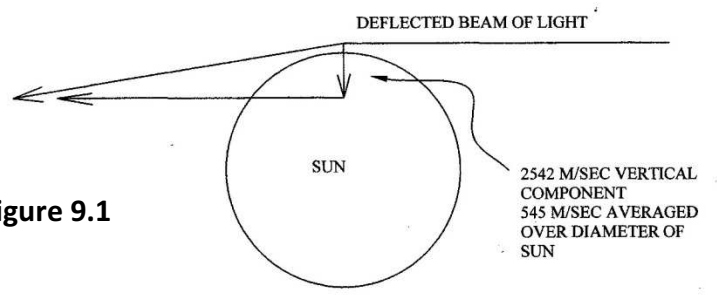

Figure 9.1

Using the area of the surface of the Sun and the amount of space that passes inward in one second, we can derive the volume of space that is consumed in one second: $3.351x10^{21} m^3 / \sec$.

Next we consider the postulate that an ongoing increase in mass at the rate of $\Delta m_d = 9.512x10^{-9} / year$ as derived from the anomalous rotation of the galaxies and apply this to the sun. The amount of mass the Sun would gain in one year is $1.891x10^{22} kg / yr$. This change basically would go undetectable because all mass in the Universe would be experiencing the same rate of change since the Big Bang. Remember that this "dynamic matter" rate of conversion in this analysis is replacing the immense amount of dark matter that is theorized. Converting the change of mass per year to attain the gain in mass per second and taking the ratio of this number with volume of space consumed will give us an estimate for the equivalence factor of space to mass.

Surface area of the Sun: $a = 4\pi r^2$

$= 4\pi(6.995x10^8)^2$

$a = 6.1487x10^{18} m^2$

Volume of space per second: $\text{vol/sec} = a \cdot 545m / \sec$

$= 6.1487x10^{18} \cdot 545$

$\text{vol/sec} = 3.351x10^{21} m^3 / \sec$

Gain in mass/year: $\Delta m / \Delta t = 1.891x10^{22} kg / yr$

Gain in mass/sec: $\Delta m / \Delta t = 5.994x10^{14} kg / \sec$

$\frac{vol / \sec}{mass / \sec}$: $m^3 / kg = \frac{3.351x10^{21}}{5.994x10^{14}}$

$= 5,590,668 m^3 / kg$

This calculation implies that approximately 5.6 million cubic meters of space is equal to one kilogram of mass.

This is the static ratio of space to mass. Our flow of space is dynamic at the surface of the sun. It is in accelerated motion, per the square rule, in the same nature as gravity. Our units for the flow of space therefore are $meters^3 / \sec^2$. When combined with the static ratio of $meters^3 / kg$, we then have our dynamic conversion constant of:

$$= 5.591x10^6 m^3 / kg \cdot \sec^2$$

This relationship demonstrates the proportionality of space to mass.

Returning to our previous deduction for the volume of space per kilogram, we arrived at 5,591,000 cubic meters per kilogram each second. We can insert this conversion value into the equation (2.2) that was derived from Newton's law of gravity and establish an equality of space to mass:

$$space = 5.59x10^6 mt^2 \quad \text{(with m = mass)} \qquad (9.1)$$

There are features of this equation that may be of significance. Our conversion constant was derived from theory and can be supported through measurement. In addition, the dimensions of our conversion constant; $meters^3 / kg \cdot \sec^2$, are also naturally derived and provide the dimensional conversion necessary to establish the equality of space to mass. We have thus defined a new constant; a constant that defines the conversion of space to mass for each passing second of time. For convenience I have assigned it the symbol "*Dm*." Our equation can now be written as:

$$space = Dm \cdot mt^2 \qquad (9.2)$$

with $Dm = (5.59 \pm .03)x10^6 meters^3 / kg \cdot \sec^2$

It is now universally accepted that energy and mass are directly equivalent per $E = mc^2$. Equation (9.2) implies a similar equality of space to mass. One hundred years ago, the concept of mass spontaneously changing to energy was not accepted by most scientists who considered the postulate. However, a few decades later it was demonstrated that the radioactive decay of uranium precisely matched the reduction of mass and release of energy as predicted by relativity. Does equation (9.2) imply a similar spontaneous conversion between space and mass? We could defy this suggestion purely on an intuitive resistance to alternate explanations. As with all advances in research, experimental testing is required to determine if theory matches observation. A laboratory experiment is outlined in section 13.

