The Existence Framework
Based Upon Principles Derived From a History of Science

The Existence Framework proposes a radically new paradigm for understanding the origin, nature, and structure of space-time. Based upon this framework, a quantum theory of gravity is developed, in which gravity is viewed not as a force, but rather as an emergent property. The framework attempts to unify general relativity and quantum mechanics, in a unique way, distinct from string theory and loop quantum gravity. The Existence Framework is primarily a non-mathematical investigation. It relies upon a historical perspective, simple analysis, logic, intuition, and imagination in order to produce a comprehensive, yet simple framework.

The development of the Existence Framework was guided by three sets of principles. The first set of principles is derived from an examination of the history of science, particularly the events leading to past major advances in physics. A second set of principles is derived from observations related to relativity theory and quantum mechanics. And a third principle is based upon an intuition that there are simple underlying dynamics, which remain to be discovered, that can explain aspects of general relativity and quantum mechanics.

Historical Review

A historical review of physics reveals that major breakthroughs often result by applying one of three principles:

1) Equivalence Principle

Entities previously considered unrelated are determined to be equivalent.

Examples include:

Newton's equivalence between the force acting on planets, causing them to revolve around the sun, and the force causing objects to fall to the earth. This led to his theory of gravity.

Faraday and Maxwell established an equivalence between electricity, magnetism and light which led to the understanding of electromagnetic energy.

Einstein suggested an equivalence between the force acting on accelerating bodies and the gravitational force. This led to his theory of general relativity.

Einstein also established equivalences between matter and energy, $E=MC^2$, and between space and time, i.e., the space and time continuum.

2) Hierarchical Principle

Entities previously assumed to be elementary are actually comprised of something more elementary. For example:

Atoms were thought to be elementary until it was discovered that they are comprised of more elementary sub-atomic particles.

Protons were thought to be elementary until it was discovered that they are comprised of quarks.

String theory proposes that elementary particles are comprised of vibrating strings.

In fact, everything in the universe is comprised of something more elementary. Molecules are comprised of atoms, atoms are comprised of sub-atomic particles, protons are comprised of quarks. String theory speculates that elementary particles are comprised of strings. I propose:

The architecture of the universe is hierarchical. All objects exist within the universe's hierarchical arrangement; that is, everything is constructed from something more elementary, and this includes space and time!

3) Quantum Principle

Quantities that were once considered continuous are actually discrete, occurring in quantum amounts.

Example:

Einstein's photoelectric effect revealed that energy manifests in quantized packets, and his discovery led to the formation quantum mechanics.

How might the principles of equivalence, the hierarchal architecture of the universe, and the quantification of nature be applied toward the next major breakthrough? What area of physics is most in need of a breakthrough? After almost a century of searching by theoretical physicists, a means of rectifying general relativity with quantum

mechanics remains unresolved; this quest has challenged physicists since Einstein began his search for a unified field theory. Although string theory and loop quantum gravity are very strong candidates, both remain incomplete.

The rectification of general relativity with quantum mechanics is essentially an attempt to unify gravity with the three other natural forces: the electromagnetic, the strong, and the weak forces. The three natural forces fall within the domain of energy and matter, while the gravitational force is essentially a property of space-time. Thus, it can be viewed that the grand unification sought is one between space-time and matter-energy. If the historical precedent of equivalence were to be followed, then the logical step would be to discover an equivalence between space-time and matter-energy. What form might that equivalence assume?

Perhaps an equivalence can be discovered by applying the second historical principle: the hierarchical principle—breakthroughs occur with the realization that something assumed to be elementary is actually comprised of something more elementary. Might point-particles such as photons and electrons actually be comprised of something more elementary? String theory suggests that these particles are actually comprised of strings. But strings of what? Einstein proposed that point particles might contain hidden variables; but what are the properties of those variables?

As we have seen, the universe is arranged in a hierarchical manner. Everything is comprised of something more elementary; everything, that is, but space and time. Why are space and time not presently included in the universe's hierarchical arrangement?

It seems logical to explore the possibility that space-time should not be excluded from the universe's hierarchical architecture. It also seems reasonable to assume that space-time and matter-energy are equivalent. Might this equivalence result from one being comprised of the other? Might space-time be the substance of matter-energy, or might space-time be derived from matter-energy?

If space-time and matter-energy are equivalent, and if one is comprised of the other, then it seems apparent that space-time is more elementary, and that matter-energy is comprised of it. I propose this, due to the fact that space-time is more subtle than matter-energy; it is more elusive, it cannot be detected, whereas matter-energy can be observed and measured. Therefore, I suggest that space-time would lie at the fundamental level of the universe's hierarchical arrangement, and it would serve as the building block of point-particles. Thus, space-time would be the substance of matter-energy.

Applying the hierarchical principle—the notion that breakthroughs occur by discovering that entities assumed to be elementary are actually comprised of something more elementary—suggests that space-time itself might actually be comprised of something more elementary. If everything else in the universe is quantified, occurring in discrete packages, is it not likely that space-time is also discrete? If so, then two questions

arise: What is the discrete nature of space-time? What is the substance that forms space-time?

In order to determine what the substance of space-time might be, it is reasonable to consider the nature of space-time as revealed by relativity theory and the nature of matter-energy as revealed by quantum mechanics.

Second Set of Principles : Simple Underlying Dynamics

The second set of principles upon which the Existence Framework is established is derived from the premise that there are simple underlying physical phenomena which can explain the behavior of space-time, matter, and energy as dictated by relativity theory and quantum mechanics. Currently, neither relativity nor quantum mechanics can explain why certain phenomena occur. The Existence Framework investigates the following phenomena:

- Why do time and length (space) remain constant in an observer's frame of reference but differ in a frame of reference moving relative to an observer?
- Why does a frame of reference travel with an observer?
- Why does time slow down in gravitational fields?
- Why is the speed of light always constant?
- Why does the force of gravity travel at the speed of light?
- Why does mass warp space-time?

The Existence Framework development is also based upon the assumption that the major constants found in many equations of physics actually represent underlying dynamics. In other words these constants are not just mathematical constructs, but they actually emerge from underlying physical phenomena. In order to help determine the nature and structure of space-time, these major constants are explored:

- Gravitational Constant
- Planck Constant, Planck Length, Planck Time, Planck Mass
- C - The speed of light
- Fine Constant
- Electric Force

The remainder of this paper focuses on the formulation of the Existence Framework. It begins with the application of the equivalence and hierarchical principles in order to formulate a hypothesis regarding the substance and structure of space-time. Then, in order to determine the nature of space-time, it continues with an exploration of relativity theory and the observed phenomena predicted by it. Finally, it melds this understanding of space-time with the proposed space-time structure in order to explain how relativistic phenomena, including gravity, arise.

Existence: The Substance of Space-Time

If space-time is comprised of a substance, what might that substance be? A simple conclusion is that whatever that substance is, it must be more elementary than space and time, and therefore cannot possess any attributes belonging to space or time. In other words, this substance cannot consist of any length, nor can it endure for any duration of time. Furthermore, this substance cannot have mass or force associated with it. What type of substance could consume no space, endure for no time, and have no mass or force?

It is also logical to assume that this substance must be a fundamental component of the universe in the same manner that space, time, energy, and matter are fundamental. It is also likely to be extremely subtle, so subtle that it has not yet been detected. In fact it may be impossible to detect.

What attribute might the most fundamental aspect of the universe possess? I propose that it is—**existence**. Why existence? Because nothing can exist without existence. The mere fact that the universe exists, in contrast to the alternative, that nothing exists, indicates that existence is likely to be this most fundamental aspect. The Existence Framework proposes that existence is the property to first emerge during the Big Bang; it manifests as an individual quantum of existence, or an "existence particle."

An existence particle has two states: it is either existing or non-existing. It is similar to a single bit of information, which is either on (existing) or off (non-existing), and therefore, it could also be considered a quantum of information, or an information particle.

It could also be considered a quantum of consciousness. There is a quandary in the science of consciousness known as the hard problem, which basically states that even if neuroscience succeeds in understanding how the human brain generates experiences of seeing, hearing, thinking and feeling, this understanding will not be adequate in explaining how the subjective experience of consciousness emerges. In other words, it asks how can subjective experience arise out of the functioning of matter and energy? There is a trend among those who study consciousness to believe that a yet undetected component of the universe must exist in order to account for consciousness. Some assert that consciousness is innate and has been part of the universe since its conception. I propose that existence is the missing property, the undetected attribute which can explain human consciousness. In that sense, an existence particle could be considered a quantum of consciousness.

