DYNAMIC MATTER

CONCEPTS OF SPACE, TIME & GRAVITY

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ABSTRACT

The research and study herein addresses anomalies that exist in our observations and understanding of the physical universe. The four primary anomalies that are addressed deal with momentum. These include: the slowing rotation of the Earth, the increasing altitude of the Moon, the slowing of the Pioneer 10 and 11 space probes and the rotational velocities of Galaxies. The conclusions in this study appear to resolve these momentum anomalies by introducing a postulate that predicts a fundamental increasing variance of matter. Support for this postulate can be applied by the variance of mass as defined by Special and General Relativity. Additional support is also applied by the prediction of all matter of the Universe existing as a singularity prior to the Big Bang. Current assumption in physics is that matter went from infinitesimally small prior to the Big Bang to an immediate and constant fixed size for the life of the Universe. The Dynamic Matter postulate predicts an ongoing, perpetual expansion of matter beginning with the Big Bang and intrinsically linked to time.

For matter to undergo a continuous expansion demands an equal and ongoing input and conversion of energy. Recognizing that space is one of the three fundamental components of the Universe: matter, energy and space, then it is not an unfair proposition that there exists an equivalence between these three components. The matter variability can therefore be provided by the "energy" of space. The deduction of an equivalence of space to mass is derived from Newton's law of gravity.

General Relativity defines a curvature to space. It is a postulate herein that space only appears curved. The true geometry is one of a flow of space into the heart of every star, planet and atom. The two geometric descriptions are mathematically equivalent. By adopting the geometry of flowing space rather than curved, we then have a model that defines the transformation of space to matter. Per the square rule, we recognize that a flow of space at the surface of a planet would be in an accelerated state. By extending the equivalence principle which

states that inertial force and gravitational force are equal, we can then see that the force due to gravity results from an "inertial space."

The velocity of space at the surface of the Earth is derived from General Relativity. It is then shown that as one goes deep into the heart of an atom, this velocity terminates at "c", the velocity of light. Additional analysis shows that the Gravitational Constant can be predicted from the determined sub-atomic radius at which the velocity of space reaches "c", and the value of "c." It seems likely that a theory that does successfully predict the value of "G" would do so from the velocity of light.

It has been demonstrated by Stephenson and others that tidal friction is not adequate to account for the total slowing of the Earth's rotation. By applying Newton's "conversation of angular momentum," the value for the ongoing variance of matter is derived from the slowing rotation of the Earth. This value is then used to successfully resolve the momentum anomalies of; the Moon's increasing orbit altitude, the slowing of Pioneer and the rotational velocities of the Galaxies.

Further relationships emerge from the concept of a "dynamic matter." These include the basis for the "quantum" and the definition of how a fifth dimension manifests itself. In addition, a percentage of the extreme red shift measured in distant galaxies can be attributed to "dynamic matter." Also, the concept of a flowing inertial space yields a model of a scalar field that can be defined as space itself and is equal to the speed of light. In the final analysis, what we currently observe in these momentum anomalies appears as a violation of Newton's first law. If we adhere to this law, then what emerges is a requirement that mass be variable in an ongoing and intrinsic manner. Additional experimenting and testing should be conducted that verifies if an apparent discrepancy in Newton's first law is attributable to the "dynamic matter" postulate presented herein.

INTRODUCTION

Is it possible for matter to be dynamic? The dynamics of motion that exists at the sub-atomic level is well understood. The question I raise is of a rudimentary dynamics associated with volumetric dimensionality of matter. The possibility of an inherent dynamic nature to matter was clearly revealed in 1905 in the theory of Special Relativity. Time was shown to be variable as well as mass and length.

Mass is the inertial property of matter. In a gravitational field this equates to how much something weighs. In empty space the quantity of mass is determined by the amount of force required for a given amount of acceleration. Matter, on the other hand, is the physical component that has spatial dimensions and possesses the attribute of mass. Relativity revealed to us the variability or dynamic nature of both mass and matter. With Special Relativity, the variability of mass and the length of the matter are related to the velocity of the object. With General Relativity, the length of the matter and its associated mass are dependent on the gravitational field.

With a black hole, these two quantities can extend to their limits. The predictions from applications of General Relativity and Quantum Theory outline a collapse of matter that can continue to a singularity. This is to say, all matter seems to continually shrink and finally vanish leaving only a single, infinitesimally small point of condensed mass and matter. Black holes have earned a place in physics where their existence is now considered proven. These cosmological objects demonstrate and confirm the predicted variability of mass and matter.

Following these explanations of mass and matter leads us to a quantifying of the fundamental components of our universe. There are actually only three; matter, energy and space. For some discussion, the terms mass and matter can be used interchangeably with matter being the more general term.

With these definitions established, what is it then that I am presenting in this work that adds upon current physical concepts? This has become an extensively encompassing question, covered by the analysis presented within these pages. For purposes of introduction, I will summarize a few key viewpoints. First; given the widely accepted model of the Big Bang, all matter of our universe was born from a singularity. The current concept maintains that this matter, with infinitesimally small volume, was thrust out into empty space in a brief explosive flash. The assumption prevails that this matter went from infinitesimally small to a fixed unchanging volume in this brief flash of birth. Current assumed concept also maintains that this volumetric dimensionality has been fixed, or static, for 13 billion years. The work within these pages explores the idea that the Big Bang did not deliver us with universal matter that has a fixed volumetric dimension. Rather, matter may have been born at a small size and incorporates an intrinsic nature of expansion. While this strikes many as radical, I have found merit in the concept. In addition, the concept reveals itself to be less radical than theories of dark matter, dark energy, string theory and others; perhaps not least of all, because the basic postulate is supported by the relativistic variability of matter.

The idea, regardless of the degree of openness the reader may have to this idea, invokes question upon question. Perhaps top on the list is the conservation of energy within the universe. If mass is increasing with the passage of time then where is the energy coming from? The analysis of this question even exceeded my expectations. The short answer is - **SPACE**. It is my hope that the relatively new ideas of dark energy have helped open the door to this concept. New theories generally are sorted out by their accuracy or power of predictions. They live or die with the results obtained from actual physical tests. Although string theory struggles to be an exception to this rule, most feel solid physics must retain these criteria. It has been satisfying in my research that this concept of "dynamic matter" can be applied to many observed and measurable physical phenomenon. Although many emerge, the basic ones deal with anomalies of momentum. There are four that I explore; the Earth's variable rotation, the rotation of galaxies, the moon's increasing orbit altitude and also, the slowing of the pioneer spacecraft. In addition, simple experiments can be conducted to measure an intrinsic advancing variability of mass.

There also exists among many scientists, a dominating attitude that any new contribution to the field of physics must be extremely complex, both geometrically and mathematically. Again, string theory fits these criteria. However, is this really a requisite for exploring the nature and structure of our physical world? We can see why this attitude has prevailed. Newton invented calculus to explain gravity, Einstein invoked complex tensor math and curved space geometry to define General Relativity, Dirac and others developed increasingly abstract math for applications of quantum theory. So does it not follow that further discovery would require even more complex explanations for the continued evolution of physics? Actually it does not. We must look at really what each contribution to theory has presented in its basic form. Newton's law of gravity is a simple algebraic equation that represents mass and the square of the distance as the basic governing factors for defining gravity. His calculus was developed as an aid to predict motions based on his simple law of gravity. In a like respect, the Lorentz equation is the foundation of Special and General Relativity. All of Einstein's deductions, including equivalency of mass to energy, were born from this simple equation. The tensor math was an aid to define the geometries that result from Relativity as defined by the Lorentz equation. Quantum theory is seemingly even more complex and elaborate. However, in a like respect, the simple deBroglie equation represents the basic nature of the quantum. Of course, analysis and prediction of quantum effects can invoke extremely complex mathematical deductions. So is it really a requirement that new or different physical concepts are mathematically extreme? It would seem that our current understanding of physics, in its basic form, is defined by three simple equations:

1. Newton's law of gravity - $g = G\frac{m_1 \cdot m_2}{r^2}$

2. Relativity and the Lorentz equation - $m = \frac{m_0}{\sqrt{1 - v^2 / c^2}}$

3. Quantum theory and the deBoglie equation $\lambda = \frac{\hbar}{mv}$

This viewpoint supports the idea, and the hope of many, that new contributions would be mathematically, "elegant." It would be nice if the next stage in our understanding was defined by a basic equation.

And as in gravity and quantum theory, applications of this new basic equation will be produced with advanced mathematics.

As with any introduction, this is composed with the intention of stimulating the reader into considering the author's extensive study, and mathematical correlations that support the "dynamic matter" concept. A closing caveat that emerged hopefully will contribute to that interest. The aforementioned postulate describes an inherent nature of matter that is very slowly expanding, always in a positive forward motion, beginning with the big bang. Is it coincidence that the physical component of time behaves in this exact same fashion? Or are the two intrinsically linked?

1.

SPACE

One hundred years ago a predominant theory of physics was that space was an ether like substance. The logic was that this ether was the transfer medium for light waves. If this ether existed then it was presumed that the motion of light could be plotted relative to this ether. The experiment by Michelson and Morley failed to detect this ether. With the introduction of the theory of Relativity it was further demonstrated that the velocity of light was absolute and it was time, mass and length that varied. This realization combined with the experimental data struck a fatal blow for ether theory. Physicist's concept of space did a total reversal and many adopted the viewpoint that space is "nothing." Since that revelation in 1905 many have believed that only emptiness fills the voids between the matter and energy in our Universe.

In the formulations of his theories Einstein gave much analysis and description to space. In his words;

"It is indeed an exacting requirement to have to ascribe physical reality to space in general, and especially to empty space."

Einstein showed us that space is curved by gravity. Indeed, you could not curve or bend nothing. When quantum mechanics is applied to space, even more qualities emerge. Relativity goes on to predict effects such as gravity waves and space being dragged by massive objects. Advanced studies in quantum physics, quantum gravity, string theory, etc., prescribe more and more properties to empty space. Since its death blow in 1905, space seems to have gradually regained recognition as a real entity. If we are fair in our analysis we must ask; what did Michelson, Morley and Einstein prove? They did not prove that space was nothing. What they did demonstrate is that there are no absolute reference properties to space.

For my analysis, "space," just as in General Relativity, is a real thing. It can move and matter and energy move through it. I do not propose to construct new properties of space or take us back to the absolute reference properties originally prescribed to ether space. My work utilizes and is completely compatible with "Einstein Space."

With this understanding of space, that space is something with structure, a real thing, we then can arrive at a definition of what comprises the universe. There are three components to our universe: matter, energy and space. These three things define everything in our universe. Special relativity delivered to us the realization that mass and energy are equivalent. The common concept today is that they are the same thing, only in a different state. Converting matter to energy now is a daily occurrence in nuclear reactors and the validity of the interchangeability is not even questioned. If our universe consists of three ingredients and two of them are equivalent, why would we not assume that space is also equivalent to matter and energy? Having recognized that space is something real, to believe that it is a separate entity, without an inherent kinship to mass and energy, I feel is a greater abuse of physical assumption. Are we not just as entitled to assume that space is equal to mass? Perhaps this seems a philosophical approach to deducing physics, which is not my intent. To support an assumption, it is desirable to find a known mathematical relationship that agrees. This can be found in Newton's law of gravity and is derived in Section 6.

2.

RELATIVITY

AND THE VARIABILITY OF MASS

With our understanding that mass can vary with velocity or intensity of a gravitational field, we are given the tools to define a dynamic nature to matter that perhaps has not received due attention. It is given to us that mass increases with velocities approaching the speed of light, however, this seems to be where the discussion typically ends and one can be left wondering what implications this phenomenon may have regarding our basic understanding of matter. The variable mass of an accelerated electron is common place in our modern world of experimental physics. Perhaps some physicists view this variability as simply a peculiar nature of our universe, similar to time dilation. However, the increase in mass is very real and is integral to time and space. We are left with the unanswered questions of how and why the mass can vary.

