

Title: The "Shadows" of four spatial dimensions.

A proposal for unifying the relativistic properties of the macroscopic universe with the quantum properties of the microscopic universe in terms of the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

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Introduction: Common sense sometimes gives a false indication of reality. As a result, "Shadows" of other truths go unnoticed.

For example, many people of the fifteenth century believed the earth was flat, even though they could see the circular shadow of the earth moving across the moon during a lunar eclipse.

However, Christopher Columbus along with many educated people of that time realized this to be an indication that the earth might be spherical.

He trusted both his intellect and his senses more than the conventional wisdom of the time and sailed to a new world of knowledge and understanding.

Abstract: Quantum mechanics and Einstein's Relativistic Theories of have been the most successful scientific theories of modern times however, attempts to unify them and define "A Theory of Everything" have been unsuccessful.

This is because there exists an incompatibility between the microscopic universe described by quantum mechanics and the macroscopic universe described by Einstein's theories regarding its physical structure.

Einstein's theories define the macroscopic universe in terms of the existence of a continuous space-time metric while quantum theories define the microscopic universe in terms of discontinuous particles. Therefore, these two theories are inherently incompatible because the physical structure of the universe cannot be both continuous and discontinuous at the same time

However, "Shadows" demonstrates the relativistic properties of space and time and the quantum properties of mass, energy, momentum and position can be explained and predicted by defining the universe in terms of four *spatial* dimensions and the existence of a continuous non-quantized form of mass. This would allow physicists to define a common unifying mechanism responsible for both the quantum properties of microscopic universe and the relativistic properties of the macroscopic universe.

Chapter one will postulate that space is composed four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter two will derive the quantum or particle properties of mass in terms of integral energies associated with a resonant "structure" formed in space by "oscillations" in a continuous non-quantized form of mass.

Chapter three will define the particle called a photon in terms of "oscillations" in a continuous non-quantized form of mass caused by a matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, Chapters two and three provide a bridge between discontinuous or particle properties of the microscopic universe to the continuous properties of the macroscopic universe in terms of a continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles had a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. Therefore, there must exist a continuous non-quantized medium to propagate the wave of the smallest possible particle. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

Time will be defined as only being a measure of the sequential ordering of the causality of an event, while the causality of gravity, momentum and the quantum properties of mass and energy will be defined in terms of the physical properties of four *spatial* dimensions. Time will then be individually linked to each coordinate plane of four-dimensional space by the mathematical and experimental observed sequential ordering of events that occur in each coordinate plane

Chapter fifteen will derive the relativistic properties of gravity, space and time in terms of a distortion in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This indicates redefining the physical structure of the universe in terms of a geometry of four *spatial* dimensions and the existence of a continuous non-quantized form of mass may enable physicists to define a common unifying mechanism responsible for both the quantum and relativistic properties of our universe.

Conclusion: "Shadows" demonstrates the power that changing one's perspective can have in helping humankind understand the mechanisms responsible for the physical laws and forces of nature.

***"I am enough of an artist to draw freely on my imagination.
Imagination is more important than knowledge. Knowledge is limited.
Imagination circles the world."
Einstein***

***"Intuitive thinkers have made many of the breakthroughs in science"
Louis de Broglie***

***"The universe's most powerful enabling tool is
not knowledge or understanding
but imagination"
Jeff***

**[The Imagineers Chronicles](#)
[A theoretical blog](#)**

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Chapter one

A Universe of Four Spatial Dimensions

Defining the properties of a universe consisting of time and four *spatial* dimensions is not possible until we have an understanding of the causality of the forces responsible for those properties.

This paper postulates a volume of space is composed of a continuous non-quantized or non-particle "field" of mass and energy and interactions between these fields and four *spatial* dimensions is responsible for the causality of the forces found in nature.

Time will be defined only as being a measure of the sequential ordering of the causality of events, then the causality of the forces of gravity, electromagnetism and the particle or quantum characteristics of mass and energy will be derived in terms of the physical properties of four *spatial* dimensions. Time will be individually linked to each coordinate plane of four *spatial* dimensions by the experimentally observed sequential ordering of events that occur in each coordinate plane.

The relativistic properties of motion, gravity and its equivalence to accelerated reference frames will be derived in Chapter fifteen in terms of the existence of a four *spatial* dimensions instead of four-dimensional space-time.

There are four forces related to the existence of a positive and negative matter and energyfield components of four *spatial* dimensions. Their interactions are responsible for the geometric structure of the universe.

The matterfield component of space defines the mass of an object while a distortion in a "surface" of a three-dimensional space manifold with respect to fourth *spatial* dimension defines its energyfield component.

Most are familiar with three out of four forces that define the geometric structure of the universe

Mass is associated with a positive matterfield component of space while electrical and gravitational forces related to the energyfield component of the geometry of four *spatial* dimensions.

However, some may not be familiar with the negative matterfield component of space. It will be shown later this field is associated with the mass component of anti-particles.

(The physical mechanism responsible for a negative matterfield component of space and the mass associated with the anti particle called the positron will be developed in Chapter twenty-one in terms of the geometry of four *spatial* dimensions.)

All the forces of nature will be derived in terms of a geometric distortion or "displacement" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

It will be shown the gravitational forces associated with mass are generated by a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The forces associated with antimatter will be derived in terms of an oppositely directed curvature in that "surface".

It will be shown that electric and magnetic forces have a common origin in terms of energy "gradients" generated in a "surface" of a three-dimensional space manifold while their attractive

and repulsive properties will be derived in terms of how it interacts with the geometry of four *spatial* dimensions.

These forces interact to produce the geometric properties of space.

However, it should be remembered these four forces are generated out of one continuous non-quantized form of mass and the geometry of four *spatial* dimensions.

In Chapter three, the wave properties of electromagnetic energy will be derived in terms of a matter wave moving at the speed of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

In Chapter two, the quantum or particle properties of a photon, mass, and energy will be derived in terms of a resonant system or "structure" formed in space by "vibrations" generated by a matter wave in a continuous non-quantized form of mass.

Therefore, Chapters two and three define a common mechanism responsible for both the particle and wave properties of mass, and energy because they are both derived in terms of a mechanism related to a resonant system or "structure" generated by a matter wave in continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the "smallest" particle must have a wave component. Therefore, the success of Louis de Broglie theory requires the existence of a continuous non-quantized form of mass/energy to support the "smallest" possible particle.)

As mentioned earlier, in Chapter three the propagation of a photon will be derived in terms of a resonant matter wave moving at the speed of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. Its energy will then be defined in terms of the Kinetic energy or $E = \frac{1}{2} m v^2$ of a continuous matterfield component of space. Where "E" equals the magnitude of the energyfield, "m" equals the magnitude of the matterfield component of a matter wave associated with a photon and "v" would equal the "velocity" of the matter wave.

Additionally Chapter fifteen will show the velocity of light is universally constant, despite the fact that it is transmitted on a physical medium consisting of a continuous non-quantized form of mass because of a relativistic property of four *spatial* dimensions.

Another physical property of the continuous non-quantized mass component of space can be illustrated by comparing it to different forms of water in the air.