In a forthcoming book I examine the close relationship between consciousness and existence. I consider existence to be an essential ingredient of consciousness; I define consciousness as that which gives us awareness of our own existence. A major point in the book is that while existence cannot be observed externally, it can however be

experienced subjectively through human consciousness. In fact, I state that the human brain is the only "instrument" capable of detecting existence, and it is through perception of existence that consciousness arises.

Whether an existence particle is considered a quantum of existence, a quantum of information, or a quantum of consciousness, the question arises: How do these subtle particles form the substance of time and space?

Formation of Time

Existence particles are virtual particles. Because existence particles are more primary than time and space, an individual particle cannot remain in existence for any duration of time, nor can it consume any length of space. Existence particles emerge and then vanish; they enter into existence and then permanently vanish from existence before any time elapses. As they do not exist within the universe's time and space, they are virtual particles. A particle possesses two states, an existing state and a non-existing state. Even in the state of existence, an existence particle does not reside in the space of the universe, rather each particle resides momentarily in a separate, unique dimension. There are an infinite number of possible dimensions.

It is proposed that existence particles are the substance of time and space, and that time and space are the substance of matter and energy. In essence, everything is comprised of existence particles. Through an evolutionary process, existence particles combine to first form time, then time forms space, then space-time forms energy, which in turn is the basis of matter. The preliminary stages of this evolutionary process are:

> Existence Particles
> Moments of time—Isolated moments of time, without the flow of time.
> Strings of time—Flow of existence from the past, though the present, into the future.
> Space matrixes—Formation of space comprised of strings of time.

Moments of Time

Moments of time form when two existence particles bond together. One particle resides in a state of existence, while another particle resides in the state of non-existence. A moment endures for a discrete amount of time equal to one Planck moment, the smallest possible duration of time. After one moment the particles flip states: the existing particle vanishes into non-existence, while the non-existing particle enters into existence. This moment also endures for one Planck moment. Then, immediately another flip occurs back to the original state. This is immediately followed by a flip back to the second state. The flipping continues indefinitely, each flip ticking one moment of time, one Planck moment.

There is a fundamental law of the Existence Framework—**Transference of Existence**: In order for a vanished particle to return into existence, existence must transfer from a momentarily existing particle to a momentarily non-existing particle. This transfer must occur immediately, within one Planck moment after a particle vanishes; if a transfer does not occur within one Planck moment, then the vanished particle remains in a permanent state of non-existence. As will be discussed later, this law—Existence from Non-Existence—serves as the fundamental mechanism for gravity and the electromagnetic force.

Strings of Time

Moments of time operate in isolation from one another, hence no passage of time occurs external to the bonded pair. Passage of time begins when individual moments connect together to form strings of time. A time-string is a one-dimensional chain of existence particles linked together. The distance between particles is one Planck length. In a time-string, existence transfers from one particle to the next particle along the chain. Existence flows in one direction from one existence particle to the next existence particle, from the past through the present, and into the future.

As was stated, existence particles exist and then vanish, and after vanishing a particle will remain permanently vanished unless existence is transferred to it from a currently existing particle. This transfer must occur within one Planck moment after a particle vanishes. Existence particles within a time-string also cycle between existence and non-existence: a particle in a string receives existence from its predecessor, and then passes on its existence to the next existence particle in the string.

A particle in a string will maintain its existence (be restored from non-existence) if its most immediate (past) predecessor is in a state of existence. When its predecessor changes states and transfers from existence into non-existence (vanishes), its predecessor's existence is transferred to it. In this manner, existence passes from one particle to the next.

In bonded-moments, existence transfers back and forth between only two particles, but in time-strings existence flows through many particles. In moments, only two particles' existence is maintained, whereas in time-strings the existence of many particles is preserved. Thus, time-strings are a very efficient way of maintaining the existence of many particles.

Every particle in a time-string has an immediate, past (predecessor) particle from which it receives existence—except for the first particle in a string. Having no predecessor implies that the first particle of a string cannot receive existence, and hence it will vanish after one moment and the string will lessen in length by one Planck length.

After this first particle vanishes, the second particle in the string becomes the new first particle. It too will vanish after one Planck moment. A string will continue to shrink at the rate of one Planck length per Planck moment.

The only way for a first particle of a string to not permanently vanish is for a new existence particle to emerge into the universe, and for that new particle to bond with the first particle. If a new particle spontaneously enters into the universe and attaches to the beginning of a string, then the previous first particle can bond with this new particle, and it will receive existence from it. In this case the length of the string will increase by one Planck length, and the previous first particle in the string will be preserved. The newly emerging particle will become the new first particle.

During each moment, either a new particle attaches to the beginning of a string, or a new particle does not attach to the string. If a new particle emerges and attaches to the beginning of a string, it enlarges the string by one Planck length. If no new particle emerges, the first particle permanently vanishes, decreasing the string's length by one Planck length. Thus, a string either increases by one particle length or decreases by one particle length each moment. Strings are constantly vibrating, either shortening or lengthening each moment.

Later in this paper, there is a discussion on how the lengthening and shortening of time-strings serve as the basis of the electromagnetic force, and how the vanishing of particles within strings is responsible for gravity.

Formation of Space

Each time-string exits in a separate dimension, isolated from other time-strings. The passage of time in one string remains separate from the passage of time occurring in other time-strings.

The next stage in the universe's evolution occurs when time-strings connect with one another to form networks of space-time. Time-strings connect with one another at junctions, referred to as space-points. At a space-point, existence flows from one time-string into other time-strings which are also connected to the space-point.

When a single new existence particle emerges into the universe and attaches to the beginning of a space-time-string, existence can flow though that string and throughout all the strings connected in the network. With a single particle's emergence into existence, a vast number of particles in a network can be preserved. Thus, the formation of time-string networks offer an evolutionary advantage over unconnected time-strings and individual moments, as it potentially secures the existence of many more particles.

The networking of time-strings forms a space-matrix. Space-matrices themselves network into more complex networks. Whereas a time-string is one-dimensional, space-matrices are three-dimensional.

Time is discrete, manifesting as individual moments. The shortest time duration is one Planck moment, the duration of an existence particle. Space is also discrete; the smallest distance is one Planck length, the distance between particles in a string. Later in this paper there is a description of the composition of photons, including an explanation as to how photons move along space-time strings by connecting to one existence particle and then on to the next particle each moment. A photon moves one Planck length (distance between particles) in one Planck moment (duration of a particle). This explains why the speed of light is always constant, and why nothing can travel faster than the speed of light.

Each space-matrix comprises a volume of space. The entire universe is comprised of a vast collection of volumes. Space is not fixed; it is flexible, and matrices can connect and disconnect with other matrices, and strings forming matrices can lengthen and shorten. In order to further explore how space-matrices might function, we turn to relativity theory to understand the nature of space and time.

What Relativity Reveals about Space-Time

Relativity reveals non-intuitive aspects of space-time—non-intuitive because they differ so drastically from our human experience. For example, as humans we observe that the passing of time as measured by clocks and the length of space as measured by rulers is constant, but in actuality the passing of time and the length of space varies depending upon the observer's relative speed or position in a gravitational field. Many experiments and observations have confirmed that these are actual phenomena, demonstrating that Einstein's equations are correct. But still missing are explanations regarding the underlying space-time mechanisms that actually cause these effects to occur. With the prospect of an additional, yet undetected stratum of the universe which is more elementary than space-time, it becomes possible to conceive of mechanisms functioning within space-time which can account for relativistic effects. In order to uncover what those mechanisms might be and to help to reveal the fabric of space-time, the following four phenomena related to relativity theory are explored:

- Frames of Reference
- Warping of space-time by bodies of mass
- Gravity
- Time Dilation

Each of these phenomena are explored from the fresh perspective offered by the proposition that existence particles form the substance of space and time. The goal is to conjure simple, intuitive mechanisms which create the effects dictated by relativity

theory. Each phenomenon is explored independently, and a simple mechanism for each phenomenon is proposed, keeping in mind that each mechanism must also fit harmoniously with the other propositions in order to create an all-encompassing understanding.

We start with frames of reference. According to special relativity, each observer resides in a unique frame of reference, in which time and space remain constant. However, an observer will note that time and length will vary in frames of references which are moving relative to an observer. These effects are most noticeable when objects are traveling at speeds approaching that of the speed of light.