Universal Dynamics

There exists in physics a presumption that matter at rest is static and unchanging. There are the dynamics of spin and oscillation at the subatomic level. However, this reference of static refers to the volumetric dimensionality of matter. The first flaw in this reasoning that matter is static is that nothing really can exist at rest. Time is always moving forward and in our familiar frame of reference on the surface of the Earth all matter is “captive” within this dynamic dimension of time. The space around us is also in a dynamic state. The gravitational field of the Earth is warping the space around all the matter within our frame of reference and thereby imparting a dynamics to our spatial neighborhood. Therefore, matter, simply by existing, “lives” in a dynamic universe. When the dynamics of velocity are applied to matter we measure an increase in the mass. It may not be unreasonable to speculate that matter “at rest” also shares a dynamic nature simply because it resides in dynamic time and space.

3.

THE BIG BANG

With the expansion of the Universe well established, it is a natural extension of thought to follow this expansion back to its beginning. Mathematical treatments applying General Relativity and Quantum Theory to this event have been applied by Steven Hawking and Roger Penrose and subsequently many others have added to their work. These efforts have defined what happens when matter collapses. If the model we examine is of a collapsing universe, then we have the stellar matter of our universe converging and compressing. The Hawking/Penrose projection is that the matter of the universe, once converged, continues to collapse until it has reached a "zero point mass" or "singularity." When the analysis is performed with consideration to quantum theory, the matter does not attain a zero volume singularity but does become infinitesimally small. This work by Hawking and Penrose establishes a precedent for the concept that the size of matter does vary.

When we apply the model for the Big Bang and we then follow the birth of the new Universe, matter with infinitesimally small volume, in a very brief elapse of time, is thrust out and starts the process of creating the atoms, stars, gases, galaxies etc. Again, there seems to be an un-addressed assumption by theorists that our basic building blocks of matter, "quarks," were created at the size they currently occupy and that they will always exist at this given size – the assumption is: **they are static.** The pre - Big Bang concept of a zero point mass has a broad acceptance in theoretical science as it is predicted by General Relativity. Why do we assume that our quarks went from a size infinitesimally small to their present size in one brief flash? Perhaps it is because of the inherent desire for an unchanging universe. Hubble upset the belief in the unchanging Heavens with his observations. If we abandon our prejudiced assumption we can entertain a new viewpoint;

one that says these new quarks are born at some small size and for their entire life they have been growing - **they are dynamic.** When Einstein unveiled the variability of time it struck a note of opposition with many people. Certainly time was a constant that flows more consistently than anything. So perhaps it is with this prejudice that the current "mind set" is of static matter. Einstein himself, with regards to predictions from Relativity that the Universe is expanding, longed for a static universe; so much so that he awkwardly included a cosmological constant into his theory. Now that we know so well that the galaxies are all moving away as Hubble discovered, it would seem an awkward step backwards to consider a static Universe. Yet many had tremendous difficulty giving up the comfort of the concept of the unchanging heavens. To carry the philosophical argument one step further, it seems that the very nature of the Universe, including all stellar matter, gases, biology, and even rocks, is one of dynamics. We know time is dynamic, it is always moving and it is variable. The intent here is to hopefully open the reader's mind to the concept of our basic matter as also being dynamic. So why is it that we view atoms and quarks as dimensionally static? In my analysis of this concept I was unsuccessful at identifying even one other thing in our universe that is considered by conventional physics to exist in a static state.

With this view, I have presented a different consideration for the behavior of the matter in our universe. Perhaps this is the innovative approach that has been needed, not unlike abandoning the view of time as being something fixed and constant but instead as a dimension that is variable in nature. Initial consideration of this expansion of matter, "dynamic matter," can cause a person a response of an unsettling nature. Many will be opposed to the concept simply because they believe it is contrary to conventional physics. However, I have found just the opposite to be true because of a strong synergistic relationship to both Newton and Einstein. If we explore the idea further, one can see how well this concept of "dynamic matter" can explain certain problems. Just prior to the "big crunch," our quarks were experiencing an ongoing reduced volume as they were compressed into a singularity; there size was decreasing. After the Big Bang the process is reversed and different. The matter is scattered instead of being consolidated. The concept I introduce here is that once released in the explosion of the Big Bang, all matter begins a relentless positive expansion at a slow rate, an expansion intrinsically linked to time. Following the Big Bang, the evolutionary process of atoms, gasses, stars, etc. proceeds. Quarks continue their relentless growth and the sub-atomic forces maintain the particle distances at a relative scale. To say this in another fashion, all particles of mass are growing, but as they grow, the distances between the particles also grow so that the same relative atomic geometry is maintained. The consequence of this is that we have no convenient frame of reference to measure this growth. Our yardsticks are growing with our world. We can, however, measure it in the distant stars and apply our new knowledge to explain incongruities that until now have gone unsolved. Our first application will be tidal friction and the slowing of the Earth's rotation. We will also apply this concept of increasing mass to the orbit of the Moon, unusual rotational velocities of galaxies, and the size and intensity of quasars. Other anomalous phenomena are addressed by this concept of "dynamic matter," such as the slowing velocity of the Pioneer 10 and Pioneer 11 spacecraft.

4.

PARTICLE CREATION

"*When quantum effects are taken into account, it seems that the mass or energy of the matter would eventually be returned to the rest of the universe, and that the black hole, along with any singularity inside it, would evaporate away and finally disappear."* (Hawking 1988)

Steven Hawking has done much analysis on how black holes and their strong gravitational fields affect space. The passage above references the event horizon that he predicts accompanies a black hole. The energy he speaks of cannot be coming from within the black hole itself because all energy is being drawn in; it cannot escape. Hawking goes on to say that the particles do not come from within the black hole, but from the "empty" space just outside the black hole's event horizon. The work presented in this paper defines an equivalence of space to mass and energy. The conventional concept is that this "empty" space consists of "virtual photons." The extreme effects of the black hole can cause these virtual photons to be transformed into real photons. The key here is that this all develops in "empty" space outside the black hole. Another, perhaps more basic viewpoint is that space and energy are equivalent and the transition from space to energy is taking place outside the event horizon. Cosmologists in recent years have constructed a model of galaxies that includes a black hole at their center. This black hole now is believed to be a primary source of star creation. As these theories evolve what seems to be emerging is this concept of a synergistic equivalence between mass, energy and space.

5.

PRINCIPLE OF EQUIVALENCE

The equivalence principle was the foundation for the General Theory of Relativity. Einstein theorized that there was no difference between the force due to gravity and the force due to inertia. Experimental data, conducted by many researchers over the years, has supported this equivalence to a high number of decimal places. The success of General Relativity also supports the belief that this assumption is correct. I believe if Einstein had become exposed to our evolving theories of the Hawking space that can transform to energy, he would have arrived at the realization that gravitational force and inertial force are even more equivalent than he originally conjectured. His vision was that only the effects of gravity and the effects of inertial force were equivalent. The belief is that gravity is a field that is somehow produced by mass and conveyed by particles while inertial force is an accelerated motion relative to space. The postulate that I introduce is that they are totally equivalent. They are exactly caused by the same phenomenon. Simply put, **gravitational force and inertial force are both caused by an accelerated motion of mass relative to space.**

This statement introduces the concept of an inertial space. This is not a new idea and in fact received a fair amount of analysis prior to 1905. With the abandonment of ether theory one hundred years ago it would seem that inertial space ideas also lost favor. My argument thus far has been that indeed space does possess inertial type properties; it simply does not have absolute reference properties. With this understood it then becomes a requisite of this study to establish an inertial structure to space while maintaining a harmony with relativity.

Let us return to the idea of inertial space and equivalence. Inertial force, i.e., the force due to acceleration is easy to comprehend. If I am sitting in my automobile and step on the throttle pedal and achieve an acceleration of $9.8 meters/\sec^2$, I will be pressed back in my seat with a force of two hundred pounds. Simultaneously, I am being pressed downward in my seat with a force of two hundred pounds due to gravity. What is the difference in the cause or structure of these two forces? The answer is absolutely none. The force I feel due to acceleration in my automobile is caused by the accelerated motion of mass relative to space. The postulate I advance is that gravitational force is not conducted by gravitons; rather, it is the space that is in accelerated motion as it moves downward over my body. Again we invoke relativity. What is the difference in these two forces? If a person accelerates through space, he experiences a force. If space accelerates around me, as I remain fixed relative to the surface of the earth, a force totally identical, lacking any connection with gravitons, acting on all matter regardless of chemical composition, is experienced. This is the force we call gravity.

6.

SPACE EQUIVALENCY

In Section One I presented the philosophical argument that space is a very real component of the Universe. It has real properties that manifest themselves in a number of ways. Some of these properties were discussed in Section 3. The postulate I have advanced is that there exists 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.

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

What 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 the equivalency of mass to gravity. 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:

$$6.67 \times 10^{-11} N \cdot m^2 / kg^2 .$$

There is however a very significant aspect to "G." It is not predicted by any theory. Its value is derived only through measurement. We can say that Newton's equation of proportionality is sound and solid, but we would perhaps feel better about "G" if we had theory to back it up. (The deduction of "G" does emerge from the principals presented herein.) In my theoretical analysis of the equality of space to mass I found it necessary to remove "G" and return to the solid relationship of proportionality given by Newton.

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

The next step is to reduce the gravity equation to its basic form:

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

Next we wish to change the units to basic dimensions:

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

Substituting our general dimensions 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; length x width x height, so we have:

$$space \propto mt^2 \qquad (6.1)$$

7.

GRAVITY DUE TO DYNAMIC MATTER

I undertake this study with the understanding that Newtonian gravity and General Relativity represent a first and second approximation of our understanding of gravity. There are many unexplained physical phenomenon that demonstrate that these gravity theories are not complete. Newton considered it a failing of his work that he did not discover the nature of the conveyance of gravity. Although Einstein established a curvature to space to explain the behavior of gravity he also did not unveil the actual mechanics behind the transmission of this force. In addition, there is no theory to date that predicts the gravitational constant. These are just some of the examples that further exemplify that current gravity theory is incomplete.

Einstein realized that to apply the conclusions of Special Relativity to gravity then space would need to be curved. Or more precisely, light must travel a trajectory that is not straight if the effects of relativity and time dilation were to be accommodated. To him, this meant that those trajectories must be a state of space caused by matter. His assumption was space is warped by matter. Gravitational tensors reach out from matter, grab onto space, and pull it into a distorted shape. Such was his conclusion. But what if space is actually flowing inward into a planet or star? Could this flow be caused by the conversion of space to matter? Newton's law was shown to demonstrate proportionality between space and mass - $space \propto mt^2$. Later in this work it will be shown how an equality between space and mass emerges. This relationship provides the necessary energy to fuel the slow advancing dynamic growth of matter. Energy is conserved as space is converted to matter.

The postulate advanced here is that space flows inward to each atom and is converted to matter in the process. Would this flowing space not appear identical to warped space? A beam of light, passing by the sun, crossing an inward flow of space, would be displaced in its trajectory and appear to travel a curved path. Consider this example: A man with a small boat wishes to travel across a long narrow pond. He prepares to travel from the south shore directly north to the opposite shoreline. Unaware to this man is that there is a slight current in the middle of this pond that travels the lengthwise direction. There exists a stream whose source and mouth are obscured. He believes this pond to be a stagnate body of water. The water of this stream flows the long direction of the pond. However, because of the nature of the terrain, etc. the water at each shore is calm and becomes progressively mildly flowing near the middle of the stream. He gives his boat a strong push off of the shore, strong enough to send him to the opposite bank. At first the boat travels a straight heading, but as it approaches the flowing water near the center, the heading begins to shift. His heading curves as he coasts through this flowing water. Once past the center and into the calm water, his heading straightens out. However, he is now pointing at a spot on the north shore somewhat downstream from his original target.