Water vapor is difficult to detect with the eye because of the small size of its particles while the condensed particles of water vapor or fog become visible because they are in a form that is detectable to the human eye.

The matterfield component of space has similar properties.

In the "vapor" state, a continuous non-quantized form of mass is difficult to detect because it is not made up of particles but a continuous field. However, in a "condensed state" or a state where the resonant "structures" that defined particles in Chapter two exist, these quanta of the continuous non-quantized form of mass, (such as electron or proton) become detectable by scientific instrumentation because they are only calibrated to detect mass in its quantized or particle form.

This paper hypothesizes particles are composed of "aggregations" of a continuous non-quantized mass component of space thereby taking a form which is detectable with scientific instruments.

Mass and the gravitational forces associated with mass will be derived in Chapter twelve to be the result of a distortion, or "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension is analogous to the curvature in a space-time manifold that Einstein's General Theory of Relativity postulates is responsible for gravitational force.

In Chapter thirteen the polarity and magnitude of a positive and negative unit charge will be derived in terms of an energy gradient in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

In Chapter eight, the mass of a proton will be derived in terms of a distortion or "depression" in a "surface" of a three-dimensional space manifold with respect to the fourth "spatial" dimension.

The mass of an electron will be derived in terms of an "oppositely directed" distortion or "elevation" in a "surface" of a three-dimensional space manifold with respect to the fourth "spatial" dimension.

The "strong nuclear force" that "binds" a nucleus of an atom together can be derived in terms of the resonant "structure" that defined a particle in Chapter two.

As mentioned earlier Chapter two will derive the quantum properties of particles in terms of a resonant "structure" formed in space by "vibrations" of a continuous non-quantized form of mass.

This paper postulates the strong nuclear force is the result of the spatial separation between protons and neutrons in a nucleus becoming small enough so their resonant energies can interact to form one homogenous stable resonant "structure" composed of particles of a continuous non-quantized form of mass.

These larger stable resonant "structures" are called atomic nuclei.

The presence of a neutron in the nucleus of atoms containing more than one proton is necessary to form a stable nucleonic "structure" because the non-charged resonant system or "structure" of a neutron interacts with the charged resonant system of a proton. This increases the ratio of the attractive or binding forces of the resonant component of the nucleus with respect to the repulsive force associated with the electrical component in a nucleus allowing a stable resonant "structure" to be formed.

(The internal structure of quarks and how it relates to the stability of proton's and neutron's will be derived in Chapter nineteen in terms of an interaction between the matter and energy field components of space and the geometry of four *spatial* dimensions.)

The magnitude of the strong nuclear force is related to the size of the homogenous resonant structure associated with a nucleus.

The size or diameter of a nucleus increases as is the atomic weight increases.

Therefore, after a certain atomic weight is reached a nucleus will become physically too large for the individual resonant "structures" associated with the protons and neutron to uniformly share the energy require to maintain a stable resonant "structure" associated with that nucleus. This will result in that nucleus expelling the energy required to reduce its physical size to a point where a

stable resonant "structure" can be maintained. Therefore, any nucleus that is physically large that this will be radioactive.

Additionally, the nucleus of atoms that have an atomic weight less than the critical value for establishing homogenous resonant "structure" would increase its weight and size by "absorbing" energy from an external source if the energy were allowed to get spatially close enough to the nucleus so that it could become part of the internal resonant structure of that nucleus. This will result in increasing the size and atomic number of that nucleus.

This indicates that the effectiveness of the stronger nuclear force in absorbing or emitting a particle will be dependent on the distance from the center of the nucleus of an atom.

The exact composition of space now becomes relevant to the study.

This paper defines the physical structure of space in terms of a dynamic relationship between the geometric properties of four *spatial* dimensions and a continuous non-quantized form of mass. Therefore, a volume of space must have properties associated with mass because it is, in part, made up of mass.

Following this logic, a question is presented: Why hasn't this mass been detected?

Stepping back in history may shed light on the answer to this question.

Many people of the fifteenth century did not realize the Earth was spherical because its curvature was small compared to their scope of their vision. However, the shadow of the earth on the moon during a lunar eclipse gave them an opportunity to view the spherical shape of the earth from a distance.

Similarly, the reason we may not have detected the mass associated with a continuous non-quantized mass component of space is that its effects are small compared to our scope of "vision".

There are however, "Shadows" that give us an opportunity to "view" the properties of a continuous non-quantized mass component of space in terms of the red shift of spectral lines emanating from galaxies.

Astronomers have noted that our universe appears to be expanding. This idea is based on the shifting of the spectral lines coming from galaxies called the red shift.

One interpretation is that galaxies are moving away from the earth and the greater the distance a galaxy is from the earth the faster it is moving away.

This observation of light is similar to that of sound. The pitch of a train's whistle is lower when it is moving away and its velocity determines the difference in pitch.

Astronomers have interpreted the red shift in a similar manner.

They assume the greater the red shift in a galaxy's spectrum the faster the galaxies are moving away from the earth.

However, another explanation is possible. The frequency of spectral lines is an indication of the energy they possessed at the point it was generated. The frequency of light is also an indication of the energy it has at the point it is observed. Red light has less energy than blue light. If space were composed of a continuous non-quantized form of mass, as this paper postulates light would dissipate energy due to the "dampening" effects of its inertial properties.

Therefore, each spectral line would lose energy due to the properties of a continuous non-quantized mass component of space causing it to shift towards the red end of the spectrum.

This indicates the magnitude of the red shift may not be entirely a result of the movement of galaxies away from us.

Instead, a portion of the energy loss associated with a red shift may be a result of light interacting with a continuous non-quantized form of mass.

If space is composed of a continuous non-quantized form of mass then the assumption that the greater the distance a star is from us the faster it is moving away may not be valid.

It may be because the further light travels the more time it would have to dissipate energy to a continuous non-quantized form of mass as it traveled through space.

(A blue shift could be observed in a stars spectrum if the velocity of a star moving in our direction imparted more energy to the spectral lines than was dissipated by a continuous non-quantized mass component of space it traveled through.)

This "Tired Light" concept of the energy loss associated with the red shifting of photons by its interaction with space has been dismissed by many because no Compton scattering is observed in red shifted photons.

Compton scattering is caused by an interaction between high energy particles such as photons and electrons which results in the electron being given part of the energy (making it recoil), and a photon containing the remaining energy being emitted in a different direction from the original, so that the overall momentum of the system is conserved. If the photon still has enough energy left, the process may be repeated. This process would result in a scattering of the energy of a photon.

The reason why many astronomers believe the entire redshift of a star is the result of its movement away from an observer is that classical theory of charged particles interacting with an electromagnetic wave, cannot explain any shift in wavelength.

Therefore, if the red shift was caused by a particle interaction one should observed the **Compton scattering** of light that would be associated with a particle interaction. Since no **Compton scattering** is observed in the red shift coming from star it is assumed by many astronomers it can only be caused by the movement of an object away from an observer.

However, as will be shown in Chapter three the particle properties of a photon are the result of a resonant "system" generated by a matter wave in a continuous non-quantized form of mass moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, because a photon is made up of a matter wave in a continuous non-quantized form of mass a portion of the redshift may be the result of an interaction between the matter wave responsible for it particle properties and a continuous non-quantized form of mass.