10. UNIVERSAL SCALAR FIELD EQUAL TO THE SPEED OF LIGHT

Let us return to the postulate that space flows inward at stars, planets and all ponderable masses. What has been believed to be a warp or curvature of space may actually be a flow of space that gives the appearance and same manifestation as curved space. Every planet and star

creates a vectored inward flow of space. The intent of the following evaluation is to show that when all of the vector fields of all the matter in the universe are combined… the result is a scalar field. This scalar field is an inherent universal flow of space, with no direction, and equal to the speed of light.

Not long after the creation of General Relativity, it was realized that the Universe has a finite amount of matter and space. It has no borders or boundaries, but yet is finite. This theoretical deduction was later supported by the work of Hubble, the discovery of background radiation, and the concept of the Big Bang. Using the estimated amount of matter in the Universe one can derive a theoretical number of stars. Using the Sun as the mass increment for every star, in our simplified model of the universe we would have $2.86x10^{23}$ stars. Philosophically it would seem that as the number of vector fields approaches infinity, one would acquire a scalar field. To clarify this idea, consider our model where our vectors represent lines of flowing space. The tails of these vectors do not cancel. Rather, when the tails of two opposing vectors meet, they create a demand for more space to feed both vectors. This results in creating a spherical infinite vector field that feeds the two opposing vectors. Therefore, our vector fields that are related to the atoms, planets and stars of the Universe quite rapidly spawn an infinite vector field. The result of this infinite vector field is a scalar field.

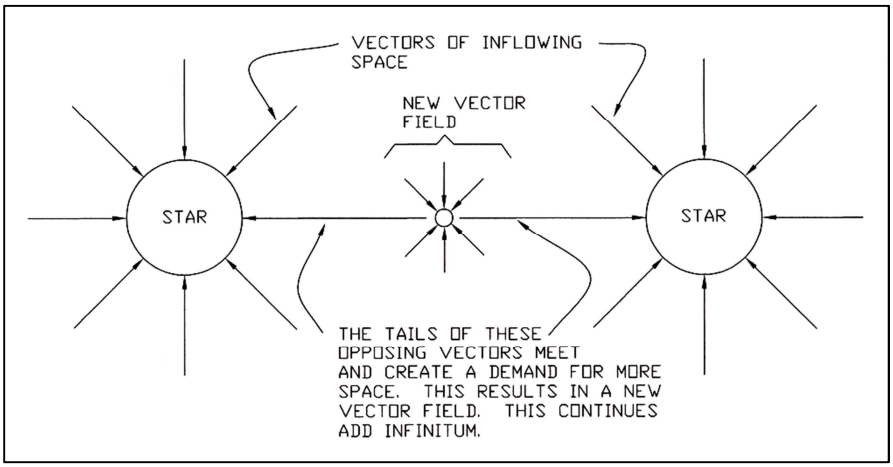

Figure 10.1 The geometry of an infinite vector field.

Relativity and the Lorentz transformation provide another argument for combined vector fields equaling a scalar field. A vector is not absolute and is transformed to any alternate frame of reference. Therefore, with Relativity, any vector field can be viewed as a scalar field as shown by Peebles [10]. The postulate advanced here is that the combined vector fields of all the stars become a scalar field that permeates the universe. It is interesting to note that a similar massive field has been indirectly predicted by Hawing and Penrose [9]. From the analysis presented herein, we can say that the inherent basic nature of the space in our universe is one of motion without direction. We thus provide a geometrical solution to the scalar field of equation (5.3).