He gets out of his boat and stands on the north shore. He looks back at his point of departure and where he is now standing and scratches his head in puzzlement. He does not believe this body of water to be a stream. The source and mouth are obscured so he therefore believes this to be a pond of static, calm water. Unable to detect a source of flow for this stream, he maintains that it is indeed a pond. However, to explain his trajectory he concludes that the surface must not consist of straight, geometric water but must somehow be curved. Without any other frames of reference there is no other evidence to convince him that the water is flowing rather than curved. The point intended is that the trajectory of his boat is identical for either situation; flowing water or curved water.

"*There is no way to define a flow of space, not least because there is no way to measure the flow of space.*" (Misner, Thorne, Wheeler, 1971.)

I have to take exception with the above statement, for in fact; we can calculate and measure the flow of space. The math of General Relativity provides us the tools to calculate the flow, and experimentally, it is possible to measure the flow. We can view the orbit of Mercury, we can measure the displacement of stars as their light passes the sun, and we can measure the red shift of light as it leaves the sun and its wavelength is stretched by the inward flow of space as it starts its journey outward.

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

$$B = \frac{\kappa M}{2\pi r}$$

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

$$B = \frac{1.87x10^{-26} \cdot 5.98x10^{24}}{2\pi \cdot 6.38x10^{6}}$$

$$B = 2.79x10^{-9}$$

This value represents the *sin* of the angle of light as it is deflected by the Earth'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 Earth, is equal to our B times the speed of light.

$$v = 2.79x10^{-9} \cdot 3x10^{8}$$

v= .84 *meters/sec*

We end up with a vertical component of our angle that represents the velocity of space inward to a star or planet. For the Earth this works out to .84 meters per second and at the sun it is approximately 2,552 meters per second.

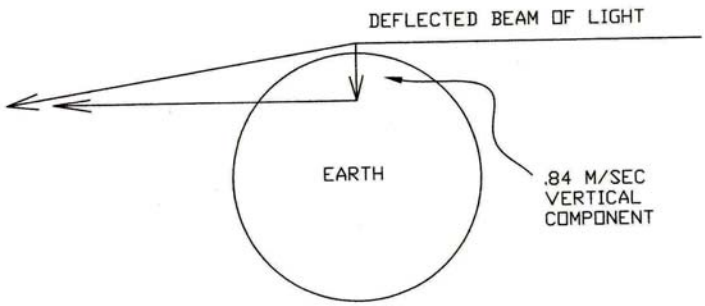

Figure 7.1

8.

CONSERVATION OF ANGULAR MOMENTUM AND EARTH'S ROTATION

By applying the principle of "conservation of angular momentum," we can apply mathematical calculations to explain these motions. With the theory of "Dynamic Matter," quarks are growing, adding more mass, while maintaining the same relative distances between. Therefore, mass increases, radius and volume increase while density remains constant. If we abide by Newton's first law, angular momentum must be conserved. The only result can be a reduction in angular velocity as mass and radius increase. The anomalies in the angular velocities of the Earth, Moon and galaxies were discussed in the beginning of this paper. The task now is to apply the principles of "Dynamic Matter" to explain these anomalies.

9.

CALCULATIONS FOR THE INCREASING RADIUS AND MASS OF THE EARTH

The slowing rotation of the Earth is well established. What is not yet decided or confirmed is how much does the action of the ocean tides slow the Earth's rotation and what percentage is from other causes. Measured variations in the rate of the Earth's slowing rotation, particularly in the last 200 years, help to establish an allocation for the lost momentum that is not related to the tides. Figure 1, (Stephenson 1991) diagrams a rate of 1.37 *ms/cy* that is non-tidal. This rate is also supported by medieval Arab eclipse timings.

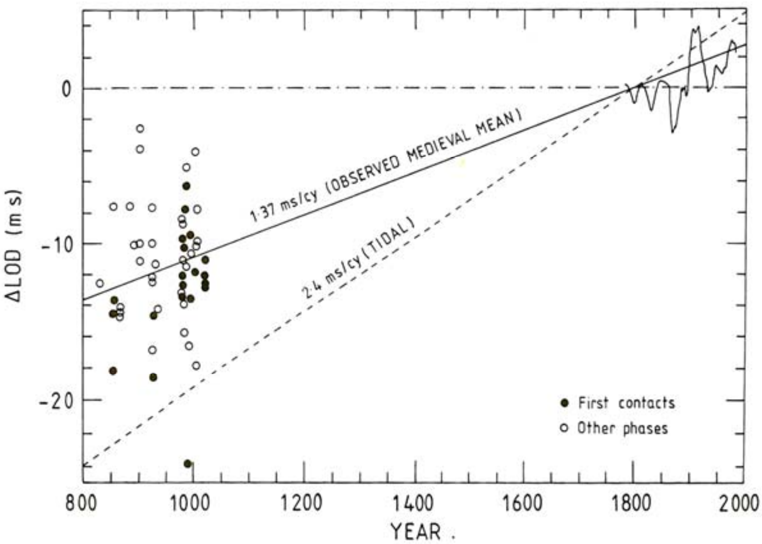

Fig. 9.1. Changes in the length of day (ΔLOD) relative to the reference day of 86400 SI seconds as derived from medieval Arab eclipse timings. The accurately mapped fluctuations since A.D. 1780 are shown for comparison. Also shown are the best fitting straight line to the data points which passes through ΔLOD = 0 at A.D. 1800 (full line) and the theoretical tidal variation (broken line).

We will use the following data for our calculations:

Mean radius Earth	$= r_0$	$= 6.371x10^6 meters$
Mass of Earth	$= m_0$	$= 5.9736x10^{24} kg$
Moment of Inertia	$= I$	$= .3308mr^2$
Angular Velocity	$= \omega$	$= 131,490^0 / yr$
		= 2294.933433 *rad/yr*
Change in velocity	$= \Delta\omega$	$= 3.6361x10^{-5} rad / yr$
		=.50sec/yr (time)
		=1.37*ms/cy*

Angular Momentum =A $= I\omega$

$$A = (.3308 m_0 r_0^{\ 2})(\omega_0)$$

$$= .3308(5.9736x10^{24})(6.371x10^{6})^{2}(2294.933433)$$

$$= 1.8407166x10^{41}$$

To solve for the increase in mass and radius we put *m* in terms of *r*:

$m = k \cdot \frac{4}{3}\pi r^3$ k = density conversion constant for mass to radius

$$k = \frac{5.9736x10^{24}}{4/3\pi(6.371x10^{6})^{3}}$$

$$k = 5,514.73583405$$

Returning to our equation for angular momentum:

$$A = .3308 r_0^{\ 2} \cdot 4/3 k\pi r_0^{\ 3} \cdot \omega_0$$

$$A = 8/15 k\pi r_0^{\ 5} \cdot \omega_0$$

We introduce another constant to reduce the numbers in the equation:

$$K = 8/15k\pi$$

$$K = 9.11954267x10^{4}$$

Which yields:

$$A = K \cdot r^5 \omega \qquad (9.1)$$

To find the rate of increase in the radius we differentiate:

$$\frac{dA}{dt} = K(5r^4\omega\frac{dr}{dt} + r^5\frac{d\omega}{dt}) \qquad (9.2)$$

If we hold to Newton's first law then *A* remains constant and $\frac{dA}{dt} = 0$

Therefore: $$5r^4\omega\frac{dr}{dt} = -r^5\frac{d\omega}{dt} \qquad (9.3)$$

$$\frac{dr}{dt} = \frac{-r}{5\omega}\frac{d\omega}{dt}$$

$$= \frac{6.371x10^6(-3.6361x10^{-5})rad/yr}{5(2294.933433)}$$

$$\frac{dr}{dt} = 2.01884663cm/yr$$

This deduction shows that the radius of the Earth is increasing at a current rate of approximately 2 centimeters per year.

The next task is to solve for the increase in mass. If density is to remain constant then the mass of the Earth is increasing with the cube of the radius. The following equation yields the increase in the mass of the Earth for one year:

$$m = k\frac{4}{3}\pi r^3$$

$$\frac{dm}{dt} = k\frac{4}{3}\pi 3r^2\frac{dr}{dt} \qquad (9.4)$$

$$= k4\pi r^2\frac{dr}{dt}$$

$$= 5{,}514.73583405 \cdot 4\pi \cdot (6.371x10^6)^2 \cdot .0202$$

$$= 5.68523302x10^{16}kg/yr$$

To check if our calculations are correct, we insert m_1, r_1, and, ω_1 into our equation for angular momentum. According to Newton's first law, *A* should not change.

$$A = .3308g5.97360006x10^{24} \cdot 6{,}371{,}000.0202^2 \cdot 2294.9339664$$

$$A = 1.84071666x10^{41}$$

This result is equal to our original calculation for angular momentum indicating that it is conserved.

This analysis shows what the increase in radius and mass of the Earth would be if there exists an inherent dynamic nature to matter. It thus provides us a mechanism that may account for the anomalous momentum problem regarding the Earth's rotation. Tidal friction and geophysical solutions seem to fall short of solving this anomaly. In addition, the results from this analysis can be extended to the anomalous momentum problems regarding the Moon's increasing orbit, the slowing Pioneer spacecraft and the rotating galaxies. The predicted change in the Earth's mass:

$$5.68x10^{16}\,kg\,/\,year$$

is used as the rate of increase in the analysis of these other anomalies. If we take our Δm and divide it by the mass of the Earth then we have the universal rate for which mass is increasing. This rate for one year is:

$$\frac{\Delta m}{\Delta t} = 9.5119x10^{-9}\,/\,year$$

Converting this rate of change to seconds we have:

$$\frac{\Delta m}{\Delta t} = 3.0142x10^{-16}\,/\sec$$

This number can be considered a constant and assigned the symbol: m_d

10.

DERIVING EQUIVALENCE OF MASS TO SPACE

With the view that space is flowing rather than warping, the velocity of the inward flow of space was derived in Section 7. By using Einstein's formula for calculating the curvature of light as it passes by a body of mass, the value of .84 meters/second was attained. Using the area of the surface of the Earth and the amount of space that passes inward in one second, one can derive the volume of space that is consumed in one second. The amount of mass the Earth is gaining in one year was calculated in the previous section and the value of $5.6852x10^{16} kg / yr$ was attained. Converting this number 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 of the equivalence factor of space to mass.

Surface area of the Earth:

$$a = 4\pi r^2$$

$$= 4\pi(6.38x10^6)^2$$

$$a = 5.11506x10^{14} m^2$$

Volume of space per second:

$$\text{vol/sec} = a \cdot .84m / \sec$$

$$= 5.11506x10^{14} \cdot .84$$

$$\text{vol/sec} = 4.2966x10^{14} m^3 / \sec$$

Gain in mass/year: $\Delta m / \Delta t$ $= 5.6852x10^{16} kg / yr$

Gain in mass/sec: $\Delta m / \Delta t$ $= 1.8016x10^{9} kg / \sec$

$$\frac{vol / \sec}{mass / \sec} : \quad m^3 / kg \quad = \frac{4.2966x10^{14}}{1.8016x10^{9}}$$

$$= 238,490 m^3 / kg$$

Approximately 240,000 cubic meters of space is equal to one kilogram of mass.