This would mean that the assumption that the entire redshift in a star's spectrum is a result of its movement away from us might be invalid.

The Cosmological Principal that the universe should appear the same in all directions supports the hypothesis that a portion of the energy loss associated with the red shift is a result of the properties of a continuous non-quantized mass component of space.

Since the energy loss of light associated with a continuous non-quantized mass component of space would only be dependent on the distance it traveled, the universe would appear to be the same in all directions as long as one kept the observational distance constant.

In addition, there is direct observational evidence that supports the hypothesis that a volume of space contains a measurable quantity of a continuous non-quantized form of mass.

Recently it has been determined by astronomers the universe must contain large amounts of "Dark Matter" that cannot be seen directly but which we know exists because of the influence its gravitational mass has on the orbits of stars in galaxies.

However, the physical properties astronomers have observed in "Dark Matter" share the same physical properties of a continuous non-quantized form of mass. They are both composed of mass and therefore would generate gravitational energy, which would influence the orbits of stars in galaxies and because it is a continuous form of mass and it would not be detectable by modern instrumentation because they are only calibrated to detect mass in its particle form.

This strongly suggests the observed properties associated with "Dark Matter" may be the result of a continuous non-quantized mass component of space.

Later in Chapter twenty-three, an experimental technique for the direct measurement and observation of the continuous non-quantized mass component of space will be proposed.

Chapter Two

The Quantum properties of mass and energy

It has been experimentally verified that energy in itself is not quantized because a photon can have any frequency and therefore any energy greater than zero or less than infinity. Additionally, the equation defining the relationship between mass and energy, $E=mc^2$, also indicates that mass is completely convertible to one or more photons with energies greater than zero or less than infinity.

The continuous properties of the electromagnetic spectrum and mass is the basis for hypothesizing, in Chapter one that space is composed of a continuous non-quantized form of mass and four *spatial* dimensions instead of four dimensional space-time.

However, it can and will be shown the laws of classical mechanics suggest that resonant systems or "structures" would be generated in a continuous non-quantized form of mass and that they may be responsible for the quantum properties of mass and energy.

(The internal structure of quarks will be derived in Chapter nineteen in terms of an interaction between a continuous non-quantized mass component of space and the geometry of four *spatial* dimensions.)

There are four conditions required for resonance to occur in a classical environment, an object, or substance with a natural frequency, a forcing function at the same frequency as the natural frequency, the lack of a damping frequency and the ability for the substance to oscillate spatially.

In Chapter three it will be shown the wave characteristics of a photon could be explained and predicted in terms of a matterwave in a continuous non-quantized form of mass moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

However, the existence of four *spatial* dimensions would give a matterwave made up of continuous non-quantized form of mass the ability to oscillate spatially on a "surface" between a

third and fourth *spatial* dimensions thereby fulfilling one of the requirements for classical resonance to occur.

These oscillations would be caused by an event such as the decay of a subatomic particle or the shifting of an electron in an atomic orbital. This would force the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension to oscillate with the frequency associated with the energy of that event.

However, these oscillations in a continuous non-quantized form of mass caused by such an event would serve as forcing function allowing a resonant system or "structure" to be established in a continuous non-quantized form of mass. These resonant systems are known as particles.

The only way to dampen the frequency of a classically resonating system is to add or remove energy from that system which results in changing the characteristics of that system. If no energy is added or removed from a classically resonating system the characteristics of that system does not change.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

We will now derive the relative density of a continuous non-quantized form of mass in a vacuum in terms of the quantum fluctuations describe on page 169 of John A Wheeler's book, "At Home in the Universe" where he defines the fundamental length of a quantum particle to be universally constant and unchanging.

"There is only one truly fundamental length in nature a length free of all reference to the dimensions and rate of revolution of the planet on which we happen to live, free of any appeal to the complex properties of any solid or gas: free of every reference to the mysterious properties of any elementary particle: what we call today the Planck length,

$$L = (hG/C^3)^{1/2} = 1.6 \times 10^{-33} \text{ cm}$$

And what we identify with the characteristic scale of quantum fluctuations in the geometry of space".

Since the quantum fluctuations mentioned in John A Wheeler's book define the fundamental quantum component of a vacuum it can be used to define density of the continuous non-quantized mass in a vacuum.

In Chapter three the energy associated with the resonant vibrations in the continuous non-quantized form of mass responsible for the internal energy of a photon and all particles will be derived in terms of the equation $E=hf$. Where "E" equals the energy of the photon "h" is Planck's constant (6.547×10^{-27} erg sec) and "f" is the frequency of the vibrations in the continuous non-quantized form of mass.

In classical physics the internal energy of resonant system is, in part, related to the kinetic energy associated with the velocity of the mass component of that system or $1/2mv^2$.

This indicates the equation $E=hf$ defining a photon's energy could be redefined in terms of the kinetic energy of a continuous non-quantized of mass component of a photon to be equal to

$1/2mc^2=hf$, where "m" equals the magnitude of the continuous non-quantized mass component of the photon.

However, a photon's energy is moving at the velocity of "c" with respect to an observer who is measuring the length of the "standing" matter wave that was shown earlier to be responsible for the quantum fluctuations mentioned in John A Wheeler's book.

Therefore, an observer must divide the observed length of a standing matter wave of a photon by the velocity of light "c" to define the physical length of a fundamental quantum fluctuation associated with a photon in terms of Planck's length.

This indicates the equation $1/2mc^2=(h/c)*f$ would define the length of the quantum fluctuations in a continuous non-quantized form of mass and energy responsible for the energy of a photon with respect to an observer who is stationary with respect to movement of a photon through space.

However, the value of Planck's length 1.6×10^{-33} cm is the spatial length associated with Planck's constant.

Therefore the above equation can be rewritten, using the value for Planck's length and solving for "m", as $m= 2*(1.6 \times 10^{-33} \text{ cm}/c^3)f$.

The minimum possible quantum fluctuation in space would have a frequency of one.

This means the density of a continuous non-quantized form of mass in a vacuum would be $m=3.2 \times 10^{-33}$ grams/ c^3 sec or 3.2×10^{-33} grams per cubic light second or a cube that has the dimensions of the distance light travels in one second.

Chapter Three

Electromagnetism

a matter wave?

EM radiation is propagated by a matter wave in a continuous non-quantized form of mass.

Chapter one hypothesized space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

In Chapter two, the quantum properties of energy were derived in terms of classically resonating system formed by a matter wave moving on a "surface" on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This defines a common mechanism responsible for both the particle and wave properties of electromagnetic energy in terms of the existence of a continuous non-quantized form of mass and four *spatial* dimensions.

However, it can be shown that "contractions" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by a matter wave are responsible for the propagation of a photon's energy.

These "contractions" would be analogous to how a wave on the two-dimensional "surface" of water contracts or shortens the two-dimensional distance, with respect to three-dimensional space of two points on its surface.

A wave on the surface of water shorten or contracts the two-dimension distance between two water molecules on its surface with respect the distance they would be separated if there was no wave present.

Similarly a wave on the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would shorten the distance between two points on its "surface" with respect to the distance they would be separated if there was no matter wave present.