What is a frame of reference? Does it have actual physical characteristics? The simplest explanation for a frame of reference is that it consists of the space-time surrounding an observer. If this is correct, then as a frame of reference moves with an object, an object's surrounding space-time must move with it. If this is true, then an object's surrounding space-time will move with the object through other space-time. Can space-time move through space-time?

No doubt the notion of space-time moving through space-time contradicts prevailing understanding, which is that space-time is a single continuum. General relativity reveals that space-time can warp, but can it also move through itself? Prior to Einstein's formulation of relativity, there was a notion that space-time was comprised of a substance, referred to as "the aether"; however, the Michelson-Morley experiment disproved the existence of aether. But that experiment did not consider that a frame of reference's space-time might flow through other space-time. As the experiment only focused on how the speed of light was affected by an object moving through the supposed aether, it did not consider the notion that an object's surrounding space-time itself might move with it.

If space-time can flow through itself, it implies that it is comprised of some substance. As we have seen, the Existence Framework proposes that the substance of space is time-strings comprised of existence particles. But there still remains a question: Why would an object's surrounding space-time move with it?

A simple, logical answer is that an object's surrounding space-time is somehow attached to an object. In that case, the attachment would "pull" an object's surrounding space-time along with the object as it moves. The questions that arise are: Why would an object be attached to its surrounding space-time? How would it pull space-time?

Answers lie with the hierarchal principle (everything is made of something more elementary). The Existence Framework proposes that matter and energy are actually comprised of fluctuations of compressed space-time. If that is true, then it is possible that an attachment between an object and its surrounding space-time is somehow related to an object's composition. In other words, the space-time comprising an

object might be attached to the space-time surrounding it. What might the nature of that attachment be?

It is not far-fetched to assume that matter and surrounding space-time affect one another. In fact, that is the basis of general relativity—matter warps space-time and this warping is what is observed as gravity. But there is one thing that general relativity does not explain and that is: Why is it that matter warp space-time?

Because the Existence Framework assumes that space-time has substance, one can examine the effects of gravity from a fresh perspective. In fact, a fresh viewpoint can offer a mechanism that produces gravity that is simpler than Einstein's explanation of space-time warping, but is still in accord with the well-established observations derived from relativity.

Given the proposition that space-time can flow through space-time, a simple, intuitive explanation for gravity arises: **Gravity is caused by the flow of space-time toward objects of mass**. Objects caught in the flow of space-time will move with the flow toward the destination of that flow. Gravity is not a force on an object per se; it does not force an object to move, but rather it is the space-time in which an object resides that moves.

Consider two objects: a smaller object A and a much larger object B. Object A is moving in a straight line through space in a region near object B. Surrounding space-time is flowing toward object B, causing object A's straight line to be altered. In a sense, object A will be swept up in object B's space-time flow and will move with the space-time toward B. Depending upon its speed and its mass, the flow may cause a small amount of change in its motion, or it might cause the object to "fall" rapidly toward object B.

Not only does object A move, but its surrounding space-time moves with it. **The attachment between an object and its surrounding space-time can therefore be explained as the space-time flowing toward the object.** The flow might only be a small fraction of all the surrounding space-time, but because space-time links with other space-time to form networks, the flow tugs on all of an object's surrounding space-time.

Of course, this raises another question, Why would space-time flow toward an object? **The Existence Framework proposes that elementary particles of mass are comprised of energy encapsulated within highly compressed space-time.** It is compressed, because space-time is constantly flowing into particles of mass. But why would space-time flow into an object? **A simple explanation is that matter consumes space-time.**

As stated above, in the Existence Framework strings of space-time either lengthen by one Planck length or shorten by one Planck length each Planck moment. Accordingly, space-time flows into matter because particles of mass, such as electrons and quarks, are comprised of time-strings that are constantly shrinking in size. The shrinking "pulls" strings toward the center of a particle. But why would space-time strings constantly shorten? A simple explanation is that **there is a void inside of these particles in which no new existence particles can emerge.** A void within space is not empty space; a void is devoid of space. Space might surround a void, but nothing can move into or out from a void, including light. Strings attached to a void will constantly shorten, because no new existence particles can emerge within a void to attach to the beginning of surrounding strings.

Strings attached to a void constantly shorten because no new existence particles can emerge within a void to attach to a string's first particle. Therefore, strings attached to a void will shorten at the rate of one particle per Planck moment. As these strings are also attached to a particle's surrounding space-time, these shrinking strings pull on that surrounding space-time, creating a flow of space-time moving inward at the speed of one Planck length per Planck moment (the speed of light). This explains why the speed of gravity is equal to the speed of light.

Time dilation, the slowing down of time in gravitational fields, is another phenomenon predicted by general relativity. Observations have proven it to be an actual phenomenon. It has been observed that clocks on the earth run more slowly than clocks on satellites orbiting the earth. The nearer a clock is to a center of gravity, the more slowly the clock will run. The greater the gravitational force associated with a body, the greater the time dilation.

What mechanisms operating within space-time could cause time dilation? The Existence Framework proposes that time dilation is caused by variations in space-time density. The greater the density, the slower time passes; in less dense regions time passes more rapidly.

According to the framework, space-time density will be greatest in regions surrounding voids. This is due to the fact that as space-time-strings are pulled into a void, they also pull on strings to which they are attached. As more and more strings get pulled toward a void, more and more strings get packed into the region surrounding a void. The density of space-time near voids is greater than the density of regions farther away from voids. It is proposed that a particle such as an electron or quark is a void, surrounded by highly compressed space-time.

To understand why time passes more slowly in denser regions of space-time, it is necessary to understand how particles, such as photons, move through space. According to the framework, photons move through space by traversing space-time strings. A photon moves along a string from one existence particle to the next adjacent particle, and then on to the next particle, and so on. A photon moves from one particle

to the next particle, a distance of one Planck length, in one Planck moment. How fast a photon travels through an entire region depends upon how many existence particles it must traverse in that region. In denser regions, a photon will have more existence particles to traverse, and in less dense regions it will have fewer existence particles to traverse.

To understand why time slows down in denser regions, consider a clock that is constructed by bouncing a photon between two mirrors. (This is similar to a thought experiment Einstein used in developing his theory of special relativity.) Each bounce will count as one click of the clock, and the passing of time is measured by how many clicks (bounces) have occurred.

Consider two identical clocks, one in a more dense region and one in a less dense region. The clock in the denser region will run more slowly, because it will take more Planck moments for a photon to traverse the distance between mirrors than it will for a photon to traverse the same distance in a less dense region. This is due to the fact that in a denser region there will be more existence particles in time-strings between the mirrors compared to the time-strings in a less dense region. Therefore, a photon in the denser region will need to traverse more existence particles as it moves between mirrors, compared to a photon in the less dense region, which will have fewer existence particles to traverse. Thus time will pass more slowly in denser regions, and will pass more rapidly in less dense regions.

Existence Framework and Known Laws

Does the Existence Framework's model of gravity conform to the existing theories and laws of gravity? In particular, does it conform to Newton's and Einstein's equations? Consider these reasons why it does:

- The model can be expressed through Newton's equations.
- The model explains the underlying mechanisms of the gravitational constant and Planck mass.
- The model explains why time slows down in gravitational fields.
- The model indicates that space-time flow creates variations in space-time density, which appears to be equivalent to general relativity's space-time warping.

Newton's Equation

Newton's equation for the force of gravity is:

$$F = \frac{G(m_1 * m_2)}{r^2}$$

Or, in English terms, the force of gravity between two bodies of mass is:

$$Force = \frac{\text{(Gravitational Constant)} * (Mass_1 * Mass_2)}{\text{(Distance Between Objects)}^2}$$

This equation reveals that the force of gravity between two objects is determined by two factors: the combined masses of the objects (multiplied by one another) as well as the distance between the objects. The greater the combined mass, the greater the gravitational force. The greater the distance between the objects, the weaker the force. The forces weaken by the distance squared; this is known as the inverse-square law.

For example, the sun's gravitational pull is greater than the moon's pull, as the sun is much larger than the moon. However, the sun's pull on earth weakens more, because it is much further away from earth than the moon is. But because it is significantly larger, the sun's pull on the earth is stronger than the moon's.