This volume of space is being drawn in and converted to mass per second each second, therefore our number becomes:

$$= 238,490 m^3 / kg / \sec^2$$

This relationship demonstrates the proportionality of space to mass.

Returning to our previous deduction for the volume of space per kilogram, we arrived at 238,490 cubic meters per kilogram each second. We can insert this conversion value into the equation derived from Newton's law of gravity and establish an equality of space to mass:

$$space = 2.3849x10^{5} mt^2 \qquad (10.1)$$

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; $meters^3 / kg / \sec^2$, 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:

$$space = DM \cdot mt^2 \qquad (10.2)$$

with $DM = 2.3849x10^5 meters^3 / kg / \sec^2$

11.

PIONEER 10 AND 11

The success of any theory depends on its ability to predict and explain physical experiments and physical anomalies. While many cosmological anomalies exist, I have focused on those that deal primarily with momentum. These include the Earth's rotation, Galaxy rotation, the Moon and others. The Pioneer spacecraft represent an exceptionally good momentum anomaly. They were constructed by Earth scientists; therefore we know every aspect of them. We have two Pioneer spacecraft, and in addition, the Galileo and Ulysses space probes. All four are slowing down, seemingly in complete violation of Newton's first law.

The Pioneer 10 spacecraft was launched in 1972 and Pioneer 11 followed in 1973. Radio doppler and ranging data from these now distant spacecraft indicate an apparent anomalous deceleration with a magnitude of $a \sim 8x10^{-8} cm/s^2$ directed towards the Sun (Anderson *et al* 2002). Much effort has been expended looking for systematic origins to account for this discrepancy but none has been found. In applying the derived rate of change in mass from the dynamic matter process we can estimate a slowing of the pioneer spacecraft due to two factors:

1. The increasing mass of the Pioneer spacecraft with time will result in a slowing velocity as momentum is conserved.
2. The increasing mass of Earth based clocks results in a slowing of the clocks.

Although the mass of the Sun is also increasing with time, the added gravitational force is too small to be significant.

The mass of the Pioneer spacecraft is 270kg. If we take the same rate for the increase of mass that we derived for the slowing of the Earth's rotation and apply it to the spacecraft and assuming momentum is conserved, we can calculate the decreasing velocity. The increase in mass with time combined with the velocity of $1.224x10^{6} cm/\sec$ for Pioneer 10 and 11, results in $a \sim 3.7x10^{-10} cm/s^{2}$. This is lower than the measured value of $a \sim 8x10^{-8} cm/s^{2}$. However, we must incorporate into our analysis the method in which the deceleration of Pioneer is measured. Time is read on array of clocks on Earth. These clocks are used to measure the Doppler shift of the signal being received from Pioneer. The clock acceleration is measured at $-a_t = -2.53x10^{-18} s/s^{2}$. Applying the postulate that matter has an intrinsic property of expansion, we would conclude that our clocks would be providing a measurement of time that would require a correction. Imagine a spring system whose oscillation is being used to calibrate a clock. If the size and mass of that system is increasing with each passing second, then our clock would be slowing down; just as the Earth's rotation is slowing down. In Section 9 we calibrated the rate of increase of mass that is causing the Earth's slow down. This number is:

$$\Delta m / \Delta t = 9.5119x10^{-9} / year$$

Converting this rate of change to seconds we have:

$$\Delta m / \Delta t = 3.0142x10^{-16} / \sec$$

We now have the number to provide the correction for our clocks that are used to measure the slowdown of Pioneer. A change in mass results in a directly proportional rate of change in our clocks, therefore, our Δm number represents the rate of deceleration of clocks due to the Dynamic Matter process. To arrive at an adjusted value of time we simply divide our Dynamic Matter rate of change value by the time acceleration value of the Earth based clocks used to measure the Pioneer Doppler signal. If we multiply this adjusted value by the actual deceleration of Pioneer as calculated by using the Dynamic Matter process, we arrive at the value which we perceive to be the deceleration value of Pioneer. Thus we have:

$$\frac{\textit{Deceleration of clocks due to DM}}{\textit{Deceleration of clocks measured at Earth}}$$

x the actual deceleration of Pioneer

= Perceived deceleration of Pioneer

$$\frac{-3.0142x10^{-16}}{-2.53x10^{-18}} \cdot 3.609x10^{-10} = 4.30x10^{-8} cm/\sec^2$$

This value is very close to the value of $a \sim 8x10^{-8} cm/s^2$ calculated by NASA for the deceleration of Pioneer.

There are also two other important points regarding the anomalous acceleration of Pioneer 10 and 11. The observed nature of the deceleration is not related to the inverse square law associated with gravity. Rather, the anomalous motion is related to velocity. In addition, the deceleration is independent of distance. Both of these characteristics agree with the "Dynamic Matter" theory as applied to conservation of momentum and the Pioneer anomaly.

12.

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 no 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.

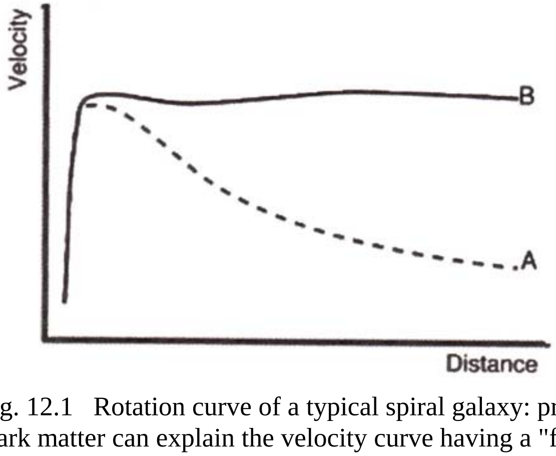

Fig. 12.1 Rotation curve of a typical spiral galaxy: predicted (**A**) and observed (**B**). Dark matter can explain the velocity curve having a "flat" appearance out to a large radius

The theory of Dynamic Matter addresses these rotational anomalies. It was shown how if we apply the dynamic matter concept, then the mass of the Earth is increasing at a rate of:

$$5.567x10^{16} kg / year .$$

With this increase, the Earth's rotational velocity is decreasing. 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. To reiterate the point, the number of quarks in the stars remains the same but their mass increases with time. A star consisting of young matter has the same energy output as the same star type that is composed of older matter but at the same time it has less mass than its older counterpart. For the Dynamic Matter analysis we need to apply this phenomenon to the rotational velocities.

Recent observations with infrared imaging (Schwarzschild 2003) have shown that the stars at the center of the Milky Way are much younger than the outer stars. This is contrary to popular 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. (Eduardo F. del Peloso. et.al 2005) 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 age of two stars also results in a variation of mass for the same energy output. In other words, for two stars of different age but are identical with regard to the number of atoms and resulting energy output, they will have different masses. This is because the older star has existed longer with the Dynamic Matter effect and its atoms are larger. We can calculate what this translates to in terms of the different masses. We apply the Δm constant derived in Section 9.

$$m_d = 9.5119x10^{-9} / year$$

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

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

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

$$= 6.69$$

This is the multiple of mass. The outer stars would have close to 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 have close to 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 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.

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. (Hawking, Penrose 1996).

A more specific example is offered with the Galaxy NGC 1560. When the rotational velocities are plotted with the application of the MOND theory (Milgrom 1983), which applies a general increase in

Newton gravity, a fairly close match to NGC 1560 is attained. However, the MOND curve primarily deviates at the innermost stars. By contrast, the "Dynamic Matter" model offered above provides the necessary increase in gravity and also provides a solution for the velocity anomalies at the inner stars. The MOND solution applies a flat increase in gravity to all the stars in the galaxy. The Dynamic Matter solution provides an explanation for the variation between the inner and outer stars.

Also related to this effect are the galaxy clusters such as the Coma cluster, which appear to not 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? This is another example of how the variable mass due to Dynamic Matter could be applied to explain the missing mass.

13.

ORBIT OF THE MOON

In 1969 the Apollo astronauts placed a reflector on the Moon that has been used to measure the distance between the Earth and the Moon. Measurements have shown that the mean distance between the Earth and the Moon is increasing consistently at a rate of 3.8 centimeters per year. The explanation that has been offered for this phenomenon is related to the ocean tides. The Moon attracts the ocean water toward it. The result is an approximate rise of 3.23 centimeters at the highest point and from there slopes away. As the Earth rotates, the ocean is pulled with it. This results in a lag of the ocean bulge. The high point is no longer in direct line with the Moon. It is believed by some that the gravitational attraction of this area of elevated water exerts a lateral pull on the Moon and accelerates it to a higher orbit. In reaction, some of the angular momentum of the Earth is transferred to the Moon. The analysis is not included in this paper, but it agrees with the conclusions of Hipkin (1975) and others that this elevated water is not adequate to account for the 3.8 cm/year increase that is measured. The net equilibrium tide that is considered responsible for the Moon's increasing altitude has an amplitude of only 3.23 cm, which is considered too small to cause such a large increase. In addition, it is broken up by the continents when they pass under the Moon. Also this tidal bulge experiences undulations with some ahead of the Moon, others behind it and still others on either side. The integration of these undulations appears to be inconclusive in verifying this tide as the source of the rather large increase of the Moon's orbital distance.

The application of the principal of Dynamic Matter offers an explanation for the Moon anomaly. Because the Moon's orbital radius is increasing, it appears that its angular momentum is also increasing. However, with the mass of the Moon increasing with time, the angular momentum will be conserved by the increasing altitude.

The moon is moving away from the earth at a rate that is perceived to be 3.8 cm per year. This is determined by the time measured for a beam of light to travel to the moon and back. The earth based clock appears to be accelerating and this is translated into an increasing distance between the earth and moon. The actual increase of the distance between the earth and moon, due to dynamic matter, is 3.66 meters per year. This value is based on the application of Newton's first law and applying it to the conversation of angular momentum. The mass of the Moon is increasing with the passage of time. For the angular momentum to remain constant, then the orbit must increase. A beam of light used to measure this increasing distance would indicate an increased passing of seconds on the clock, ie., the clock would appear to be accelerating. However, if the clock is again adjusted, just as in the measurement of the Pioneer anomaly, due to dynamic matter effect, then the clock acceleration would be less. With the passage of time, atoms, whose oscillations are used for our clock timing, are becoming heavier or more massive. Our clocks are therefore slowing down at an extremely small rate. If we use the same clock deceleration factor that we used for Pioneer, 119, then this value is reduced to 3.1 cm per year.

$$\frac{3.66 meters}{119} = .031 meters / year$$

or 3.1 *cm/year*

This value is reasonably close to the 3.8 centimeters that we perceive. However, discussion regarding our margin of error should be included. Our value for the change in mass due to the Dynamic Matter effect was derived in section 9.

We found that; $\Delta m / \Delta t = 9.5119 x 10^{-9} / year$.

While it is certain that this value can be refined to a higher degree of precision, it is perhaps close in accuracy considering it is derived from the slowing rotational velocity of the Earth. By contrast, our time measurements of both Pioneer and the Moon are derived by the use of atomic clocks. As a point of reference, the NIST-F1 Caesium fountain atomic clock has an uncertainty of $5x10^{-16}$. We can see that the accuracy of our clocks resides in the range of our margin of error. We should perhaps also not discount a small amount of momentum being transferred to the moon by the bodily tide. This contribution may account for the .7 cm difference.

14.