However, this means one should be able to define the kinetic energy of a photon in terms of the velocity of contractions in a three-dimensional space manifold caused by a matter wave as it moves through a continuous non-quantized form of mass if they are responsible for its energy.

As mentioned earlier, Chapter two defined the energy of all particles, including a photon, in terms of a resonant system formed by oscillations in a continuous non-quantized form of mass moving on a "surface" of a three dimensional space manifold with respect to a fourth *spatial* dimension.

The kinetic energy of all systems is defined by the equation $E=mv^2$ where "E" equals the energy of the system "m" equals its mass and "v" is the velocity of the mass in that system.

Therefore the equation $E=mc^2f$ would define the energy associated with those contractions as they move along a "surface" of a three-dimensional space manifold because their mass would be related to the frequency of the resonant system responsible for particle properties of a photon's energy.

The energy of a photon is defined by the equation $E=hf$.

Therefore, if a photon is a result of resonant system in a continuous non-quantized form of mass this equation can be rewritten as $E=mc^2f$ because it would define its energy in terms of the velocity of the mass component that system.

However, equation of $E=m*c^2*f$ defining a photon's energy will have to be modified to $E=m*c^2*(v/F)$.

This is because a photon's energy will be derived in terms of a **ratio** of a "contraction" in a length of a "surface" of a three-dimensional space manifold caused by the passage of a matter wave with respect to the length of a three-dimensional space manifold with no matter wave present.

The term (v/F) in the equation $E=m*c^2*(v/F)$ defines **the ratio** of a shortening of a length of a "surface" of a three-dimensional space manifold caused by the passage of a "standing" matter wave associated with a photon or EM radiation. This is because "v" equals the "distance" between two points on a "surface" of a three-dimensional space manifold with **NO** EM radiation traveling though it minus the distance between two points separated by one wavelength on a "surface" of a three-dimensional space manifold with a matter wave moving though it, while "F" equals the length of a three-dimensional space manifold with respect to a fourth *spatial* dimension with a matter wave of "0" frequency passing through it. Therefore, the **dimensionless** term (v/F) defines the **ratio** of the shortening of the length of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by the passage of the matter wave responsible for EM radiation.

However, before we begin our discussion regarding the "contractions" in a "surface" of a three-dimensional space manifold responsible for a photon's energy we must first define the difference between the "dynamic" and "static" component of a photon's energy.

The "dynamic" component of a photon's energy is related to its movement through on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

In Chapter twelve the magnitude of a mass will be derived in terms of a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This "curvature" shortens or "contracts" the three-dimensional distance on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension because the "chord" of the

"arc" caused by this "curvature" is shorter than the "arc" itself.

Chapter twelve indicates that the energy associated with mass that is not moving relative to an observer is, in part related to a contraction in the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension

The dynamic component of a photon's energy is a result of a contraction in the "surface" of a three-dimensional space manifold cause by a matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold. This means that a photon's energy has two components, its velocity of the resonant system associated with it particle properties and the contractions in a three-dimensional space manifold caused by a matter wave.

However, because the energy associated with the contractions in space caused by a matter wave are moving at the velocity of light therefore, one must factor it out to determine the quantity of energy contributed by them.

Earlier these discussions showed the "contractions" in a "surface" of a three-dimensional space manifold responsible for a photon's energy caused by oscillations moving at the velocity of light are defined by the equation $E=m*c(v/F)$.

However, this indicates, the energy associated with the "contraction" of a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension by a photon would be quantified by the equation $E=m*c*(v/F)$ or $E=m*c*(Mr-Mc)/F$.

The term $(Mr-Mc)/F$ in the equation $E=m*c*(Mr-Mc)/F$ defines the magnitude of a contraction in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension in terms of the frequency of a matter wave responsible for a photon's energy. This is because the term "Mr" represents the distance between two points on a three-dimensional space manifold with respect to a fourth *spatial* dimension with NO matter wave traveling through it and the term "Mc" represents the distance two points occupy on a three-dimensional space manifold with respect to a fourth *spatial* dimension with a matter wave moving through it and "F" equals the length of a three-dimensional space manifold with respect to a fourth *spatial* dimension with a matter wave of "0" frequency moving through it. Therefore, the dimensionless term (v/F) or $(Mr-Mc)/F$ defines the "shortening" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension by the passage of a matter wave responsible for EM radiation.

Earlier it was mention that Chapter twelve defined gravitational energy in terms of a "shortening" or contraction in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

However the equation of $E=m*c*(Mr-Mc)/F$ indicates that EM radiation and the energy of a photon is also the result of a "shortening" or contraction in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This provides a physical link between the quantized energy of a photon and gravitational energy because it defines both in terms of the physical properties of a continuous non-quantized form of mass and energy and four *spatial* dimensions.

One must factor in the velocity of light to final equation defining the energy of EM radiation because earlier it had to be factor out to define the energy contributed by the contraction of the three dimensional space manifold. Therefore, the final equation defining the energy of a photon is $E=m*c*c*(Mr-Mc)/F$ or $E=mc^2*(Mr-Mc)/F$

This completes the derivation of EM radiation in terms of a matter wave in a continuous non-quantized form of mass and energy moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter Four

The Photon a Particle or Wave?

Why does a photon behave at times like a particle and at other times like a wave?

The answer may be found in the how a photon's energy is transmitted through space.

Chapter three defined the propagation of electromagnetic energy in terms of a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

While Chapter two derived the particle characteristics of a photon in terms of the discrete energies associated with a resonant "system" formed in space by oscillations in a continuous non-quantized form of mass.

However, as was shown in Chapter two these oscillations in space are caused by a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, Chapters two and three define a common mechanism responsible for both the particle and wave characteristics of a photon in terms of a resonant "system" in four *spatial* dimensions.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

The photoelectric effect demonstrates one of the particle characteristics of a photon.

The photoelectric effect is the emission of electrons from matter upon the absorption of electromagnetic energy. The emission of electrons from matter is observed to begin as soon as the electromagnetic energy strikes it.

This supports the particle aspect of a photon because wave theory predicts delayed emissions of electrons. In addition, it was observed that varying the intensity of the light does not change the velocity of the electrons ejected but only their numbers.

Einstein based his quantum or particle theory of electromagnetic radiation, in part, on these photoelectric observations. He realized these observations could only be explained by assuming photons consist of discrete "packets" or quanta of energy that is dependent on their frequency.

The reason delayed emission is not observed in the photoelectric effect is because, as mentioned earlier Chapter two showed the energy of individual photons is the result of a resonant "system" caused by oscillations in a continuous non-quantized form of mass.

Therefore, the energy of a specific photon would be directly dependent on the frequency of the resonant "system" that defines its energy.

If the energy associated with a resonant "system" of a photon of a given frequency is sufficient it will instantly eject an individual electron off a photoelectric surface.

The velocity of an electron leaving a photoelectric surface is not affected by the intensity of the

light because varying its intensity will only cause an increase or decrease in the number of photons of a specific frequency striking the photoelectric surface. Since the energy of the resonant "system" associated with a photon is directly dependent on its frequency, the energy and therefore the velocity of electrons ejected off the surface of a photoelectric material by photons with identical frequencies will be identical.