The question is, can the Existence Framework's model for gravitational force be expressed though Newton's equation? Yes it can. First, the framework's model conforms to the inverse-square law, because time-strings that emanate outward from a particle's void resemble the field lines typically used to describe a gravitational field, which diminish in an inverse-square manner. In regions of close proximity to a particle, the strings are packed close to one another. As the strings extend further outward, there is more space between them, so they are packed less densely. Fewer strings pulling inward toward the particle means less gravitational pull. Therefore, the time-strings being pulled into the particle are more densely packed in regions of close proximity to the particle, and packed less densely in regions further away from a particle. The greater the density of strings pulling in, the greater the gravitational pull. The change in density of the strings is proportional to the surface of an expanding sphere: the more the sphere expands, the greater its surface area. The equation for a sphere's surface area is:

$$\text{Surface Area} = 4\pi r^2$$

In Newton's equation, r is the radius of a sphere which encapsulates the two objects; in other words, r is equivalent to the distance between the two objects. In the framework, time-string density is proportional to this sphere's surface area; therefore, just as in Newton's equation, the distance between objects must be squared and divided into the objects' masses, thus r^2 is placed in the denominator of the gravitational equation.

In the framework's model, the objects' masses are placed in the numerator (just as in Newton's equation) for the following reason: The greater the mass of an object, the more atoms and particles comprising those atoms are within the object, and the more

particles there are, the more voids there are into which space-time will flow; and greater space-time flow results in a stronger gravitational force.

The force caused by the objects' masses are multiplied by each and not added to each other for the following reason: Each particle radiates time-strings that are pulling into its void. These strings potentially pull on the space surrounding the other object's particles. For example, consider two simple objects, each comprised of only three particles. Each particle in object A will connect with and pull on the three particles of object B. Each particle in object B will also connect with and pull on the three particles of object A. As there are three particles in object A and three particles in object B, there are a total of 3 x 3 = 9 combinations. Thus the objects' masses are multiplied by each other, just as in Newton's equation.

The objects do not move toward one another at a constant speed, but actually accelerate toward one another. This is because as they move closer to one another the density of the pulling time-strings increases. More pulling time-strings means an increase in speed in their motion toward one another, and increasing speed is acceleration.

The remaining portion of Newton's equation that needs to be examined in relation to the Existence Framework is the gravitational constant. Neither Newton nor Einstein offered explanations regarding the underlying mechanisms responsible for this constant. Because the Existence Framework proposes an underlying substratum to space and time, it is able to offer the following explanation.

The gravitational constant can be expressed in varying ways, using various units of measurement, but to understand the underlying space-time dynamics of this constant it is best to express it in Planck units:

$$G = \frac{PlanckLength^3}{PlanckMass * PlanckTime^2}$$

As we have seen, the Existence Framework defines Planck length as the shortest possible length of space, which is the distance between two existence particles in a time-string. Planck time is the shortest possible duration of time, that is, the amount of time in which an existence particle resides in a state of existence before vanishing. Thus, according to the framework, Planck length and Planck time have underlying physical aspects. What about the remaining term, Planck mass? What phenomena does it refer to?

Planck mass is puzzling in that the other Planck terms, such as Planck length and Planck time, correspond to quantum-level phenomena by representing the smallest possible measurements of space and time. Planck mass, on the other hand, is actually enormous in comparison, something akin to the weight of a flea's egg, orders of

magnitude too large to be considered a phenomenon on the quantum scale. Planck mass does, however, have meaning in physics: If an object of 1 Planck mass is reduced in size to a point particle (1 Planck length radius), a black hole will form. A point particle is a particle of the smallest possible size, its radius equal to 1 Planck length. Thus, if 1 Planck mass object is squeezed into the space of 1 Planck length, a black hole forms. Because no such black holes have ever been detected, Planck mass is not considered to reflect a natural phenomenon, but is only considered to be a term used in equations. As we will later see, the Existence Framework offers a possible natural phenomenon for Planck mass.

To understand what that phenomenon might be, it is first necessary to understand the role of the gravitational constant in Newton's equation. To do so, it is necessary to parse the gravitational constant's terms. The first term is the speed of light:

$$\text{Speed of Light} = \frac{PlanckLength}{PlanckTime}$$

Substituting in the speed of light and the other gravitational constant terms into Newton's equation we get:

$$Force = \frac{(Mass_1 * Mass_2) * PlanckLength^2}{PlanckMass * (\text{Distance Between Masses})^2 * PlanckTime} * SpeedOfLight$$

Rearranging the equation by combining like terms results in the following:

$$Force = \frac{Mass_1 * Mass_2}{PlanckMass} * \frac{PlanckLength^2}{\text{Distance Between Masses}^2} * \frac{SpeedOfLight}{PlanckTime}$$

Expressing the equation by combining like terms sheds light on the gravitational constant's role; it is to establish a ratio between the objects' combined masses and Planck mass, as well as a ratio between Planck length and the distance between the objects, and then multiply those results by the speed of light to derive an amount of acceleration.

If the combined masses were equal to a single Planck mass, and the distance between them was a single Planck length, then the two terms would reduce to a single point particle, the smallest possible particle, and the gravitational force would be at its maximum, forming a black hole. Thus the ratios are a comparison between a maximum gravitational system and the actual gravitational force resulting from the objects'

masses and distance between the two objects. In other words, the equation determines what fraction of maximum gravity is generated.

As nothing can move faster than the speed of light, the final term in the equation is maximum acceleration:

$$\frac{\text{Speed of Light}}{\text{Planck Time}}$$

Therefore, the gravitational constant represents maximum gravitational force resulting in maximum acceleration. Newton's equation establishes what fraction of maximum gravity the objects' combined masses and distance between them generate. At maximum gravity, objects will accelerate toward each other at maximum acceleration, the speed of light. This is what happens at the boundary (event horizon) of a black hole; objects are pulled in at the speed of light, and the force is so great that nothing can escape the black hole, not even light.

As was stated, even though Planck mass appears in the gravitational constant's definition, as well as in many other equations of physics, physicists do not consider Planck mass to be based upon a corresponding natural phenomenon. Why not? One of the principles used in constructing the Existence Framework is to assume that all of the major constants have an underlying phenomenon, and this includes Planck mass.

The framework proposes that the Planck mass's underlying phenomenon is associated with the voids existing inside of particles such as electrons and quarks. According to the framework, these particles are not point particles, but are actually complex systems of space-time and energy. Voids inside of these particles are essentially black holes, and they "generate" a gravitational force equivalent to one point particle weighing one Planck mass. Thus, a void inside of particles such as an electron generates maximum gravity.

The suggestion that black holes occur inside of particles such as electrons may seem absurd, as it stands in stark contrast to what is observed; an electron's gravitational pull is not only weaker than a black hole, it is actually insignificant—many, many orders of magnitude less than what a point particle's black hole would generate. Based on this observation, it would appear that black holes inside of particles is impossible. However, the framework offers a solution. According to the framework, electrons also contain a captured photon, and photons generate space-time. (This is discussed later in the section on Photons, Electrons and Quantum Mechanics.), It is the photon's space-time which flows into an electron's void. Almost all of the space-time flowing into its void is drawn from the space-time generated by the captured photon, and only a tiny fraction of space-time flows in from beyond an electron's cloud. Because only a small amount of space-time flows in from outside of a particle, a particle's observed gravitational force is extremely weak. Therefore, although it is not observed, Planck mass exists inside of electrons and quarks.

Because the gravitational field inside such a particle is near maximum force, just like a black hole, a captured photon cannot escape.

Therefore, the Existence Framework's explanation regarding Planck mass and the gravitational constant, and its model for gravity, can be expressed through Newton's equation.

Equivalence Between Space-Time Variation and Space-Time Warping

Newton's equation for gravity is extremely accurate, precise enough to be used to calculate trajectories for space missions. However, it is not as exact as Einstein's general relativity equations for gravity. Therefore, in order to determine if the Existence Framework's model for gravity is correct, it must not only conform to Newton's equations, but it must also conform to those of general relativity. In particular, it must be shown that the Existence Framework's explanations are in accord with relativity's notion that gravity results from warping of space-time.

While work by physicists is needed to develop equations that describe the effects produced by space-time flow and then compare them to general relativity, even without the equations, there are aspects of the Existence Framework's space-time flow that appear to conform with relativity's space-time warping.

Space-time flow produces several effects. First, it increases the density of space-time surrounding objects of mass, and this effect causes time dilation. Second, it tugs on the space-time surrounding objects, in essence warping it. And three, it produces the gravitational effect. In essence, these effects produce the same effect as general relativity.