PREHISTORIC LIFE

If we look back in time we observe the amazing size that was attained by dinosaurs. Engineering analysis contradicts the immense sizes. Eighty tons and more is difficult to support and function. In addition, some flying reptiles had wingspans of fifty feet. Large size has always been an evolutionary survival advantage. However, increase in size reaches a limit imposed by the force of gravity. Whales demonstrate the large sizes attainable when the force of gravity is reduced by water with the Blue Whale reaching 180 tons. Elephants represent the current limit for land animals with sizes ranging from 7 to 11 tons. As recent as 40 years ago, the dominating theory was that the largest dinosaurs supported their tremendous bulk by living in water. However, as the fossil record became clearer, it was evident that the largest dinosaurs lived on dry land. The riddle of how their immense size was supported has defied a solution. However, the principle of Dynamic Matter very effectively explains and predicts the relative sizes of prehistoric animals.

The very large sauropods exercised a strong dominance 150 million years ago. The postulate was presented herein that the Earth's radius and mass are increasing with time by an effect I have termed as "Dynamic Matter." Calculations can be performed to show what the size and mass of the Earth would have been 150 million years in the past. This number will yield what the gravitational force and the adjusted weight of these large dinosaurs would have been during their day.

First we take the rate of change of mass per year divided by the mass of the Earth to attain the percentage of mass change per year.

$$\frac{\Delta m / \Delta t}{m} = \frac{5.68x10^{16} kg}{5.97x10^{24} kg} = 9.51x10^{-9} / year$$

Using a formula for compounding that utilizes the number *e*, we have:

$m(t) = Ae^{-m_d t}$ with m_d our rate of mass change and *t* our time interval. A is our beginning mass value of $5.97x10^{24} kg$. The age of the large sauropods was 150 million years ago and this is our value for *t*. Hence:

$$m(t) = 5.97x10^{24} \cdot 2.7183^{-9.51x10^{-9} \cdot 1.5x10^{8}}$$

$$= 1.4377x10^{24} kg$$

The mass of the Earth at -150 million years.

To solve for gravity at 150 million years ago, we use a similar treatment for the radius of the Earth at that time:

$$\frac{\Delta r / \Delta t}{r} = \frac{.02 meters}{6.371x10^{6} meters} = 3.14x10^{-9} / year$$

Again using our formula for compounding that utilizes the number *e*;

$r(t) = Ae^{-kt}$ with *k* our rate of radius change and *t* our time interval. A is our beginning radius value of $6.371x10^{6} meters$. Again we use -150 million years for our value for *t*. Hence:

$$r(t) = 6.371x10^{6} \cdot 2.7183^{-3.14x10^{-9} \cdot 1.5x10^{8}}$$

$$= 3.978x10^{6} meters$$

The radius of the Earth at -150 million years.

Next we will calculate the acceleration at the surface of the Earth for gravity at -150 million years.

$$a = 6.67x10^{-11} \frac{1.4337x10^{24}}{(3.978x10^{6})^{2}}$$

$$= 6.04 meters / \sec^{2}$$

By taking the ratio of the past gravitational acceleration to today's acceleration and reducing the mass of the past by using the ratio of past mass to today's mass, we arrive at a percentage value for weight at -150 million years.

$$\frac{6.04 m / \sec^{2}}{9.8 m / \sec^{2}} \cdot \frac{1.4337x10^{24} kg}{5.97x10^{24} kg} = 0.148$$

Therefore, dinosaurs and all life 150 million years ago experienced a weight of approximately 15% of what we would perceive today as their weight. Their fossilized bones have been increasing in size and mass with the Dynamic Matter effect for the last 150 million years. Using our 15% value, a 70 ton dinosaur of 150 million years ago would have only experienced an actual weight of 10.5 tons. This puts it in the range of elephants today. By observing whales we can see that evolutionary limits of size are not imposed by gravity when the effect of gravity is reduced by water. As noted, the Blue Whale can reach 180 tons. Land animals are limited in their size by gravity. Ten to eleven tons would appear to be the limit imposed by what the biology can support structurally. The Dynamic Matter affect appears to be the explanation of how such immense creatures survived in the past.

15.

REGRESSIVE SIZE OF THE EARTH AND THE AGE OF THE EARTH

If the current advancing increase of the radius of the Earth is two centimeters per year, then what past value for the size of the Earth do we attain when we apply a regressive shrinking of the Earth's radius? We will treat this problem as a continuous compounding problem and work backward into the past. If we take $\Delta r / r$ as the rate of decrease of the Earth's radius with $\Delta r = 2$cm, (the change of the Earth's radius currently for one solar year), and r as the current radius of the Earth, then we have:

$$\frac{\Delta r}{r} = \frac{.02 meters}{6.371 x 10^6 meters} = 3.14 x 10^{-9} / year$$

Using the formula for compounding that utilizes the number *e.*

$r(t) = Ae^{-kt}$ with *k* our rate of radius change and *t* our time interval. A is our beginning radius value of $6.371 x 10^6 meters$. The current estimate of the age of the earth is five billion years and this is our value for *t.* Hence:

$$r(t) = 6.371 x 10^6 \cdot 2.7183^{-3.14 x 10^{-9} \cdot 5 x 10^9}$$

$$= .9677 meters$$

This calculation demonstrates that as we go back in time 5 billion years, and applying the changing radius over time, the Earth's radius near the beginning of its creation was about one meter.

16.

VELOCITY OF SPACE TERMINATES AT "C" WITHIN THE ATOM

Continuing with the postulate that space is converted to mass, then at the sub-atomic level, space is drawn into every particle of mass. This results in an inward flow of space toward the center of every particle. This flow of space at the sub-atomic particle has a velocity component and an acceleration component. With the view that space is flowing rather than curved or warped we can establish this same relationship at the surface of a large body of mass. For example, at the surface of the Earth, the inward velocity of space is .84 meters per second and the acceleration value of space is 9.8 $meters/\sec^2$. The question presents itself: Knowing the values for velocity and acceleration of space at the surface of the Earth, can we calculate what these vector quantities translate to at the surface and nucleus of each atom within the Earth?

One of the foremost questions resulting from this analysis is: At what velocity is space traveling when it reaches its final destination at the heart of an atomic nucleus? It is logical to assume that it is traveling its maximum value for both acceleration and velocity when it reaches the heart of the nucleus. To calculate either of these motion values at a given distance is again accomplished by using the inverse square rule.

We will start with the value of acceleration due to gravity at the surface of an iron atom. We will use iron since it appears that this is the primary element making up the bulk of the Earth and the Earth's density is comparable to iron. We are viewing gravity as an inward flow of space to each particle; therefore we will use the acceleration value that would be realized at the surface of an object of mass. Utilizing Newton's law of gravity, we have:

$$a = G\frac{m}{r^2}$$

Mass of an iron atom $= 9.36x10^{-26}kg$

Radius of atom $= 1.28x10^{-10} meters$

G $= 6.67x10^{-11}$

Therefore we have:

$$a = 6.67x10^{-11}\frac{9.36x10^{-26}}{(1.28x10^{-10})^2}$$

$$a = 3.81x10^{-16} m/\sec^2$$

Next, using the square rule, we will calculate the increase for *acceleration* due to gravity at the surface of the nucleus. The value we will use for the outer most radius of the atom shell is $10^{-10} meters$. The value we will use for the radius of the nucleus is $10^{-15} meters$. Therefore we have:

$$\frac{(1x10^{-10})^2}{(1x10^{-15})^2}\cdot 3.81x10^{-16} = 3.81x10^{-6} meters/\sec^2$$

This is our value for acceleration at the surface of an iron nucleus. We wish to solve for velocity; the velocity of space. Both velocity and acceleration are increasing with the square rule. Therefore the ratio of our values at the surface of the Earth will apply at the nucleus. So we have:

$$\frac{.84}{9.8}\cdot 3.81x10^{-6} = 3.26x10^{-7} meters/\sec$$

This is our velocity value for space at the surface of an iron nucleus.

It is given by relativity that our velocity cannot exceed the speed of light. We will therefore set up our relationship to determine at what radius within an iron atom will the velocity of space terminate at C? The expression is:

$$r = \sqrt{\frac{3.26x10^{-7} \cdot (1.28x10^{-15})^2}{3x10^8}}$$

$$r = 4.22x10^{-23} meters$$

This is the hypothetical radius, an average radius, for the minimum radius that space reaches the speed of light. In actuality, the matter within the nucleus is divided between all of the neutrons and protons, and deeper into them, the quarks. Because of this, the actual termination of the velocity of space would happen at these sub particles at multiple distances greater than that calculated. Our value of $r = 4.22x10^{-23} meters$ represents an "average" minimum radius and likely corresponds with the radius of a quark.

From our knowledge of Special Relativity, we know that the greater the velocity of an object of mass, there is a corresponding increase in the mass of the object. In Section 6 the proportionality of space to mass was derived from Newton's law of gravity, and in Section 10 it was shown how this relationship can be extended to an equality of space to mass. Given an understood equality of space to mass, then it is quite likely that space also experiences an increase in its corresponding mass value as its velocity increases per the Lorentz transformation.

If the velocity of space is increasing as it approaches the heart of an atom, then it is likely that the proportional value of space to mass be increasing, i.e.; a given amount of space is equal to a greater value of mass. Our current understanding of atoms demonstrates that the boundaries of our mass particles such as protons and neutrons is not well defined but rather is mushy and indeterminable. In addition, some researchers estimate the mass value of the quarks to be about 1/100 of the mass of the particle. This model appears to coincide with the outlined model of space beginning its transformation towards mass inside the nucleus of the atom. It is also at these sub atomic distances where the velocity of space is approaching the speed of light, thereby experiencing an increase in mass per the Lorentz transformation.

17.
GRAVITATIONAL CONSTANT

An interesting aspect of physics is that to date, there is no theory that predicts the gravitational constant. The value for this number was originally derived by Henry Cavendish in 1798 only through experimentation. It has since been measured to a high level of accuracy. An interesting footnote is that even modern experiments fail to measure a number that is consistently the same. Each laboratory test reveals small variances. The fact that this number is not predicted by theory is a testament that our theories of gravity, both Newton and General Relativity, are incomplete. Given the numbers that have been derived from Dynamic Matter, is it possible to predict the gravitational constant? Again we start with Newton's equation:

$a = G\frac{m}{r^2}$ We wish to solve for G, so we rearrange.

$$G = \frac{ar^2}{m} \qquad (17.1)$$

We established in the last section that the velocity of space terminates at the speed of light in the heart of the nucleus. We can convert this velocity value to acceleration by using the ratio of 9.8/.84 = 11.67. These are the values of acceleration and velocity at the surface of the Earth. We calculated the radius at which space terminates at "c" as: $4.22x10^{-23}\,meters$. Since this is our "average" radius, we must use the total mass of the iron atom which is given as: $9.36x10^{-26}\,kg$. Inserting these values into our equation, we have:

$$G = \frac{11.67 \cdot 3x10^{8} \cdot (4.22x10^{-23})^2}{9.36x10^{-26}}$$

$$G = 6.66x10^{-11}$$

As we can see, this result is nearly in perfect agreement with the Cavendish value.

18.

UNIVERSAL SCALAR FIELD EQUAL TO THE SPEED OF LIGHT

Let us return to the postulate that space flows inward at stars and planets. What has been believed to be a warp or curvature of space is actually 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.