However, increasing or decreasing the intensity of the light striking the photoelectric surface will increase or decrease the number of electrons ejected from the surface because the number of resonant "structures" of sufficient energy to eject electrons from the surface will increase or decrease.

Therefore, the particle characteristics of a photon associated with the photoelectric effect can be explained in terms of a resonant "system" generated by a matter wave in a continuous non-quantized form of mass.

However, light also possesses the non-particle characteristics of a wave.

Thomas Young demonstrated this in an experiment using a light source in front of a screen containing two slits. Each of the slits could be covered individually. On the other side of screen was a wall against which the light coming through the slits could shine on.

When a very dim light was shined on the screen with one hole covered, the light impacts the wall in a line between the source and hole in the screen. However, when both holes are open the light impacts the wall generating an interference pattern that is characteristic of a wave. This interference pattern is generated even when a very dim light consisting of series of single photons are allowed to pass through a screen with two slits.

Additionally when a device was used to determine which slit the individual photons passed through the interference disappeared. This indicates that act of measuring which slit a photon passes result in destroying the interference pattern.

This appears to contradict the particle characteristics of a photon because a series of individual photons can generate an interference pattern associated with a wave when passing through a screen with two slits, therefore, each individual photon, also possesses the characteristics of a wave.

The wave characteristics of individual photons is due to the fact that its energy, as was shown in Chapter three is propagated through space by a resonant "system" generated by a matter wave moving on a surface of a three dimensional space manifold with respect to a fourth spatial dimension.

When a single photon passes through a screen with a single slit, the spatial component associated with the wavelength can only be transmitted along velocity vector of the photon and the direction of the photon will not be altered. The photon will strike the screen on straight line between the source and hole in the screen.

However, a "torque" will be generated on a single photon if it is allowed to pass through one slit in a screen with two opened slits because the spatial component associated with the wavelength of its resonant "system" can simultaneously pass or be transmitted through the two spatially separated slits. This will generate a torque on the direction of a photon after passing through the slits in the screen because of the different spatial path lengths between the slits.

Because the resonant "system" of a photon is transmitted by a matter wave, the orientation of its spatial component will vary sinusoidally with respect to time. This means the direction of the "torque" and therefore the direction of the photon as it moves through the two slits will vary sinusoidally with respect to time.

Therefore, a series of single individual photons passing through a screen with two opened slits will generate an interference pattern on the screen because the torque generated by the sinusoidal varying direction of the spatial component associated with a matter wave will cause a sinusoidal variation in the direction of each photon that transverses the screen.

This is the mechanism responsible for the wave characteristics of individual photons as observed in the Thomas Young experiment.

However, when attempts are made to measure which slit a photon passed through the interference pattern disappears and it behaves like a particle.

This is because attempts to measure which slit a photon passes through changes the characteristics of the matter wave passing through that slit. Therefore, that component of the matter wave responsible for its resonant "structure" will no longer interfere with component that is passing through the other slit. This will result in the collapse of the wave function and the disappearance of the interference pattern that is observed when no attempt is made to determine which slit the photon passed through.

Therefore defining the propagation of electromagnetic energy in terms of a matter wave in a continuous non-quantized form of mass and a photon in terms of a resonant system in four spatial dimensions answers the question "Why does a photon behave at times like a particle and at other times like a wave?"

Chapter Five

Bell's Theorem and the EPR paradox

Tjipto Juwono contributed the following explanation of a 1935 paper co-authored by Einstein, Podolsky, and Rosen, which presented what has been called the EPR paradox.

"In 1935, Einstein co-authored a paper which was intended to show that Quantum Mechanics could not be a complete theory of nature. The first thing to notice is that Einstein was not trying to disprove Quantum Mechanics in any way. In fact, he was well aware of its power to predict the outcomes of various experiments. What he was trying to show was that there must be a "hidden variable" that would allow Quantum Mechanics to become a complete theory of nature

The argument begins by assuming that there are two systems, A and B (which might be two free particles), whose wave functions are known. Then, if A and B interact for a short period of time, one can determine the wave function which results after this interaction via the Schrödinger equation or some other Quantum Mechanical equation of state. Now, let us assume that A and B move far apart, so far apart that they can no longer interact in any fashion. In other words, A and B have moved outside of each other's light cones and therefore are spacelike separated.

With this situation in mind, Einstein asked the question: what happens if one makes a measurement on system A? Say, for example, one measures the momentum value for system A. Then, using the conservation of momentum and our knowledge of the system before the interaction, one can infer the momentum of system B. Thus, by making a momentum measurement of A, one can also measure the momentum of B. Recall now that A and B are spacelike separated, and thus they cannot communicate in any way. This separation means that B must have had the inferred value of momentum not only in the instant after one makes a measurement at A, but also in the few moments before the measurement was made. If, on the other hand, it were the case that the measurement at A had somehow caused B to enter into a particular momentum state, then there would need to be a way for A to signal B and tell it that a measurement took place. However, the two systems cannot communicate in any way!

If one examines the wave function at the moment just before the measurement at A is made, one finds that there is no certainty as to the momentum of B because the combined system is in a

superposition of multiple momentum eigenstates of A and B. So, even though system B must be in a definite state before the measurement at A takes place, the wave function description of this system cannot tell us what that momentum is! Therefore, since system B has a definite momentum and since Quantum Mechanics cannot predict this momentum, Quantum Mechanics must be incomplete.

In response to Einstein's argument about incompleteness of Quantum Mechanics, John Bell derived a mathematical formula that quantified what you would get if you made measurements of the superposition of the multiple momentum eigenstates of two particles. If local realism was correct, the correlation between measurements made on one of the pair and those made on its partner could not exceed a certain amount, because of each particle's limited influence.

This gave physicists the ability to test whether particles can instantly influence other particles when they are "spacelike separated" or exist in different local reality.

It can be shown the "hidden variable" that Einstein was referring to in the previous article that would "make quantum mechanics complete" may be related to the existence of a continuous non-quantized form of mass because it defines a mechanism allowing particles which are spacelike separated to share information.

Chapter one postulated that space is composed of a continuous non-quantized form of mass and four *spatial* dimensions instead of four-dimensional space-time.

Later in Chapter two, a particle was defined in terms of a resonant system or "structure" formed in space by a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter three derived the propagation of EM radiation in terms of a matter wave "moving" at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, the existence of a continuous non-quantized form of mass would "make quantum mechanics complete" because

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

However, the existence of a continuous non-quantized form of mass may also provide the "hidden variable" defining a mechanism that would allow two particles that are "spacelike separated" to communicate.

This mechanism would be analogous to how two pool balls communicate on a pool table.

The pool balls will represent the resonant "structures" in a continuous non-quantized form of mass that defined a quantum particle in Chapter two.

Pool is a game in which a ball, called a cue ball is struck and as a result, it travels on the surface of the pool table until it collides with an object ball. This collision results in the "information" regarding the cue ball's momentum to be "communicated" to the object ball. The object ball then begins to travel across the table until it collides with and "communicates" the "information" on its momentum to the next ball in line. The speed at which the "information" is "communicated"

between the cue ball and the object ball is, in part, dependent on the time required to travel the distance between the individual balls on the table.