As strings of space-time flow into voids inside of particles, they also tug on the other non-flowing space-time strings surrounding the particle. This tugging warps the surrounding space-time. The closer the space-time is to a particle, the more warping there is; there is less warping in regions further from a particle. This is due to the inverse-square law; there are proportionally fewer space-time flowing strings in more distant regions.

In addition to space-time warping resulting from tugging by space-time flow, the flow also creates variations in space-time density. There is greater density in regions surrounding particles of mass, and less density in regions further away; the density is proportional to distance via the inverse-square law. As was discussed earlier, variations in space-time density also result in variations in the relative elapsing of time. Because a photon traveling along a time-string in a denser region of space must traverse more existence particles than a photon traversing a string in a less dense region, it takes

longer for that photon to traverse the same distance. The result is that clocks will run slower—time will slow down in denser regions.

An animation demonstrating the equivalence between variations in space-time density and space-time warping can be viewed at this webpage.

Photons, Electrons and Quantum Mechanics

In addition to a theory of quantum gravity, the Existence Framework also proposes new insights into quantum mechanics. These insights arise from the assumption that there are underlying, internal aspects to what was previously considered point-particles, such as electrons and photons. It is proposed that these particles actually have complex internal systems.

Particles carry associated forces. In addition to the force of gravity there are the three other major forces of nature, and these are governed by the laws of quantum mechanics. These forces include: the electromagnetic, strong, and weak forces. This discussion focuses on the electromagnetic force.

According to quantum mechanics, electromagnetic energy is quantized; it exists in discrete, quantum packages referred to as photons. In order to determine the nature of photons and electrons and associated quantum mechanical phenomena, the equivalence, hierarchical, and simple underlying dynamic principles are once again employed.

The first phenomenon explored is the perplexing dual nature of light (electromagnetic energy). The double-slit experiment revealed that light behaves as both waves of energy and like particles (photons). Why is this? It remains one of the mysteries of physics. The Existence Framework again looks for a simple underlying explanation, and it suggests that photons are indeed particles (comprised of compressed space-time), and that these particles possess internal mechanisms that emit waves of electromagnetic energy. These waves are actually fluctuations in space-time density. Furthermore, because a photon travels through this fluctuating space-time, its path is affected. Although a photon travels straight through space, the path in space through which it travels oscillates. These oscillations in space-time cause photons to travel in a wave-like manner. Thus light acts as both a wave and a particle.

Another phenomenon explored is Einstein's photoelectric effect which explains what happens when a photon strikes an electron; the photon is absorbed and the electron's energy level increases. Likewise, when an electron's energy level decreases, a photon is emitted. The prevailing understanding is that although a photon is the carrier of energy, photons in the form of particles do not enter into and reside within electrons after being absorbed. Rather, the current understanding is that a photon's energy simply gets absorbed. The Existence Framework proposes an alternative explanation:

Electrons are not point particles, but instead are complex systems which include captured photons, circulating around an electron's void. Thus encapsulated photons maintain their particle nature while absorbed inside electrons.

Einstein's photoelectric effect led to his equation $E=MC^2$, which establishes an equivalence between matter and energy. The framework extends this equivalence by applying the hierarchical principle, which assumes that matter is comprised of energy. In the case of an electron, its mass is largely derived from the energy of encapsulated photons.

Another examined phenomenon is the collision of an electron with a positron (an anti-matter electron). Upon collision, these particles vanish and two photons are emitted, traveling in opposite directions. To explain this phenomenon, the framework proposes the following underlying dynamic: The electron's and positron's voids consume one another, and their voids are filled in with space-time. A gravity wave is generated, and each of the electron's photons is released in opposite directions from one another.

What exactly is a photon, and what are its internal dynamics? A framework photon is a complex system of oscillating, flowing space-time. At the core of a photon lies an oscillating void. Whereas an electron's void only consumes space-time, a photon's void pulsates; space-time flows out, and then space-time flows back in. This pulsating flow of space-time serves as the basis for electromagnetic energy.

The difference between a photon's dynamics and an electron's is due to the difference in the structural makeup of the two particles and the types of voids residing within each. An electron possesses a positive void, and it consumes space-time. A photon possesses a negative void, which both generates and consumes space-time. Furthermore, an electron's void is surrounded by space-time; a photon, on the other hand, is just a single point of space-time, a space-point. In a space-time matrix, a space-point serves as a junction between time-strings; it has no length. Therefore, an electron has volume, and a photon has no volume.

A photon is a space-point that is disconnected from a space-time matrix. Photons constantly move along time-strings; they are never still. A photon moves by attaching to a time-string's existence particles, one particle each moment. During one Planck moment, a photon moves from one existence particle to the next particle in a string; thus it moves the distance of one Planck length per Planck moment, which is the speed of light. As it moves it spins on its axis.

Although a photon contains a void, it is a negative void. In a negative void, it is possible for new existence particles to emerge. This stands in contrast to an electron's positive void, which is surrounded by a space-time matrix; no new existence particles can emerge in an electron's positive void. A photon's void is surrounded by negative space-time, space-time internal to a space-point, but which is totally disconnected from the

space-time matrix forming the universe. A photon's internal space-time exists in a separate dimension.

The production rate of newly emerging existence particles is dependent upon the size of a photon's void. When a photon's void is relatively empty, many new existence particles have "room" to emerge. As they emerge, the particles bond with one another to form moments of time. Moments then unite to form time-strings, and time-strings connect to form space-time. As the void "fills up" with space-time, there is less "room" for new existence particles to emerge, and thus the production rate of newly emerging particles decreases.

The rate of newly formed existence particles is at its highest when a void is mostly empty, and it is at its lowest when the void is mostly filled. When a void is filled to its maximum, few new particles can emerge. Those time-strings which are adjacent to the void begin to shorten, just as time-strings attached to an electron's void shorten. The result is that the newly created space-time within the void begins to vanish. It continues to vanish until the void is once again mostly empty. Then the void begins to fill up again with newly emerging existence particles that form new time-strings and space-time. This process repeats, creating oscillations.

Some of the newly formed space-time extends beyond a photon's boundaries during the emerging phase, and enters into the space-time matrix. During the vanishing phase, this space-time flows back into the photon's void. Thus, a photon emits space-time, and then reabsorbs that space-time. It emits space-time as its voids fill up, and it reabsorbs that space-time as time-strings surrounding its void vanish. This oscillation is observed as electromagnetic energy. The emitted space-time also affects the path of the photon.

For a photon embedded within an electron, its dynamics are dramatically altered, as most of its generated space-time flows into the electron's void. An embedded photon is one which is trapped in a constant stream of space-time flowing into an electron's void. Like a black-hole, an electron's void creates a localized, extremely forceful flow of space-time from which nothing can escape, including photons (light). This flow traps a photon, causing it to circulate around the electron's void. While trapped, the embedded photon continues to generate space-time, almost all of which flows into the electron's void. Because the emitted space-time is absorbed by the electron's void, it is not reabsorbed by the photon's void.

Although most of the flow into an electron's void emanates from a captured photon, a lesser amount flows into the electron from beyond its boundary. This small flow creates the electron's gravitational force. Because the inflow is minimal, an electron's gravitational force is observed to be extremely weak in comparison to the electromagnetic force. However, within its boundary, an electron's gravitational force is maximum, equivalent to a black hole created by compressing one Planck mass to the size of one Planck length. Planck mass therefore is a real physical phenomenon; it

exists within electrons, but it is shielded by one or more embedded photons. Some of an embedded photon's generated space-time also escapes an electron's boundary, and this produces the particle's electric charge.

Electrons' Structure and Dynamics—Planck Particles and the Fine-Structure Constant

In order to determine the deeper aspects of an electron's structure and the dynamics of its captured photon, these major principles are once again employed—the principle of simple underlying dynamics, the equivalence principle, as well as the notion that constants of nature represent real physical phenomena. The principles are applied to properties known as the Compton wavelength, the Schwarzschild radius, and to the fine-structure constant.

The Compton wavelength was developed by Arthur Compton in order to explain the dynamics occurring when a photon strikes an electron. It expresses an equivalence between mass and energy. Basically, the equation converts a particle's mass into its equivalent energy via $E=MC^2$, and then the resulting energy is expressed as a length—a wavelength.