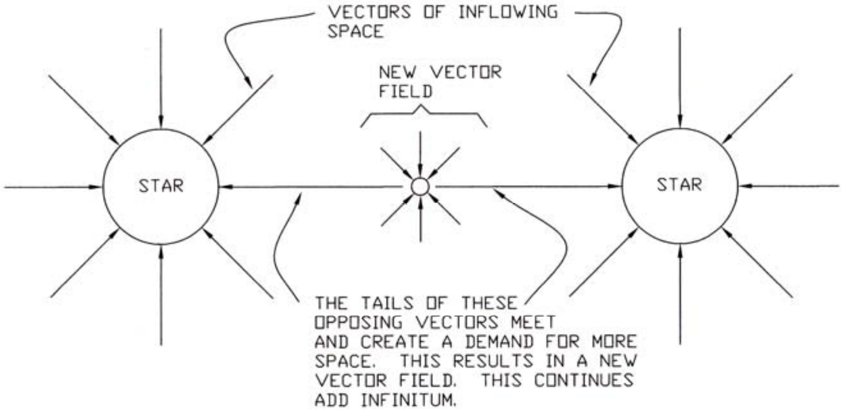

Figure 18.1 The geometry of an infinite vector field.

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. (Peebles 1993). 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. (Hawking, Penrose 1996.) From this analysis presented herein, we can say that the inherent basic nature of the space in our universe is one of motion without direction.

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 *sin* 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 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 that 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* [Misner, Thorne, Wheeler, 1973)] to $3x10^{52}$ *kg* [McPherson, Kristine (2006). Mass of the Universe. *The Physics Factbook*.] 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 I have taken the liberty to choose a number that falls between the two. And as it would turn out, $1.033x10^{53}$ *kg* appears to be the best number to use.

. 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 sin 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:

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

$$= .707$$

This is the *sin* 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.

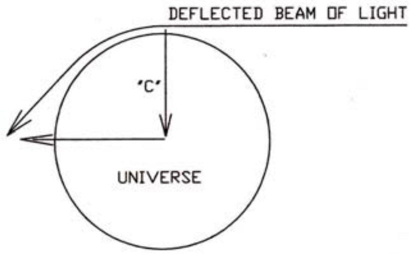

Figure 18.2. The total mass and volume of the universe equals the proper quantities to create a scalar field whose non directional velocity equals the speed of light.

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 of the universe drawing in space at velocity "*c*," as shown in section 16, results in a universal scalar field of space equal to the value of "*c*." Therefore, our 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 on why the speed of light is the dominating universal constant. The relation revealed by Dynamic Matter demonstrates why the speed of light is the dominating constant.

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. For any particle with zero mass that is released from an atom, that particle can only travel away at the velocity "*c*," for 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 of 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 cannot alter the measured value of this field.

19.

GALACTIC EVOLUTION AND QUASARS

Perhaps as mysterious as the dark matter halo theory is the nature of quasars. They are tremendously powerful for their size, rotating at high velocities and are the most distant and young objects in the cosmos. One theory is that quasars are the first stage in the evolution of a galaxy. Applying the change in angular momentum due to the change in the mass, we can see how this applies to the phenomenon of quasars. Let us consider a normal galaxy in our neighborhood and work backwards. If a billion years ago the matter in a galaxy had less mass but the same angular momentum, then as predicted by Dynamic Matter, the stars would be revolving much faster and would be closer together. This is the same principal as the spinning ice skater. As she draws in her arms and legs close to her body, her speed increases. The further we travel back in time, the more pronounced this effect becomes. If we go far enough back we end up with a system of stars that match the description of a quasar. The interesting point that should be emphasized is that the number of stars remains constant, as does their general energy output, but the physical dimensions of the star system are considerably reduced while the rotational velocity dramatically increases. A galaxy 13 billion years ago would appear to us as a quasar.

Exactly how a galaxy evolves is not yet confirmed. Several theories are currently open for consideration. One such theory is that there is an evolutionary chain starting with quasars, evolving to Seyfert galaxies, the next stage is radio galaxies and the oldest galaxies being the normal spiral type. This evolution, if demonstrated to be the appropriate model, supports the theory that the oldest stars are in the outer areas of a galaxy, and the younger stars, likely born from the central black hole, occupy the interior area.

1. Quasar- youngest galaxy

2. Seyfert galaxy – next stage

3. Radio Galaxy – 3rd stage

4. Spiral Galaxy – oldest

Figure 19.1 Galaxy evolution.

The Dynamic Matter effect provides for the evolution of the galaxies through the conservation of angular momentum. The youngest, Quasars, have as many stars as the oldest, the Spiral Galaxy, however, they are smaller, packed very close together and revolve at a high velocity.

20.
DARK ENERGY

The observational data that is now being provided by the Hubble telescope and other methods imply that the Universe may be expanding at a very high rate. Implications are also that this rate of expansion could be accelerating. Gravity, as defined by Newton and Einstein's Relativity and as applied within our solar system and galaxy outlines a force that would be slowing down the perceived expansion of the Universe. This contrary expansion behavior has inspired the speculation of a "dark energy" that in essence is space itself. This assigned energy of space is termed the "cosmological constant." While there currently is no empirical or experimental data to nurture this idea to the level necessary to define the observed anomalies, it does agree in principle with the postulate introduced in Section 6, with equation 6.1, that space is equivalent to mass, and thus equal to energy.

Independently from its actual nature, dark energy would need to have a strong negative pressure in order to explain the observed acceleration in the expansion rate of the universe. A major outstanding problem with dark energy theory is that most quantum field theories predict a huge cosmological constant from the energy of the quantum vacuum, more than 100 orders of magnitude too large.

In quintessence models of dark energy, the observed acceleration of the scale factor is caused by the potential energy of a dynamical field, referred to as quintessence field. Quintessence differs from the cosmological constant in that it can vary in space and time. In order for it not to clump and form structure like matter, the field must be very light so that it has a large Compton wavelength. No evidence of quintessence is yet available. It generally predicts a slightly slower acceleration of the expansion of the universe than the cosmological constant.

The perceived expansion of the Universe is based on an observed "red shift" of the light emitted by distant galaxies, quasars and other objects. This phenomenon was originally introduced by Edwin Hubble. An object that is moving away from the observer has a lengthening of its wavelength. This results in the light that it emits as appearing to have its light shifted toward the red spectrum. The natural assumption is to believe that the extreme red shift that is observed is due entirely to a receding motion relative to Earth. Dynamic Matter offers another explanation for the observed red shift.

It is a known phenomenon in physics that the smaller the particle the longer the wavelength that is associated with it. The theory of Dynamic Matter defines a nature to matter that says it was small following the Big Bang and has been expanding at a slow consistent rate, coupled with the passage of time. When we observe the most distant objects in our Universe we are observing them when they were very young and closer to the time of the Big Bang. The wave lengths associated with these very young galaxies would be much longer. It may be possible to show that the majority of the observed red shift is due to the much smaller size of atoms in the distant pass. This would negate the need for an extreme “dark energy” associated with empty space. This also does away with the other unresolved issues such as: negative pressure, a huge cosmological constant, quintessence field and other problems with the current dark energy theory.

21.

QUANTUM MATTER

If we extend the idea of the perpetual, slow expansion of matter, then the task presents itself of learning the nature of this expansion. I can visualize two possibilities for the nature in which matter could be expanding; it is either a steady state expansion that is smooth without any variations, or it happens in discrete quantities. If we consider the quark as our most basic sub atomic component of matter, then imagine it as an onion that is growing a new skin of matter with every passing Planck second. In deciding which type of expansion is the most likely, given the established quantum nature of atomics, the quantum type would be the preferred choice.

The quantum behavior of the sub-atomic world is well established. If we choose to include quarks, the basic constituents of matter, as existing in a quantum state by virtue of their pulsing expansion, we may be able to piece together relationships that tie in with known quantum behavior. What we now see emerging from this theory of Dynamic Matter is a new constant. This number represents the amount of matter being added to a quark with every passing Planck second. Within the framework of this concept, I include the following passages:

"Of the known physical constants, the speed of light and Planck's constant are considered natural units. It seems quite likely that a deeper understanding of the particles will be accompanied by the discovery of a third natural unit. This unit, if found, may be a length and there is much speculation that such a unit will be connected with a whole new view of the nature of space and time in the world of the very small." (Kenneth W. Ford 1963)

If all matter is indeed in a constant state of expansion as I have outlined, there then emerges a constant that resembles the description offered by Kenneth Ford. This may be significant in the respect that it offers a unifying aspect to the concept of Dynamic Matter. The viewpoint of Ford is also supported by Paul Wesson who says:

"It is believed that a consistent theory of quantum gravity that involves, c, G, and $\hbar$ would naturally produce particles of the Plank mass." (Wesson 1999)

When we include the quantum nature of Dynamic Matter, it may be possible to resolve some of the abstract concepts associated with Quantum Dynamics and offer a new, more geometric consideration. Steven Weinberg offers the following thought:

"What one needs is a quantum-mechanical model with a wave function that describes not only various systems under study but also something representing a conscious observer." (Weinberg 1992.)

The current belief is that we have particles; photons, electrons, etc., that behave in a quantum manner. And this is correct. The proposal in this paper is that everything exists in a quantum state. Every quark in our body is in a quantum state as it grows in discrete increments, therefore, to accurately define a conscious observer or any object of ponderable mass requires a wave function, whether at rest or in motion. This concept satisfies the viewpoint offered by Weinberg.

It is often written that Albert Einstein never accepted quantum theory. This is not entirely true. In fact, it was Einstein who originally defined the quantum with his paper on the photo electric effect in 1905. The famous quote that is often referenced is "God doesn't play dice with the world." What Einstein was conveying with this statement is that all physical phenomenons, if properly understood, will allow us to predict the outcome of an experiment. Theorists accepted the unpredictable duality of the quantum, as if they relinquished the deterministic mission of the science of physics. Whether light, electrons and particles in general are waves or particles became indeterminable and their nature became subjugated to the fuzzy realm of probabilities. With physics, if one knows all there is to know about a coin; it's mass, the force with which it is flipped, the angle of trajectory, the air resistance, it is possible to determine which side will land face down. Einstein's position, until the very end, was that if we know all there is to know about a particle then we can predict if we will detect it as a particle or wave. He maintained that we did not understand all that was to be understood.

Steven Weinberg is saying that a wave function that defines the observer gives us the determinability to know what the outcome would be. With Dynamic Matter we now have the observer defined by a wave function. What this means is, because matter is constantly expanding in quantum increments, everything exists in a wave state regardless if it is in motion. Imagine that an electron is fired at a target. The electron is travelling as a wave. The atom, which is its target, is also in a wave state, even though it is stationary, simply because it is growing a new "onion skin" of matter every quantum second. If the wave state of the electron and atom are in sync then the electron will be in phase with the atom and will appear to be absorbed as a wave. If the two particles are out of sync in their phase then the electron will bounce off and appear to the observer as a particle. Therefore, if we know both the Dynamic Matter quantum phase of the projectile and the quantum phase of the target, we can predict the outcome; we can predict if the projectile will be observed as a wave or particle. The undeterminable outcome of the experiment is eliminated.

Another phenomenon of modern physics is the tremendous number of sub atomic particles. With particle accelerators it is possible to create a seemingly infinite variety of particles. While quark theory helps to explain a large number of possible permutations, perhaps Dynamic Matter can add to this dilemma. Matter increases with time. An atomic particle, if transferred through time, would appear as a different particle than its counter part that exists in the present. It seems possible that by the intense forces created by collisions in accelerators, and the now understood dynamic nature of matter, that the state of matter can be transformed from its natural state in the present. Following an intense collision, it would most likely appear as a different particle for a very brief microsecond and then revert to its natural state in the present time.

22.