In section 7, we used Einstein's formula for the bending of a ray of light to determine the inward flow of space. The reasoning being that the *sine* value of the resulting angle multiplied by the speed of light yields the velocity at which space is flowing inward at a body of mass. If one imagines the Universe as spherical with a given radius and a finite amount of mass, one could apply the same formula to the Universe as a whole. Recognizing that indeed the Universe has no defined edges or boundaries reinforces the idea that the resulting value has no direction.

It is a scalar value rather than vector. We also consider only the visible matter of the observable universe.

We will consider the Universe to be spherical in nature, although recognizing that this is a three dimensional model invoked for the sake of visualization. Applying Einstein's formula for bending of light, we will calculate the deflection of a light beam as if it were passing the edge of the spherical Universe. This analysis is used to determine what effect the overall mass and volume of the Universe has on scalar motion of space as a whole. Einstein's formula requires two variables, the radius of the Universe and the mass of the Universe. Current estimates for the radius of the Universe are $46x10^9$ *light years* or $4.35x10^{26}$ *meters*. The second variable, *mass*, is perhaps more difficult to estimate, since it involves trying to establish a number for all of the visible matter in the Universe. Estimates range from $5.68x10^{53}kg$ as shown by Misner, Thorne, Wheeler [11] to $3x10^{52}kg$ per the *The Physics Factbook* [12]. It is quite likely that the higher estimate is more accurate, simply because there may be hot matter that we simply cannot see. In reality, the number most likely falls somewhere between the two estimates. For this calculation we choose a number that falls between the two. The quantity $1.033x10^{53}kg$ is used for our purposes.

Radius:	$46x10^9 lyr = 4.35x10^{26} meters$
Estimated matter:	$1.033x10^{53}kg$

Einstein's formula for bending of light:

$B = \frac{\kappa M}{2\pi r}$ with B equal to the *sine* of the resulting angle

κ	is Einstein's coupling constant: $1.87x10^{-26}$
M	is mass
r	is radius

Substituting the values for the Universe we have:

$$B = \frac{1.87x10^{-26} \cdot 1.033x10^{53}}{2\pi \cdot 4.35x10^{26}} \qquad (10.1)$$

$$= .707$$

This is the *sine* value for the resulting angle caused by the inward flow of space. The related angle for this value is 45 degrees. The tangent value for 45 degrees is 1. Our beam of light grazing the edge of the Universe would then be deflected at 45 degrees. This result implies that the background scalar velocity of the space that permeates our universe is the speed of light.

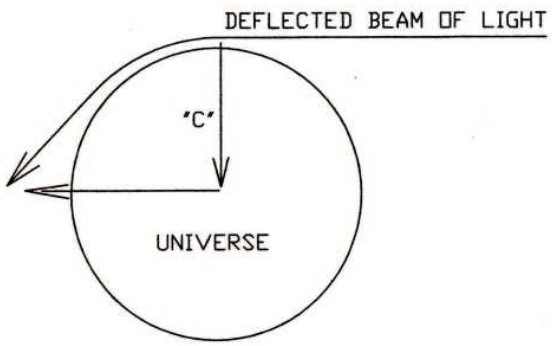

Figure 10.2. The total mass and volume of the universe equals the proper quantities to create a scalar field whose non directional velocity equals the speed of light.

My conclusion is that each quark is as a miniature black hole drawing in space at the speed of light. The combined effect of all the quarks and hadrons of the universe drawing in space at velocity "*c*," as shown in section 10, results in a universal scalar field of space equal to the value of "*c*." Therefore, the constant for the speed of light is dependent on the amount of matter in the Universe. This deduction implies that the physical structure of the Universe is based entirely on the speed of light. There has been speculation in physics at to why the speed of light is the dominating universal constant. The relation revealed by Dynamic Matter satisfies that question.