The equations representing the Compton wavelength is derived from the following:

A photon's energy is directly proportionally to its frequency as stated by Planck's equation:

$$Energy = Planck'sConstant*Frequency$$

Its frequency can be converted into its wavelength

$$Wavelength = Frequency/SpeedofLight$$

Substituting mass for energy via $E=MC^2$ yields:

$$ComptonWavelength = \frac{PlanckConstant}{Mass*SpeedofLight}$$

The Compton wavelength converts an electron into an equivalent photon, by converting its mass into energy. Compton's equations have proven accurate in determining how a photon's energy and wavelength changes after colliding with an electron. The Compton wavelength also appears in other equations of quantum mechanics.

But why should treating an electron as a photon produce the correct results? What are the underlying dynamics? Why should there be an equivalence between electrons and

photons? The answer provided by the framework is that electrons and photons are equivalent because electrons are comprised of captured photons, and the captured photon is responsible for generating an electron's energy and mass. According to the framework, Compton's wavelength is actually measuring the wavelength of a captured photon.

Another important physical construct derived from general relativity is the Schwarzschild radius. It determines how much a body of mass must be compressed in order to turn it into a black hole. For example, if the entire earth was compressed to a sphere with a radius of just 1/3 inch, it would form a black hole. When a massive star burns out and implodes, its immense gravity compresses the star to a such a small point—smaller than its Schwarzschild radius—that it forms a black hole.

The Schwarzschild radius and the Compton wavelength converge in an interesting hypothetical particle referred to as a Planck particle. Though it is hypothetical, this particle is used in certain models of the very early universe, referred to as the Planck epoch, the period just after the Big Bang, prior to the formation of other particles and matter. There are several characteristics of this hypothetical particle that make it unique. First, a Planck particle is one whose Compton wavelength is equal to its Schwarzschild radius, and it is the only particle in which this is the case. Second, the wavelength and radius are the smallest a particle can be, about a single Planck length. Third, a Planck particle possesses Planck mass, the unaccounted for constant. (See the discussion of the role of Planck mass in the gravitational constant earlier in this paper.) And fourth, such a hypothetical particle creates a tiny black hole.

In essence, the Existence Framework's model of an electron is a combination of all of the attributes of a Planck particle. As we have seen, the framework's structure for an electron consists of two components. The first component is a void, and the second component is a captured photon. These two components correspond to the two aspects of a Planck particle: its Schwarzschild radius and its Compton wavelength. The Schwarzschild radius generates a black hole, which is equivalent to an Existence Framework void, and its Compton wavelength is generated by the framework's captured photon. The framework's electron's void and its captured photon's wavelength are on the same scale as a Planck particle's, several Planck lengths in radius. In essence, a framework's electron is formed by a bonding between two Planck particles.

Although a Planck particle has Planck mass, an electron's observed mass is many orders of magnitude less than Planck mass. This is because most of the space-time flowing into the electron's void is generated by the captured photon, and thus a very limited amount of space-time flows into an electron's void from outside its boundary. Therefore, an electron has a limited amount of mass that is exposed. Likewise, the Compton wavelength of an electron is much greater than a Planck particle's wavelength, and thus has much less energy. Again, this is because most of the captured photon's energy (oscillating space-time) flows into the electron's void. The remaining space-time flows out beyond the electron's boundary in the form of

electrostatic energy. As this energy is significantly less than that of a Planck particle, its wavelength is significantly greater (There is an inverse relationship between energy and wavelength.)

What are the exact proportions of space-time flowing into an electron's void and space-time generated by a captured photon? An answer may come from one remaining, mysterious constant found in many equations of physics, one whose underlying meaning has so far eluded physicists. It is the fine-structure constant. What makes the fine-structure constant so compelling and mysterious is that it defines relationships between various, but seemingly unrelated, aspects of quantum mechanics. Some of the various relationships include: a ratio between electrostatic and electromagnetic energy, a coupling constant between electrons and photons, a ratio between electrostatic and gravitational force of the hypothetical Planck particle, and the ratio between the speed of an electron and a photon. There are also other relationships which it helps define, but these are the most pertinent to this discussion.

It is also rather odd that the fine-structure ratio is free of any units; it is not like other constants which are measurements of length, or time, or energy, or mass, but rather it is an exact number, approximately equal to 1/137. Why this number?

Once again it must noted that the Existence Framework is constructed upon the premise that constants of nature represent underlying physical dynamics. In the case of the fine-structure constant, deciphering its meaning might reveal more details of an electron's internal dynamics. This is because an Existence Framework electron has the following aspects, all of which have relationships defined by the fine-structure constant. These aspects include: gravitational and electromagnetic force, electrostatic energy, and a velocity.

Of particular interest is determining the proportion of a captured photon's generated space-time which is flowing inward into an electron's void, to the space-time flowing outward, generating an electron's electrostatic energy.

The first ratio that might provide some insight is the following:

> Given two hypothetical point-particles each of Planck mass and elementary charge, separated by any distance, α (fine-structure constant) is the ratio of their electrostatic repulsive force to their gravitational attractive force.

If a framework's electron is considered to be comprised of two Planck particles, then this ratio indicates that the gravitational flow into an electron's void is approximately 137 ($1 \div \alpha$) times greater than the space-time flowing outward, generating the electron's electrostatic force.

A second fine-structure ratio of relevance is:

> The ratio of two energies: (i) the energy needed to overcome the electrostatic repulsion between two electrons a distance of d apart, and (ii) the energy of a single photon of wavelength $\lambda = 2\pi d$.

For a captured photon, most of the space-time flows into the electron's void. The first ratio indicated that for a captured photon, approximately 136÷137 of its generated space-time flows into the electron's void. This second ratio seems to indicate that if the portion of the photon's generated space-time that escapes the electron's boundary in the form of electrostatic energy is translated into an equivalent amount of energy in terms of a photon's wavelength, then it appears that again the equivalent photon would have approximately 137 times more space-time flow than the space-time flow forming the electrostatic charge.

A third fine-structure ratio is:

> The ratio of the velocity of the electron in the first circular orbit of the Bohr model of the atom to the speed of light in a vacuum, c.

According to the framework, the path of an electron is determined by its captured photon. Photons are constantly in motion, and it is a captured photon that determines how an electron moves; the photon's motion drags the electron's void and its compressed space-time. Because a captured photon lies at the boundary of an electron, it attaches to both space-time within the electron as well as that beyond the electron's boundary. A captured photon circulates around an electron's void, and also circulates around the nucleus of an atom.

A captured photon's path does not take an electron on a constant revolution around a nucleus. Rather, the photon's path causes the electron's path to zig-zag, moving it sometimes closer and sometimes farther from the nucleus as it revolves around the electron's void. This accounts for what quantum mechanics reveals as an electron's cloud—a cloud of probability that determines how likely it is to find an electron's location within an atom. The Bohr's model of an electron's orbit is an average of probable locations at which an electron is likely to be found. It determines the orbit's radius and circumference.

The ratio of an electron's velocity within an atom to that of the speed of light is the ratio of the electron's motion as it travels around its orbit compared to its zig-zagging in and out. It is proposed that the ratio determines how much of the captured photon's motion is contributing toward an electron's orbit and how much to its zig-zagging. If all the motion was directed into its orbit, it would be traveling at the speed of light. It appears that only 1/137 of its motion is directed toward its orbit.

What is presented so far are individual bits of information regarding the fine-structure constant. Like pieces of a puzzle they need to be fit with one another to make a

complete picture. This will require more thought. The following is one possible explanation.

As a photon revolves around an electron's void, it goes through two cycles. In each cycle it emits space-time and then absorbs space-time. When it emits space-time, some of the emission flows outward beyond the electron's boundary, generating electrostatic flow, but most goes into the void. When it absorbs space-time, the electrostatic flow returns back into the photon. The point at which the flow returns into the electron is a pole. As the photon absorbs flow twice in an orbit, an electron thus has two poles; these are its magnetic poles.

The poles are aligned with the direction of an electron's motion. There is a pole in the forward and rear parts of an electron. The point at which a captured photon attaches to a time-sting is the point at which it generates maximum space-time, the high point of its oscillation. The point at which the photon is at its furthest from a time-string is the point of maximum absorption.

The ratios also suggest that there is a relationship between the electron's orbiting boundary and the speed of light.

$$Circumference = \alpha * Speed of Light$$

Redshift

Redshift presents a challenge to the Existence Framework's model of photons. Redshift is an observed increase in the wavelength of light (electromagnetic energy), emanating from distant galaxies receding from the earth at very high speeds. It is similar to the Doppler effect, which is experienced when a sound such as a police siren is heard to have a lower pitch as it moves away from an observer, compared to a higher pitch heard when it moves toward an observer. The reason the pitch changes is because the distance between the peaks of sound waves is closer to each as the source moves toward the observer, and the peaks are further apart when the source of the sound moves away from the observer.