FIVE DIMENSIONS

We have used four dimensions to mathematically describe our universe since 1905 when Special Relativity was created. What was discovered is that "time" is another dimension that is to be treated just as the three spatial dimensions. Once we were shown this, the logic seemed obvious. Three spatial dimensions do not entirely represent an object of consideration. That object also occupies a position in time. Since this realization it has been believed that four dimensions now completely represent an object. This of course is an assumption based on what we perceive within our limited Earthly existence. We do not perceive extra dimensions within what we see and touch. The problem has been that we have not known what constitutes the extra 5th dimension. We have not known where to look or what instruments to build to help us see it. This situation is similar to when we learned that time is variable. Time appeared to tick at a steady rate for everyone. But once we knew where to look and how to look for the variation in time, we were able to detect it.

Let us consider matter as expanding slowly forward since the Big Bang. The quarks within our body are expanding, as are those in our measuring sticks and clocks, and those in our planet Earth as well as the entire universe. Essentially this has left us without a convenient frame of reference to detect the expansion. But now, with the idea that matter is expanding, we can redefine the dimensionality. Four dimensions are no longer adequate and a fifth must be introduced. To represent an object completely, what is required is a factor that represents that object with respect to Dynamic Matter. Four dimensions currently are used to represent an object, but that object is constantly growing and moving relative to its previous position. Any four-dimensional description would not entirely represent an object because all objects are in this constant state of change.

In 1921, mathematician Edwin Kaluza combined the field equation for the electromagnetic force with Einstein's field equation for gravity. The result was a five dimensional mathematical description that unified these two forces. He presented this to Einstein. Initially Einstein did not give this work his endorsement for publication. A year and a half later he reversed this position, seeing that Kaluza's work may have some significance, and he recommended it to be published. Years later, Oscar Klein extended Kaluza's work and was able to incorporate Quantum Mechanics into the five dimensional mathematical model. Unfortunately the Kaluza-Klein treatment was not given much attention for most of the remainder of the century. In recent years five dimensional equations have been getting more consideration with regards to uniting Quantum Mechanics and General Relativity. One of these theorists, Paul Wesson of the University of Waterloo, Ontario has arrived at several mathematical relationships with projections of how a five dimensional universe possibly could manifest itself. Typically he says, "*If there is a fifth dimension it could show up as a variation in mass."*

23.

TIME

What I have proposed herein is a general dynamic nature of matter that goes beyond the variable quality of matter defined by relativity. The essence of this dynamic behavior is a relentless, positive, slow expansion of all matter. The birth of this “expanding matter” perhaps began with the Big Bang when matter went from zero volume and was thrust out into the Universe. Did the “flow” of time also begin with the Big Bang? If one is open to considering the idea of “dynamic matter” it may be a comfortable connection to recognize that this expansion is directly coupled to “time” in its behavior. The physical dimension of time, the existence of time, the concept of time, has held a special position in the field of physics by maintaining an independence from the other seemingly co-dependant ingredients of our Universe. It has basically remained a philosophical question; what is time? If matter is relentlessly, slowly expanding in an always forward positive direction, it may be that this expansion is the “engine” of time. We know from Relativity that time is linked to motion. An inherent expansion of matter yields a relentless forward motion of matter thereby establishing an undeniable link to time.

24.

PROPOSED LABORATORY TEST

The Pioneer spacecraft may represent a test of Newton's first law. Momentum should be conserved but indeed the data demonstrates that these two spacecraft and also two others are slowing in velocity when in fact they should not be. Even more recent data shows that there are now several additional space probes that are also demonstrating momentum anomalies. If we choose to adhere to Newton's first law, and if we can exclude outside interferences which is believed to have been done in the case of Pioneer, then few alternate explanations present themselves. One consideration offered herein is the dynamic increase in matter. A steady increase in matter will slow the motion of a moving body.

A corresponding test to the Pioneer anomaly can be performed in the laboratory. If a rotating gyro is set in motion within a vacuum chamber, the nature of its slowing motion may yield correlating results. 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 will vary with the rotational velocity; the greater the velocity then the greater the effects of friction. By contrast, the lost 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 expected result would be a change in velocity comparable to the change measured for the non-tidal slowing of the Earth's rotation.

25.

CONCLUSION AND POSTULATES

What I have presented herein hopefully outlines a vision or model that is a closer approximation of many physical phenomena. It has been over twenty five years since I first began pondering an inertial space theory for the explanation of gravity. Through the course of my study on gravitation and the development of the Dynamic Matter concept, I have taken some wrong turns and I found myself backing up and looking for the more correct path. However, overall I have been consistently encouraged with how each piece has seemed to fall "comfortably" into place. Unless I have overlooked some significant aspect of physics, it appears to me that the theory of Dynamic Matter has little or no conflict. At the same time, this theory seems to address several areas of physics that have been considered unresolved. Perhaps adding to the comfort is that Dynamic Matter is not a complex theory and it is very geometric in nature. It could be that the fundamental behavior of our universe is easier to understand than we expected.

I am concluding this paper with a list of postulates that are born out of the relationships I have correlated. The list seems rather long and I suppose that this speaks of the current unresolved aspects of physical theory. In addition, because Dynamic Matter resolves these postulates, it speaks of the potential this theory has for being a more complete description of the nature of our universe.

1. EQUIVALENCE / GRAVITY
The backbone of relativity is the equivalence principle. This principle says that the force or effect due to acceleration is identical to the force or effect due to gravity.

POSTULATE: Force due to gravity and the force due to inertia appear equivalent because both are caused by relative acceleration. Inertial force is caused by accelerated motion of a mass relative to space. Gravitational force is caused by accelerated motion of space relative to mass.

CONCLUSION: Space at the surface of the Earth and at all bodies of mass is in an accelerated state. Space has an inherent motion or flow toward the center of the body of mass.

2. CURVED SPACE
Einstein's relativity gave us the tools to describe the behavior of space and gravity. Matter curves space. But exactly how does matter "grab" onto space and warp it?

POSTULATE: At every body of mass, space is moving inward. This motion of space manifests itself to the observer as a curvature of space when in fact it is a constant flow or motion that causes space to only appear curved.

CONCLUSION: The calculated curvature of space as predicted from relativity can be used to determine the velocity of the inboard flow of space. At the surface of the Earth this is approximately .84 meters per second.

3. MASS = SPACE = ENERGY
Relativity gave us the equivalence of mass to energy. At the same time it gave substance to space.

POSTULATE: A given amount of mass equals a given volume of space. A given amount of energy equals a given volume of space. These three components are what constitute the universe.

CONCLUSION: Mass, energy and space are interchangeable. The natural state of the universe is dynamic with a constant interchange of these three components.

$$\text{space} = \text{DM x } mt^2$$

4. DYNAMIC MATTER

Observations support the theory that the universe started at a singularity or a zero point mass with the "Big Bang." We know that the universe is expanding with all galaxies moving away from one another.

POSTULATE: Following the Big Bang, matter did not immediately assume a constant size. Particles started small and have been increasing in size. The growth or addition of matter is fueled by a conversion of space to matter. Matter is not static.

CONCLUSION: Every sub-atomic particle is in a constant state of growth. As particles grow, distances between remain relative to particle size resulting in a stable atomic structure.

5. SPEED OF LIGHT

The constant $2.98x10^8\,meters/\sec$ permeates our physical universe. It is the maximum velocity limit of mass, it is integral in electromagnetic theory, and it defines the equivalence of mass to energy. The speed of light is absolute. All frames of reference measure this constant value for light.

POSTULATE: The speed of light for the universe is determined by the number of quarks in the universe. The velocity of space at the surface of a quark equals "c." The combined vector motion of space at each atom results in a scalar field of space with a value equal to "c."

CONCLUSION: The dynamic matter nature of all bodies in the universe results in an inboard motion of space at each star, planet and atom. At the Sun, the inboard velocity of space at the surface is 2,552 meters per second. All stars in the universe have similar inboard motion of space. If all the motion of space generated by every star in the universe is accumulated into one value, that value is scalar and equals the speed of light. This results in a massive scalar field, which is space itself and dominates the entire universe. The inward flow of space at a body of mass continues its acceleration into the heart of every atom. It reaches a terminal velocity at the approximate size of the quark. This vector velocity also equals the speed of light.

6. WAVES

We know that all particles, whether they have mass or are mass less, travel in a wave motion. This wave motion is directly proportional to the quantum constant known as Plank's constant.

POSTULATE: The conversion of space to matter occurs in quantum increments. Therefore there is a wave function associated with every body of mass.

CONCLUSION: The nature of a particle, whether wave or particle, is directly related to the system it is being associated with. This relationship becomes clearer with the understanding that all matter exists in a quantum state.

7. FIVE DIMENSIONS

It has been demonstrated that a five dimensional mathematical model effectively unites relativity and quantum mechanics. The question has been; how does the fifth dimension manifest itself?

POSTULATE: The universe consists of five dimensions: three spatial, one of time and a fifth dimension that is represented by constant expansion due to the dynamic nature of matter.

CONCLUSION: With current physics, to describe an event requires three spatial dimensions and time. In addition, the curvature of space, or coordinate transformation is applied as matter affects the position of the event. Understanding that what appears as a curvature of space is actually a motion of space allows us to interpret the coordinate transformation and expansion of matter as a fifth dimension.

8. TIME
Time is only and always moving in a positive direction. Its rate is variable and dependent on gravity and velocity.

POSTULATE: Motion through space is time. All matter has a perpetual motion through space by virtue of its dynamic nature. This mandates an absolute value for time that equals zero at the surface of a quark. With a reduced vector velocity relative to the scalar value of space there is an increased rate for the passage of time.

CONSLUSION: We have measured time dilation due to both gravity and velocity. From Dynamic Matter we now know that space is in a constant state of motion. At the surface of the Earth we experience a vector motion of .84 meters per second. Our passage of time is linked to our vectored motion through space.

9. DARK MATTER
Galaxies appear to be rotating too fast for the amount of matter they contain. It has been suggested that an unknown form of matter, which emits no energy, accounts for the observed rotational velocities. We are observing galaxies whose ages decrease with their distance from us. Matter was smaller in the past.

POSTULATE: There is an increase in mass with the passage of time due to the dynamic nature of matter. Gravity remains relatively constant because the number of quarks remains relatively constant. Therefore galaxies, as they age, will increase in diameter and their rotational velocities will decrease. Also, the older stars in the outer areas of galaxies have more mass than the younger stars closer to the center.

CONSLUSION: Our observations of galaxies allow us to see them in the past when they were younger. By applying the principle of conversation of angular momentum, younger galaxies will be spinning faster than older ones.

10. RED SHIFT

Extreme red shifts are measured for galaxies with the most distant having the greatest shift. For quasars, red shifts have been measured in the range of 9/10 the speed of light. The current belief is that the red shift measured is due to the receding motion.

POSTULATE: It is known that the smaller the particle, the longer the wavelength associated with the particle. Due to the dynamic nature of matter, particles were smaller in the past. Therefore some of the observed red shift of distant galaxies is attributable to Dynamic Matter.

CONCLUSION: Many have felt that the observed values for red shift are too large. When attributed to receding motion, they can imply tremendous velocities. In addition, the current Hubble value does not provide for enough mass to allow for a closed universe which is contrary to expected theory. It is likely that a significant percentage of the observed red shift is due to the “dynamic matter” effect and the corresponding smaller size of distant atoms.

26.

APPENDIX

1. TIDAL FRICTION

Halley (1693) and others, including Kant (1754) were among the first to detect discrepancies in the paths of totality in eclipses of the sun as predicted by Newtonian gravitation theory. Halley was perhaps the first to realize that the Earth was not precise in its rotational velocity and he also surmised that the Moon's angular velocity was not constant as it orbits the Earth. With the advent of the telescope, more precise measurements of star occultations and better record keeping, particularly after A.D. 1780, helped to establish an understanding that the Earth is indeed slowing down in its rotation. For many years the problem lay searching for an explanation. In 1920 it appeared that Harold Jeffreys had solved the problem. Jeffreys had developed a map that demonstrated that the continuing slowing of the Earth's rotation was caused by the gravitational pull of the Moon and Sun working on the Earth's oceans. The resulting friction of tides working against certain shallow ocean basins was believed to be the cause of the Earth's lost rotational energy.