However if the pool balls are physically contacting each other the "communication" or "information" transfer from the first to the last ball in line will be almost instantaneous because the time required for them to travel the distance between them would be minimal.

Chapter three derived the velocity of EM radiation and the information it carries in terms of a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, speed of information transfer by electromagnetic energy between two spatial separated particles made up of a resonant system defined in Chapter two would be dependent on the time required for them to travel through the space between them.

This would be analogous to the speed of "communication" or "information" transfer in the earlier example of the pool balls in that the time required for information to be transferred from the first to the last pool ball in the line was dependent on the time required for them to travel through the space between them. This is because speed of the transfer of information by EM radiation would be dependent on the time required for a continuous non-quantized form of mass to "travel the distance" required for it to interact with a continuous non-quantized form of energy.

However, both the EPR paradox and Bells theorem deal with rate at which the information regarding the momentum of particles can be communicated between different local realities.

If space were made up of a continuous non-quantized form of mass as is postulated in Chapter one each resonant "structure" that defined a particle in Chapter two would be in direct physical contact with other particles through the continuous non-quantized form of mass that makes up the space between them. Therefore, the transfer of the information related to their momentum could be almost instantaneous for the same reason as the information transfer between the pool balls in the earlier example that were physically connect or touching was almost instantaneous.

This indicates two particles may be "spacelike separated" with respect to the electromagnetic energy but not with respect to the information carried by a continuous non-quantized mass component of space.

This defines a physical mechanism explaining why Bell's theorem may provide mathematical verification for the instantaneous communication between particles that exist in different local realities in terms of the existence of a continuous non-quantized form of mass and energy.

Chapter Six

Heisenberg's uncertainty principle and four spatial dimensions

The Heisenberg uncertainty principle states that locating a particle in a small region of space makes the momentum of the particle uncertain; and conversely, that measuring the momentum of a particle precisely makes the position uncertain.

However, it can be shown the uncertainty of the position and momentum of a particle is physically related to the internal structure of the resonant system that defines a particle in Chapter two.

Chapter one postulated a volume of space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

In Chapter two, a particle was defined in terms of a resonant system or "structure" formed in space

by a matter wave in a continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles had a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

This indicates the momentum of a specific particle would be related to the quantity of a continuous non-quantized form of mass contained in its resonant structure while its position would be related to where in space that resonant structure is located.

The uncertainty involved in simultaneously measuring both the momentum and position of a particle is related to fact that its mass and position are disturbed throughout the volume of space associated with the wavelength of its resonant structure.

Therefore, there is an inherent uncertainty in one's ability to measure the exact the position of a particle because it can be anywhere in the volume of space occupied by its resonant structure.

Similarly, there is an inherent uncertainty in the ability to measure the exact the momentum of a particle because the quantity of mass in a particle at each point in space will vary according to where it is measured with respect to the matter wave responsible for generating it.

The accuracy of a measurement is determined by how much of the measurement parameter is accessed. For example, one must access more of the mass component of the matter wave responsible for the momentum of a particle as he or she increase the accuracy of the measurement of its momentum.

However, this means a portion of the energy of the matter wave responsible for the "position" of a particle will not be available to define its boundaries.

This is because the same matter wave responsible for a particle's momentum is also responsible for generating the resonant system responsible for a particle's boundaries. Therefore, if a portion of it is used to measure its momentum there will be less available to define its boundaries thereby causing it to occupy a bigger volume making the measurement of its position less accurate.

Similarly, one must access more of the matter wave responsible for the position of a particle as he or she increase the accuracy of the measurement of its position.

However, because the resonant system associated with a particle's position is generated by a matter wave, there will be less of the matter wave component accessible for the measurement of its momentum, thereby increasing its uncertainty.

This means the uncertainty involved in the simultaneous measurement of the position or momentum of a particle or "The Heisenberg's uncertainty principle" is due to the internal structure of a particle and the existence of a matter wave in a continuous non-quantized form of mass.

Additionally defining particle such as an electron in terms of a resonant "structure" in a continuous non-quantized form of mass as was done in Chapter two, also explains why quantum particles appear to randomly "move" or "jump" to different positions in space without ever moving though the intervening space.

An electron can "jump" from one atomic orbital to the next without going through the intervening space because the resonant "structure" associated with an electron does not move from one

atomic orbital to the next.

Instead the resonant "structure" associated with an electron collapses in its initial atomic orbital and is then reformed in a new atomic orbital. Because no resonant system is generated in the intervening space between the atomic orbital no electrons will be found there.

Defining a quantum particle in terms of resonant system formed by matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension also provides a physical mechanism responsible for probability of finding an electron at a certain position or Schrödinger's probability wave function.

This is because the position of an electron in an atomic orbital would be dependent on how the energy associated the matter wave responsible for generating its boundaries is distributed around the nucleus of an atom.

This defines a physical mechanism responsible Schrödinger's wave function in terms of a matter wave and the existence four *spatial* dimensions.

Therefore, defining a particle in terms of resonant "structure" formed by a matter wave in a continuous non-quantized form of mass allows one to define a physical mechanism responsible for Heisenberg's uncertainty principle and Schrödinger's probability wave function.

Chapter Seven

The Photon, a matterenergy wave?

It is possible to understand how and why electromagnetic radiation can have of both the particle and wave properties described by Richard P Feynman in his book "QED The Strange Theory of Light and Matter" by defining it in terms of a resonant system generated by the passage of matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension

On pages 17 thru 23 he discusses what happens when light is partially reflected by two surfaces. He demonstrates by placing two glass surfaces exactly parallel to each other one can observe how the photons of light reflected from the bottom surface interact with those reflected from the top surface. Depending on the distance between the glass surfaces he can determine, by using a photo detector, that four percent or 4 out of 100 photons reflected from the lower surface of the glass could add up to as many as 16 or none at all when they interact with the photons reflected from the upper surface of the glass.

These observations by Mr. Feynman support a wave theory of electromagnetic radiation because according to it, the energy associated with the interference of 4 photons with 4 others will result in energy variations that corresponds to the energy of 0 to 16 photons.

However, wave theory also predicts the energy variations should be continuous.

In other words, the energy of the reflected photons should be able to take on any value between 0 and the combined energies associated with 16 photons.

Unfortunately, for the wave theory of light, the energy of the reflected photons Richard Feynman observed in the above experiment only took on integral values equal to the energy of the photons that originally struck the surface of the glass. This indicates that their energy is not transmitted by a wave but by a particle of energy.

However, this apparent contraction between their wave and particle properties can be resolved if they are, as mentioned earlier is viewed in terms of a resonant "system" generated by the passage

of matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter one postulated that space is composed of four *spatial* dimensions.

In Chapter two, it was shown one can derive the particle properties of a photon in terms of a classically resonating "system" formed in space by a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension

Chapter three derived the propagation of their energy in terms of a matter wave moving at the velocity of on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(Louis de Broglie was the first to theorize that all particles had a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer.)

Therefore, Chapters two and three answers the question regarding how and why electromagnetic radiation can behave at times like a wave and at other times like a particle because it can define a common mechanism related to a matter wave moving in four *spatial* dimensions responsible for those behaviors.