Redshift presents a challenge because the framework proposes that electromagnetic waves are produced by oscillating photons. This is in contrast to the standard understanding that the waves originate from a source, such as stars in a distant galaxy. The challenge presented is: Why should photons reaching the earth billions of years after leaving a galaxy have a longer wavelength than what their original wavelength was?

There is a possible explanation why individual photon's oscillations should be altered by redshift. Consider the fact that a stream of light coming from any source, including distant galaxies, is comprised of multiple photons, one arriving after the other. If the

framework's model is correct, each photon will be separated from other photons in the stream by one wavelength. The photon ahead will be one wavelength in front, and the photon behind will be one wavelength behind.

Now consider what happens if the source galaxy is receding from the earth, either because of its motion or because more space is being created due to inflation of space. The distance between photons will increase. But will this cause the wavelengths to also increase? It will if the photons' frequencies synch up with one another. What would cause photons' frequencies to synchronize?

Synchronization might result from the photons' electromagnetic waves (space-time) overlapping one another. Normally, photons' emerging space-time oscillates in unison; space-time emerges from voids and then recedes back into voids. The point at which a wave from a photon enters an adjacent photon's void is the same point in time at which the wave begins to recede back into its voids. But if the distance between photons increases, it will take longer for a photon's wave to reach its adjacent photon's void. Thus it wavelength will increase and its frequency will decrease. The photon's oscillations synchronize and redshift is produced.

Structure of Space-Time

Space-time is comprised of networks of time-strings. Time-strings form networks by connecting with one another at junction points referred to as space-points. Multiple time-strings can attach to a single space-point.

Existence flows into and out from a space-point. From some of the attached time-strings, existence flows into a space-point, and through other attached time-strings existence flows out.

Time is the flow of existence through a time-string. Time flows in only one direction in a time-string, from the past, to the present, and into the future.

A space-matrix is comprised of a group of space-points linked together by connected time-strings. A single new existence particle attaching to the beginning of a time-string can maintain the existence of an entire space-matrix.

Space can move through space. The movement of a space-matrix is accomplished by outer time-strings disconnecting from a space-point of another matrix and attaching to a space-point of an adjacent matrix.

When a particle such as an electron or proton moves, its surrounding space-matrix moves with it.

The universe is comprised of an innumerable number of space-matrices.

Mass, Inertia, and Acceleration

Mass is inertia—the resistance to motion when a force is applied. When there is no force applied to an object, the object and its surrounding space-time move in unison as one compete system. This is true for large objects such as planets, stars, and even galaxies, but the process responsible for this effect occurs on a quantum level. As we have seen, according to the framework, a particle of mass is comprised of a void and a photon embedded within its highly compressed space-time. Additionally, a particle is connected to surrounding space-time flowing inward toward it. When there is no force, the particle and its connected surrounding space-time move as one unit through the space-time matrix.

When a force is applied, the situation changes. A force on a particle causes it to move against its own surrounding space-time. The links connecting the particle's compressed space-time to its surrounding flowing space-time must break free and then relink with the space-time residing in the direction of motion. Because it is the particle's highly compressed space-time that is delinking and relinking, as opposed to its surrounding less compressed space-time, the process is more complex and slower. In a sense, a particle must move against the space-time flowing into it; it must move against its own gravitational force (gravity and acceleration are equivalent). This more complex delinking and linking process is observed as inertia, the basis of mass.

Photons, on the other hand, do not experience inertia, as they simply delink from one existence particle and and relinks to the next adjacent particle in a time-string.

Black Hole Reinterpretation

The Existence Framework reinterprets the dynamics of black holes. The concept of a black hole originates from Einstein's general relativity equations. At first, black holes were dismissed as being just a mathematical side effect, not a real physical phenomenon. This viewpoint persisted for several decades until observations indicated that they might actually exist. However, certain aspects of the equations remain troubling. One major problem is the equation's result that indicates that space-time warps infinitely inside of black holes. Infinite results always indicate something is wrong.

According to the Existence Framework, infinite space-time warping does not occur within a black hole; rather black holes actually consume space-time as well as all matter and energy that passes through its event horizon. There might be intense warping surrounding a black hole, but not within it. Space-time, and everything else

vanishes inside of black holes. General relativity's result indicating infinite warping might actually reflect the vanishing of space-time.

Another theory regarding black holes concerns the conservation of information. That theory proposes that information is preserved on a black hole's event horizon. According to the framework, this would not occur, as all mass and energy entering a black hole is destroyed, and this would include all corresponding information. Thus it cannot be conserved.

Dark Matter and Dark Energy

The Existence Framework also offers alternative explanations regarding dark matter and dark energy. These will be addressed in more detail in a future paper. Some of these issues are also addressed in my book, *The Architecture of the Universe.*

Alternative Frameworks: String Theory and Loop Quantum Gravity

String Theory and Loop Quantum Gravity offer two alternative approaches to quantum gravity. Both approaches have achieved some degree of successes, but neither is considered complete. Interestingly, they each adhere to one but not all of the main principles upon which the Existence Framework was established.

For example, String Theory is based on the assumption that a unification between general relativity and quantum mechanics requires discovering the graviton, a particle which carries the force of gravity. The assumption is that whatever is responsible for gravity must reside on the same stratum as other particles which carry force, such as photons. But gravity is an attribute of space-time, and String Theory does not attempt to find an equivalence between space-time and matter-energy, and therefore does not adhere to the equivalence principle in the manner that the Existence Framework does. However, String Theory does adhere to the hierarchical principle by proposing that particles are comprised of something more fundamental—vibrating strings. It does not explain what comprises the strings.

On the other hand, Loop Quantum Gravity does adhere to the equivalence principle because it attempts to establish an equivalence between space-time, as described by general relativity, and quantum fields, as proposed in Quantum Field Theory. Quantum fields are more elementary than particles, because they comprise particles. Loop Quantum Gravity also adheres to the quantum principle; it proposes that space-time is comprised of discrete, quantum elements. However, it does not postulate that there is a more fundamental element of the universe, and thus it does not adhere to the hierarchical principle. I believe that neither theory has achieved the completeness sought because neither attempts to adhere to all of the principles, which history has shown is a requirement for a successful theory.

Some physicists suggest that String Theory and Loop Quantum Gravity describe the same phenomena from different perspectives, and that a complete theory would emerge by somehow combining the two. I also believe that String Theory and Loop Quantum Gravity demonstrate promising results, because each presents a partial solution to a complete theory. In a sense, each could be considered a partial explanation of the Existence Framework.

For example, in String Theory the fundamental composition of particles is a single vibrating string. In the Existence Framework, particles are comprised of many vibrating time-strings inside of photons. The difference between the two theories is that in String Theory there is only one string comprising a particle, whereas in the Existence Framework there is a vast number of strings per particle. In both approaches, strings are many orders of magnitude smaller than the particles they comprise. In nature, when there are orders of magnitude of difference in size, it also follows that there are orders of magnitude of difference in the number of particles. For example, there is a vast difference in size between a mole (a measurement of the number of molecules of a substance) and the size of a single molecule, and correspondingly a vast number of molecules (10^{23}) are required to make a gram-mole. Therefore, it follows that there should be a vast number of strings required to form a particle. Therefore, String Theory's notion of a particle comprised of a single string does not fit with what is normally observed in nature, whereas the Existence Framework's theory of many strings per particle does. Perhaps String Theory's equations of a single string really represent a statistical average of a vast number of Existence Framework's time-strings.

Loop Quantum Gravity asserts that gravity is caused by variations in the volume of space regions, and that the linkage between different space volumes (regions) varies over time. The notion that regions of space can vary in volume is equivalent to the Existence Framework's notion that regions of space can vary in density; as the density varies so does its volume. This notion that the linkage between volumes can vary is equivalent to the Existence Framework's notion that space can flow through space through linkage.

Therefore, Loop Quantum Gravity and String Theory might represent subsets of the Existence Framework.

The Final: Maximum Equivalence

Why is it that the most important breakthroughs in theoretical physics have apparently resulted from establishing equivalencies between previously unrelated phenomena? Is it just a coincidence, or are there some fundamental attributes of the universe that favor equivalencies? This question is most relevant, as the Existence Framework is based upon the equivalence principle.