As promising as the tidal friction theory was it has unfortunately had a troublesome history. Following Jeffreys' work, many continued the analysis of the dissipation estimates for the Earth's oceans. There has been a continuous problem of trying to quantify the localized distribution of energy sinks (Munk 1997). The problem of tidal friction has been primarily addressed by oceanographers who generally share a determination to match the lost energy represented by slowing rotation to the friction of ocean tides. Walter Munk has perhaps been the leader in this field. He has also been forthright in stating that analysis has historically estimated dissipation based on assumptions. The task of mapping the energy sinks represented by the tides and shallow oceans is extremely difficult. Other problems enter into the analysis, such as equilibrium of tidal action, atmospheric friction, bodily tides and the Earth's molten outer core.

Geophysicists have approached the problem of the Earth's slowing rotation almost seemingly as a study separated from that of the oceanographers. If one combines the research of both groups, a clearer picture emerges. There is strong evidence that tidal friction accounts for only a percentage of the slowing rotation (Stephenson 1991). The remainder of the corresponding lost rotational energy is currently not adequately explained. However, geophysicists have worked at developing various models that account for this energy dissipation through dynamic interactions of the Earth's mantle and the outer molten core. In a simplified summary, if the molten core had a rotational velocity less than the mantle, and if adequate friction exists between the mantle and molten core, then the core could be working to slow down the rotation of the mantle. The primary obstacle to this model is that there is a fairly broad consensus that the mantle and outer molten core are closely coupled thereby not providing the required difference in velocity (Kakuta et al. 1975). When considering the age of the Earth and assuming that it was set in rotational motion early in its birth, it is reasonable to project that the mantle and core would have reached a motion of equilibrium long before our time period.

The last two centuries have yielded more precise measurements of the Earth's rotation that contribute to the dynamic analysis. The decrease in change of rotational velocity is not uniform. There have been periods of length of day (LOD) fluctuation that vary as much as 10 milliseconds per century (ms/cy), with a typical amplitude of 2 to 3 ms/cy. The period between these fluctuations is typically about 30 years. The torques required to produce these changes exceed 10^{18} *Nm.* The observed cycle is considered by some to be related to the Markowitz Wobble (Poma 1988). What does seem evident is that these fluctuations clearly define a change in rotational velocity that is separate from tidal friction. The rate of acceleration based on the average slope measured between fluctuations is $1.37 \pm .07 ms/cy$. In addition, data recorded from medieval Arab solar eclipses (A.D. 950) coincide with this slope of 1.37 *ms/cy.* Unfortunately, there are large lapses in historical data both before the Arab data and after. Babylonian observations between 700 and 50 B.C. yield a value of 2.60*ms/cy* (Stephenson 1991). This implies either a change in the rate of acceleration between A.D. 950 and 50 B.C. caused by some unknown factor or a discrepancy in record keeping. (See figure 1.)

The Stephenson data establishes strong support for a non-tidal Length of Day (LOD) variation of 1.37 *ms/cy*. A correlating deduction is provided by Stig Flodmark (1991). His mathematical analysis yields a non-tidal component of 65% for the total LOD variation. Given the observed current LOD variation as 2.4 *ms/cy* and applying Flodmark's 65% allotment to that number yields a non-tidal LOD variation of 1.57 *ms/cy*. This is close to Stephenson's observed value and adds support to the assumption that the Babylonian value of 2.60 *ms/cy* may be inflated. For the evaluation in my research I have chosen to use the Stephenson value of 1.37 *ms/cy*. This value is derived through extensive observation, including numerous telescopic measurements covering the last two centuries and the corresponding Arab data of 800 to 1000 A.D. Therefore I feel it represents the most reliable variable LOD value that has been put forth in the literature concerning this area of study.

The slowing rotation of the Earth, when generalized over the millennia, seems to be constant and perpetual. It appears likely that the high and low fluctuations in varying LOD may be linked to the Chandler and Markowitz wobbles. The outer core is believed to be fluid and geocentric wobbles may act upon the fluid core to produce periodical accelerations and decelerations. However, the overall general motion remains to be a consistent slowing. In other words, the fluid dynamics of the molten core can cause short term variations in the rate of slowdown, but it is unlikely that a dynamic transfer in momentum between the outer core and mantle is the cause of the seemingly long term perpetual slowing of the Earth's rotation. One argument in support of this view is that the average slowdown of 1.37 *ms/cy* represents a very large change in angular momentum. For the Earth to give up this amount of angular momentum millennia after millennia asks for an explanation that goes beyond what the tidal friction and geophysical theories have offered.

It may be easier to understand the angular dynamics of a body when comparing the problem to a linear analogy. In its simplest form we wish to view the Earth as a homogenous sphere with a constant rotational velocity that obeys Newton's first law. By contrast, let us consider an object that is traveling a linear path through space. Ignoring outside influences, this object should not vary in its velocity as per Newton's first law. If the object is a rigid box with a fluid interior we might observe short term variations in its long term general motion. If the interior fluid has a wave motion within it that is traveling fore and aft in our box, one would observe a variation in velocity as the wave bounces back and forth between the front of the box and the back. However, the general overall motion of the box through space would be a constant velocity that has periodic fluctuations associated with the motion of the wave in the interior fluid. A similar situation may occur in the Earth and although the molten core or oceans or a combination thereof may contribute to varying accelerations and decelerations, the overall behavior is one of continuing slowing of rotation that may be independent of the oceans and molten core dynamics.

Of the total tidal friction allotment, a small portion is allocated to the bodily tide. This is the perpetual bulge of ocean water of approximately 3.23 cm in height that is drawn toward the moon. Because of the Earth’s rotation, there results a lag in this bulge that is approximately 0.21^{o} ahead of the Earth’s alignment with the Moon (Munk 1997). Munk estimates the energy of the bodily tide at about 4% of the total 2.4 *ms/cy* LOD variation. The gravitational pull of this bulge on the Moon imparts a small amount of angular momentum from the Earth’s rotation to the orbit of the Moon. Consequently, the altitude of the Moon’s orbit and the length of period of the lunar revolution are increasing. The Apollo astronauts left a reflector on the Moon and this has been used to measure a 3.8 cm/year increase in the radius of the Moon’s orbit. Again, as in the hopes of oceanographers assigning the lost energy of varying LOD to tidal friction and geophysicists hoping to assign the lost energy to core/mantle coupling, assumptions seem to prevail and there may be an over allocation of bodily tide transfer. The supposed exchange of angular momentum between Earth and Moon results in a tidal deceleration of the Earth that is actually greater than that observed for the last 3000 years (Lambeck 1980). Hipkin (1975) criticizes the use of the lagged tidal bulge as representing the ocean tide in studies of the tidal perturbations in satellite motions (see also Goldreich & Peale 1968, p. 291: Alfven & Arrhenius 1969).

The problem of the slowing velocity of the Earth’s rotation also involves studies that probe into Earth’s distant past. Some researchers have been heavily involved in calculating past orbits of the Earth/Moon system. These researchers place a strong emphasis on the bodily tides as the mechanism for varying rotation. By calculating back into

Earth's past, it would be convenient if the Earth/Moon relationship offered the numerical support for the transfer of angular momentum over the millennia. The problem is that even if the average rate of dissipation has been one half of the present rate, the Moon is brought uncomfortably close to the Earth about $3x10^9$ years ago. Neither the terrestrial nor the lunar geology bears clear evidence for such a catastrophic event (Lambeck 1980). This situation leaves us with a deficiency in the application of tidal friction from ocean tides and bodily tides, as well as core/mantle coupling, for the mechanism responsible for the Earth's variable rotation.

Planet periods of the distant past should not be neglected from the analysis. Paleontological clocks have been used to establish LOD as far back as the Ordovician period some $4.5x10^8$ years ago. Growth rhythms in coral, bivalve and stromatolite fossils have been interpreted in terms of astronomical cycles (Lambeck 1980). The mean average of two samples from fossil corals are:

$-300x10^6$ years	385 days/yr
$-370x10^6$ years	400 days/yr
	(Wells 1970, Scrutton 1970)

These estimates are also supported by fossil records of bivalves (Pannella 1972). The significant number of samples analyzed and the similar results obtained by independent researchers supports the credibility of the values obtained. A comprehensive theory should include the pre-history LOD values with the current observed LOD variation.

The conclusion that can be drawn from the study of the long term variation in the Earth's rotation is that there exist anomalies in the Earth's rotational behavior that are not adequately explained by tidal friction theory or geophysical theory. My work began as a study in gravity and certain outcomes of that research have led me to the study of the anomalies in Earth's rotation. My work in gravity adheres strictly to Newtonian gravity and General Relativity, not necessarily as a self imposed requirement but more of a natural outcome. This work also reveals a quantum gravity relationship that uncovers certain aspects of this force that may have hitherto gone undetected. I have determined a relationship between the Earth's anomalous rotational behavior and gravity. It is also now well understood that there exist anomalies in the rotational behavior of galaxies. A solid geometric and mathematical correlation emerges that connects these rotational anomalies to those of the Earth. After arriving at conclusions in my study of gravity, these conclusions were applied to both Earth's rotation and galactic rotation with intriguing results. In addition, the relationships are further extended to the increasing altitude of the Moon and the slowing of the Pioneer spacecraft. The commonality of these four phenomenons is that they all seem to violate Newton's first law. What we seem to be observing is not a conservation of momentum as predicted by Newton but a variation of momentum. Newton's first law stands, not so much from empirical proof, but perhaps a logical and philosophical commitment to its validity. I have adhered to this law while seeking a resolution to observed anomalous motion.

BIBLIOGRAPHY

Anderson, J.D., Laing, P.A., Lau, E.L., Liu, A.S., Nieto, M.M., Turyshev, S.G., Study of the Anomalous Acceleration of Pioneer 10 and 11. 2002. *Physical Review D,* **65**, Issue 8.

Floodmark, S., 1991. The Earth's Polar Motion. *New Approaches in Geomagnetism and the Earth's Rotation.* World Scientific Publishing, Singapore. 36-40.

Ford, K. 1963. The Large and the Small. Reprinted in: *The World Treasury of Physics, Astronomy and Mathematics.* 1991. Timothy Ferris, Back Bay Books. Little, Brown and Company, New York City.

Hawking, S., Penrose, R., 1996. *The Nature of Space and Time.* Princeton University Press, Princeton, N.J.

Lambeck, K., 1980. *The Earth's Variable Rotation: Geophysical Causes and Consequences.* Cambridge University Press, Cambridge.

Milgrom, M., 1983. A Modification of the Newtonian Dynamics as a Possible Alternative to the Hidden Mass Hypothesis. *The Astrophysical Journal* **270:** 365-370.

Munk, W., 1997. Once again: once again- tidal friction. *Progressive Oceanography*. **40:** 7-35.

Stephenson, R., 1991. The Earth's Rotation as Documented by Historical Data. *New Approaches in Geomagnetism and the Earth's Rotation.* World Scientific Publishing, Singapore. 87-113.

Schwarzschild, B. 2003. Infrared Adaptive Optics Reveals Stars Orbiting Within Light-Hours of the Milky Way's Center. *Physics Today*. Feb. pg. 19.

Weinberg, S., 1992. *Dreams of a Final Theory*. Random House, New York City

Wesson, P., 1999. *Space Time Matter*. World Scientific, New Jersey.