The wave like interference of photons observed by Mr. Feynman would be due to the wave properties of the resonant "system" defined in Chapter two.

If the distance between the two glass surfaces in Richard Feynman's experiment is equal to half of the wavelength of the resonant "system", the interference of its wave properties will yield the energy associated with 0 photons.

If the distance between two glass surfaces is equal to its wavelength, the interference of their wave properties of will yield the energy associated with 16 photons.

However, this does not explain how and why the energy variations caused by their interference are quantized and not continuous as wave theory predicts they should.

The reason is because, as was shown in Chapters two and three they are propagated by a "standing" or resonant matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Since the energy of each photon is fixed by its resonant parameters it can only interact or interfere with the wave properties of other photons to generate other one's with those same resonant parameters.

Therefore, energy variations caused by the interference of their wave properties can only have the discrete or quantum values associated with the resonant "systems" of the those photons.

This indicates viewing a photon in terms of a resonant "system" generated by a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension can explain and predict both their particle and wave properties.

However, defining its energy in terms of a resonant property of a matter wave also makes it possible to analyze their paths between two reflective surfaces in terms of their energy amplitudes, as Richard P Feynman did in his book "QED".

In Richard Feynman's book "QED", he analyzed the process by which 4 photons are reflected from bottom surface of two pieces of glass in terms of the direction of their energy amplitudes.

When light is reflected from a single surface, the directions of energy amplitudes of the reflected photons are randomly varying with respect to photons impacting the surface. However, when photons are reflected from two surfaces the timing or direction of the energy amplitude can be synchronize between the top and bottom surfaces so they can be made to cancel or reinforce each other. As a result 4 photons reflected from the bottom surface can cause as few as 0 photons or as many as 8 photons to arrive at the top surface.

The vector properties of amplitude of a matter wave define the mechanism responsible for the synchronization of the energy amplitude of photons that Richard Feynman mentions in his book "QED".

The direction of its energy amplitude would vary sinusoidally with respect to distance. This means that it would be possible to synchronize the direction and amplitude of it between the top and bottom reflective surfaces so that as few as 0 photons or as many as 8 photons to arrive at the top surface.

When the directional amplitudes of the 4 photons reflected from the top surface are opposite to those that are impacting the bottom surface, they will cancel and no photons reflected from the bottom surface will arrive at the top surface. When the directional amplitudes of the ones reflected from the bottom surface are the same as to those that are impacting the bottom surface, they will add and 8 photons reflected from the bottom surface will arrive at the top surface.

Therefore, defining a photon in terms of a matter wave in a continuous non-quantized mass component of space defines a mechanism that allowed Mr. Richard Feynman to analyze the process by which 4 photons are reflected from two surfaces in terms of the direction of their energy amplitudes.

Chapter Eight

The relative masses of the Proton and Electron in terms of Four Spatial Dimensions

Why do a proton and an electron have different masses even though the absolute magnitude of their charge is the same?

The answer to this question can be found in terms of gradients in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by the charges of the proton and electron.

Chapter one postulated space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter two, showed the particle properties of a proton and electron are derivable in terms of classically resonating system formed by a matter wave in a continuous non-quantized form of mass.

Chapter ten will show that a curvature or gradient in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension is responsible for all forms of energy.

This curvature is analogous to the space-time curvature The General Theory of Relativity hypothesized is responsible for gravitational energy.

It differs in the fact that defining energy in terms of four *spatial* dimensions allows for a bidirectional spatial movement of a "surface" of a three-dimensional space manifold where as defining it in terms of four dimensional space-time does not. This is because one can move in two directions up or down, forwards or backwards in a spatial dimension but in only one direction,

forward in a time dimension.

Chapter thirteen will derive the polarity and absolute magnitude of the unit charge of a proton and electron in terms a bidirectional movement of a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The positive charge of a proton and will be derived in terms of "downward" movement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. While the negative the charge of an electron will be derived in terms of oppositely directed "upward" movement in that surface.

The mechanism responsible for generating this movement will be defined in Chapter twelve. It will be shown that when energy is released by the conversion of mass to energy, it "expands" towards a fourth *spatial* dimension. This would result in the movement of the "surface" of the three-dimensional space manifold where that mass is located with respect to a fourth *spatial* dimension. An oppositely directed movement would occur when energy is converted to mass in particle accelerators.

The effects the energy associated with these movements have on the density of continuous non-quantized mass of the resonant systems that defined a proton and electron in Chapter Two are analogous to the effects high and low pressure areas in the earth's atmosphere have on density of air molecules.

In a high-pressure area, the energy of air molecules is directed downward towards the surface of the earth. This results in the density of the air molecules at the apex of a high-pressure area to be greater than the density of the air molecules in the volume of air adjacent to the apex of a high-pressure area.

Conversely, in a low-pressure area the energy of the air molecules is directed upward away from the surface of the earth. This result in the density of the air molecules at the apex of a low-pressure area to be less than the density of the air molecules in the volume of air adjacent to the apex of a low-pressure area.

A similar effect would occur in space with respect to the density of a continuous non-quantized form of mass.

In a dimensional "high-energy volume" associated with the positive charge of a proton, the energy of the continuous non-quantized mass component of space would be directed "downward" with respect to a fourth *spatial* dimension, towards the "surface" of a three-dimension space manifold. This results in the density of the continuous non-quantized mass component in the resonant system of a proton to be greater relative to its density in the volume of space adjacent to it.

This is analogous to how the air molecules at the apex of a high-pressure area in the earth's atmosphere would be denser than the air molecules in the volume of air adjacent to the apex of a high-pressure area.

Conversely in a dimensional "low-energy volume" associated with the negative charge of an electron, the energy of the continuous non-quantized mass component of space would be directed "upward" with respect to a fourth *spatial* dimension, away from the "surface" of a three-dimension space manifold. This results in the density of the continuous non-quantized mass component in the resonant system of an electron to be less relative to its density in the volume of space adjacent to it.

Therefore, the density of a continuous non-quantized form of mass in the resonant of a proton will be greater than that of an electron even though the magnitude of the energy the same but oppositely directed.

This is analogous to why the density of air molecules in a high-pressure area is greater than in a low-pressure area even though the magnitude of their energy is the same but oppositely directed.

Chapter twelve will show that the mass of a particle or object is dependent on the density or concentration of a continuous non-quantized form of mass contained in the volume of that particle or object.

Therefore the relative mass of a proton will be greater than the mass of an electron even though the absolute magnitude of their charge is the same because the density of the continuous non-quantized form of mass is greater in the volume occupied by a proton than an electron.

Chapter Nine

Electrical Potential Energy and Four Spatial Dimensions

An electrical potential is caused by displacements in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter one hypothesized space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

In Chapter eight the relative masses of protons and electrons were derived in terms of the density of a continuous non-quantized form of mass contained in their volumes.

The mechanism responsible for generating these displacements will be derived in Chapter twelve. It will be shown when energy is released by the conversion of mass to energy, the "surface" of a three-dimensional space manifold "expands" towards a fourth *spatial* dimension. This results in the movement or displacement of the "surface" of the three-dimensional space manifold where that mass is located with respect to a fourth *spatial* dimension. An oppositely directed displacement would occur when energy is converted to mass in particle accelerators.