With the concept of a universal scalar field equal to the speed of light, one can see how this explains the relativistic nature of physics. Any particle with zero mass that is released from an atom can only travel away at the velocity "*c*," because that is the scalar value for the motion of all space in the universe. We can see that the inertial space represented by Dynamic Matter is actually an individual field associated with each body of mass that contributes to the grand scalar field. In some respects, the universal scalar field, as outlined by Dynamic Matter, helps to explain relativity. For example, if you are the classic traveler measuring the velocity of light, regardless of your direction and your velocity, you will be traveling relative to the universal scalar field of space that has the value of "*c*." Therefore, you will always measure $3x10^8 m/\sec$ for the velocity of light because that is the value of the scalar field. Any motion by an observer within this field, combined with time dilation, demonstrates that the measured value of this field cannot be altered.

11. QUANTUM GRAVITY

The Dynamic Matter postulate presented advances the idea of an accelerated motion of space into bodies of ponderable mass as the conveying mechanism for the force of gravity. This transformation of "dark energy" into matter occurs at the heart of every atom within the atomic nuclei and also the electrons. With relative distances between particles remaining constant, any expansion of matter remains mostly transparent because our yardsticks are increasing with the physical dimensions of matter.

There are two possible expansion behaviors available:

1. The expansion of subatomic particles of mass happens in a smooth, analog fashion.
2. The expansion is in discrete increments.

Given the known quantum nature of the subatomic world, the only possible choice of the two available is that the expansion of matter happens in discrete pulses in direct relation to the Planck constant. This, in turn, translates to a pulsing behavior to the incoming energetic space. The benefit of this postulate is it provides a geometric model for quantum gravity. As stated earlier, we can view the "dark energy" concept of space as gravitons. With dark energy being transformed to matter at the subatomic level in discrete Planck sized increments, these discrete increments of energetic space may be viewed as massless graviton particles.

12. RED SHIFT

One aspect of nuclear physics is that the smaller the particle, the longer the wave length associated with that particle as per deBroglie [13]. An application of the presented postulate of "dynamic matter" is the effect on observed red shift. If matter of the early stages of the Universe is much smaller as postulated then it is possible that a portion of the red shift in distant quasars and galaxies is due to the smaller and less energetic particles. The atomic structure would be the same as in our own galaxy, and thus emitting the same amount of light for a given star, but that star would be smaller and emitting light with a longer wave length [14]. This aspect may help resolve certain observations regarding speeds of distant quasars and galaxies. The Universe may not be expanding at the rates projected if a percentage of the red shift can be attributed to smaller matter and subsequently, smaller atoms.

13. PROPOSED LABORATORY TEST

If a rotating gyro is set in motion within a vacuum chamber, the nature of its slowing motion may yield correlating results to the anomalous rotational motion of galaxies. Per Newton's first law, a frictionless gyro rotating in a perfect vacuum should not have any slowing. In a real test, friction cannot be eliminated entirely. However, the lost rotational velocity due to friction may vary with the rotational velocity; ie., the greater the velocity then the greater the effects of friction. By contrast, the rate of decreasing angular velocity due to "Dynamic Matter" should appear as constant regardless of the velocity. By measuring lost rotational velocity at different rotational velocities this variation can be used to quantify those losses due to friction and reveal the losses due to the "dynamic matter" effect. The decreasing angular velocity of the gyro should be changing at a decimal percentage rate of $\Delta\omega_d = -5.032x10^{-16}/\sec$. This amount of change is very slight and it is likely that in past gyro experiments the change was attributed entirely to friction. This oversight may be similar to the historic measurement of time and mass variations due to relativity. They were so slight, that until we knew what to look for, they went undetected.

14. CONCLUSION

The postulate presented in this paper presents a model where "dark energy space" is being converted into mass in quantum increments at the heart of every atom. This postulate can be applied to the following issues and anomalies:

1. It defines a physical explanation for the conveyance of gravity.
2. The quantum "space to mass" conversion defines quantum gravity and the graviton.
3. Slow, forward, positive expansion of matter is synergistic with time.

4. A third natural constant is derived which has applications in nuclear physics.
5. A fifth dimension would be required to define physical events.
6. It provides a solution for the anomalous rotational velocities of galaxies (dark matter).
7. A percentage of observed redshift would be attributed to distant, younger and smaller matter.
8. An experiment is outlined to test this postulate.

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