What universal attribute might serve as the basis for equivalence? Might there be a state of maximum equivalence? Would a state of maximum equivalence be one in which nothing further could be unified? Perhaps the Existence Framework has already established a final equivalence: According to the framework, everything contained within the universe (time, space, energy, and matter) is comprised of existence particles; everything is ultimately made of the same substance. Is this a final equivalence? Perhaps, or perhaps not. In the framework there is a differentiation between existence and non-existence. Perhaps a final equivalence would be a state in which equivalence is established between existence and non-existence.

In what state would existence and non-existence be equivalent? Perhaps it is a state in which an equivalence is established between the universe and that which lies beyond it, or prior to it. If the universe springs out of non-existence, would such an equivalence reveal the dynamics that led to the Big Bang, the creation of the universe?

The concept of the Big Bang originally emerged when the equations of general relativity were applied to the moment when time equals zero, the beginning of time. At the time of the first moment, not only is time equal to zero, but the space of the universe also reduces to zero. At the beginning of time, the entire universe is reduced in size to a single point of infinite density, which is known as a singularity. In this state, not only are all of time and space equal to zero, but all of the universe's matter and energy are compressed into this single point smaller than an atom.

In the singularity, matter does not exist as we know it, and the different forces of nature are undifferentiated. Might there be a state of extreme singularity? Might there be a state in which everything that currently exists in the universe is merged in total unification? Might there be a state in which there is no differentiation, where only oneness prevails? If this state were to exist, would it not be a state of absolute equivalence?

In my book, *The Architecture of the Universe*, I consider a state of absolute equivalence. In this state, existence and non-existence are unified in oneness. It is a state in which equivalence is also established between infinity and absolute nothingness. Ultimately, I believe that it is an equivalence between the universe and God.

God, as I understand God, is a state of absolute oneness, absolute unification, devoid of any duality. God is Infinite Existence. God is absolute singularity. God is the infinite unification of everything. In this state there are no things; only oneness prevails. Everything that will ever potentially exist within the universe is part of the absolute unified oneness.

My understanding of God is based upon the cosmology of Meher Baba, a modern-day spiritual master. In his cosmology, Meher Baba describes the process of creation. Simply stated, the impulse that creates the universe is God's desire to become

conscious of himself. In order for Infinity (God) to know itself, it must contrast itself to what it is not. Because there are no other things to contrast itself to, God must conceive of and contrast itself to absolute nothingness, non-existence. As explained by Meher Baba, infinite existence conceives of absolute non-existence, and through that conception the universe springs into existence.

When God, the infinite, conceives of absolute nothingness, it endows nothingness with existence. In fact, it endows nothingness with all of the infinite's attributes, including the desire to know itself. In the second stage of the universe's creation, the creation process is replicated. Absolute nothingness attempts to know itself, and it replicates the process of contrasting itself to what it is not. Absolute nothingness contrasts itself to innumerable false (negative) nothings. As proposed in the Existence Framework, each of these negative nothings is an existence particle.

The Existence Framework proposes an additional replication of the original impulse, the process in which God contrasts its infinite existence to absolute non-existence, and it forms the framework's fundamental principle—existence from non-existence. In essence, the process of creation is replicated each moment of time. In a bonded-pair, one existence particle plays the role of Everything (existence) and the other plays the role of Nothingness (non-existence). Just as Everything bestows existence on Nothingness, an existing particle bestows existence on a non-existing particle. The existing particle vanishes while the non-existing particle enters existence. The process repeats with the now existing particle bestowing existence on the just vanished particle. This process repeats ad infinitum. As we have seen, the principle of existence from non-existence is replicated in time-strings forming space-time, and it also serves as the basis for gravity and electromagnetic energy.

According to Meher Baba, the universe evolves from the most simple state of unconscious existence to a state of full consciousness. Everything in the universe is attempting to consciously regain the state of the oneness of the original unity, in which there is no differentiation. Thus existence particles bond together to form moments of time. Moments connect to form strings of time. Strings of time connect to form space matrices. Space matrices connect to form the space of the universe. Space-time forms particles, particles unite to form atoms, atoms unite to form molecules, and molecules form the structures of life. There is a continuing attempt to create greater complexity in order to arrive at oneness.

If everything in the universe (time, space, energy, and matter) is built upon existence particles that emerged from the state of absolute unification (equivalence), and if the driving force of evolution is to regain that state of absolute unification (equivalence), then equivalence must be an intrinsic property of the universe. Therefore, because equivalence is intrinsic, it is but natural that the equivalence principle be fundamental, and that breakthroughs in physics derive from the establishment of equivalencies.

Everything is evolving in order to reunite with the state of infinite equivalence; ultimately everything is equivalent. In the state of God, existence and non-existence are merged in absolute oneness. God is a state of absolute equivalence.

Appendix 1

Time Dilation, Planck Length, and Planck Time

As we have seen, time slows down in a gravitational field. What exactly does this mean?

When discussing time, it is important to distinguish between classical time and quantum time, or what I have been referring to as Planck time. Classical time is that which can be measured by a clock, be it a grandfather clock, a digital watch, or an atomic clock. On the other hand, quantum time (Planck time) as proposed by the Existence Framework results from the oscillations of existence particles. In standard physics, Planck time is only a mathematical constant, it does not have an underlying physical phenomenon associated with it. A question arises: Do time variations associated with gravitational fields only affect classical clocks, or do they also alter the passing of Planck moments?

General relativity does not address this question, as it focuses on classical-level time, which is continuous, not discrete, and has no quantum aspects. According to relativity, time is distorted because the space-of-time (the 4th dimension) is warped by matter, creating more time-space between events. Time is stretched. Therefore, the movement through time will be slower because more time-space must be traversed.

If the alternative perspective is considered, in which time is quantized, there are two possibilities as to what “more time-space between events” means. One possibility is that as time is stretched, Planck moments elapse relatively more slowly. The other possibility is that there are relatively more Planck moments within the stretched time-space; but Planck moments elapse at the same rate as within space, which is not stretched. Whether Planck moments elapse more slowly, or whether there are more Planck moments elapsing at the same rate, classical time will be observed from the outside as passing more slowly.

The Existence Framework assumes the second possibility: On the most quantum level Planck moments are always elapsing at a constant rate. They cannot be affected by alterations to space-time, because they are more fundamental than space-time, they are the building blocks of space-time.

Likewise, Planck length does not vary; the distance between existence particles is always constant. What changes is the number of particles, the density, with a region.

There are however challenging consequences to this theory which might violate standard physics. In particular, it implies that the number of Planck moments in a second will vary according to whether the observation is performed within a gravitational field or outside of one. Likewise, the number of Planck lengths in a meter will vary. In standard physics, these Planck constants do not have meaning. However, if it were to be discovered that these assumptions are violations, it would represent a major challenge to the Existence Framework.

For example, consider an apparatus which emits a laser beam and then measures how long it takes that beam to traverse a given distance. Consider that there two are exact same apparatuses, one in space far removed from a source of gravity, and the other close to the source of gravity. Let's say the apparatus is 1 million units long and an observer in space sees that it takes a light beam 1 million units of time to travel that length.

Now consider the same apparatus is now set up near a large source of gravity. An observer inside the gravitational field will see the same results: It takes 1 million units of time for the light to traverse the 1 million units of length.

However, if an observer who is far off in space watches the beam which is close to the gravitational field, he will find that the beam takes longer to traverse the same distance than the one set up in outer space. Therefore, for him, time has slowed down within the gravitational field. If the clock is moved to the far away observer, it will be observed that the clock ran slower than the same clock in in the gravitational field. Clock on satellites have proven this to be true.

The Existence Framework's explanation is that there are more existence particles for a photon beam to traverse in the region in the gravitational field than far off in space. However, each observer measures the lengths to be the same. Therefore, there must be more existence particles within 1 million lengths when it is in a gravitational field, and fewer existence particles within the same 1 million lengths when removed from gravity. Therefore, the number of Planck units within a given length varies depending upon where it is located.

The problem is that Planck length and Planck time have specific sizes, and these are seemingly independent of location.

There are two possible solutions. Either the framework is correct and Planck length and Planck time remain constant, and what varies are measurements of lengths such as meters and feet, and measurements of time such as seconds and minutes. When time slows down, it is because there are more Planck moments to count in a second.

The other possibility is that a measurement of time, such as 1 second, always has exactly the same number of Planck moments, and that constant number is

independent of where the measurement is performed, i.e., in a gravitational field or outside of it. If this is correct, then the Existence Framework's model for time dilation will need to be reconsidered.