In Chapter Eight it was shown the direction of this displacement relative to a fourth *spatial* dimension affects the density of a continuous non-quantized form of mass in the volume occupied by that manifold. Therefore, one can derive the relative masses of a photon and electron in terms of their oppositely directed electrical energy, as was done in Chapter Eight because it affects the density of a continuous non-quantized mass component of space in the volumes they occupied.

However, the effects these displacements have on a spatial environment are analogous to the effects the displacement of mercury in a barometer has on its environment.

A barometer consists of a U shaped glass tube filled with mercury that has one side sealed with the air removed so the air pressure on that side of the U tube is close to zero.

The displacements in the earth's atmosphere called high or low-pressure areas cause the surface of the mercury in the open tube upward or downward with respect to the surface of the mercury in the sealed side of the tube. The direction of the energy of air molecules determines which way the mercury moves. In a high-pressure area, the mercury moves downward because the energy of the air molecules is directed downward. While in a low-pressure area the mercury moves upward relative to where it would be in a high-pressure area because the downward energy of the air molecules is less than it is in a high-pressure area.

The magnitude of the energy of a high or low-pressure area can be determined by measuring the separation in the surfaces of the two columns of mercury and calculating the energy or pressure required to cause that separation.

Chapter thirteen will derive the polarity of a unit charge in terms of how dimensional "high and low energy volumes" effects the "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

It will be shown that in a three-dimensional "high energy volume" the "surface" of a three-dimensional space manifold moves "downward" because the pressure of a continuous non-quantized form of mass is directed downward towards the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This would be analogous to how the air molecules in a high-pressure area cause the surface of mercury to move downward in a barometer.

Similarly, in three-dimensional "low energy volume" the "surface" of a three-dimensional space manifold moves "upward" with respect to where it would be in a three-dimensional high energy volume because the pressure of a continuous non-quantized form of mass is directed upward towards the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This would be analogous to how the air molecules in a low-pressure area cause the surface of mercury to move upward in a barometer with respect to where it was in a high-pressure area.

Chapter ten will demonstrate there is a direct relationship between the magnitude of a spatial "separation" between two "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension and the magnitude of the energy differential associated with that "separation".

Therefore, the relative "separation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by the "upward" or "downward" "movement" of a "surface" of a three-dimensional space manifold associated with a positive or negative charge will result in an energy differential to be developed along a "surface" of a three-dimensional space manifold.

This spatial separation between the "surfaces" of a three-dimensional space manifold is the casualty of an electrical potential.

The relative "positions" of the "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension determines the polarity of the electric potential. If one defines the energy associated with a "surface" of a three-dimensional manifold "above" another one with respect to a fourth *spatial* dimension as positive electric potential one would define the energy associated with a "surface" of a three-dimensional manifold "below" it with respect to a fourth *spatial* dimension as negative electric potential.

This completes the derivation of an electrical potential in terms of an energy gradient in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Additionally it shows an electrical potential and the relative masses of a proton and electron share a common casualty in terms displacements in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension because, as was mentioned earlier, Chapter eight derived the relative masses of a proton and electron in terms of an energy gradient in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter Ten

The boundary between a Third and Fourth Spatial Dimensions

Chapter one showed one can derive both gravitational and electrical forces in terms of a curvature or displacement in a "surface" of a three dimensional space manifold with respect to a fourth *spatial* dimension.

The reason why can be understood by comparing the affects a curvature in a "surface" of a three-dimensional space manifold have on its volume to the affect the curvature in a piece of paper has on its surface.

We will use an analogy of a two-dimensional creature living on surface of a piece of paper to illustrate why this is a valid comparison.

A two dimensional creature "living" on the surface of a piece of paper would not be aware the paper he was living on existed in a three-dimensional universe because his field of vision would be limited to the surface or length and width of the paper.

Therefore, he or she would not be aware of the existence of the dimension of height or a third *spatial* dimension because he or she could not look in the direction of a third *spatial* dimension.

As will be shown latter, the energy three-dimensional beings use to activate their senses does **NOT** travel through a fourth *spatial* dimension but only on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, similar to the two-dimensional creature, the field of vision of three-dimensional beings would be limited to the "surface" of a three-dimensional space manifold.

This means three-dimensional beings would not be aware of the existence of a fourth *spatial* dimension because they cannot "look" in the "direction" of a fourth *spatial* dimension.

But before we begin exploring a universe consisting of four *spatial* dimensions we must first have an understanding of how the individual dimensions are oriented with respect to each other.

We observe that we can move independently in any direction in three-dimensional space. This indicates that the axes of three-dimensional space are not fixed to each other but are embedded into each other.

This similar to how we can move or change the orientation of a two-dimensional plane such as the surface of a piece of paper in three-dimensional space independently with respect to each axis of three-dimensional space.

This suggests each axis of three-dimensional space may be embedded in a universe consisting of four *spatial* dimensions in a similar manner. In other words the origins of the axes of a four dimensional universe is not rigidly fix to each other but are embedded in it allowing for the independent movement of each individual axis of four *spatial* dimensions with respect to the other axis of four *spatial* dimensions. Therefore, it would be possible to orient each axes of a "surface" of a three-dimensional space manifold independently of its orientation to the axes of four *spatial* dimensions. This would be analogous to how it is possible to orient a two-dimensional surface of piece of a paper in any way we chose in three-dimensional space.

If we move a two-dimensional surface of a piece of paper through three-dimensional space by pushing on its center, its surface will develop a curvature with respect to three-dimensional space because of the drag generated by the space it is moving through. A two dimensional creature living on the "surface" of the paper would not realize the surface of the paper is curved with respect to three-dimensional space because, as mentioned earlier he or she could not "look" in that direction.

Similarly if a three-dimensional object is move through a fourth *spatial* dimension, its three-dimensional "surface" will develop a curvature due to the "drag" generated by its movement through four *spatial* dimensions. This is similar to how the surface of the paper developed a curvature due to it movement through three-dimensional space. It will be shown in Chapter fifteen why this curvature in a "surface" of a three-dimensional space manifold with respect to a fourth

spatial dimension is the causality of kinetic forces.

However, we as three-dimensional beings would not be aware the "surface" of our three-dimensional space manifold was curved with respect to a fourth *spatial* dimension because we could not look in the direction of a fourth *spatial* dimension.

We also observe that it is possible to curl a two-dimensional surface into a sphere forming a balloon in three-dimensional space because as mentioned earlier the axes of a two-dimensional surface are not fixed to the axis of three-dimensional space. Additionally we observe that we can increase or decrease the magnitude of the curvature of the "surface" of the balloon by increasing or decreasing its internal pressure.

Similarly, a "surface" of three-dimensional space manifold can be curled to form a three-dimensional "sphere" in four *spatial* dimensions because axes of the "surface" of three-dimensional space are not fixed to the axes four *spatial* dimensions. This is analogous to how a two-dimensional surface can be curled to form a three-dimensional sphere in three spatial dimensions. The force developed by this spherical curvature is responsible for gravitational forces.

Similar to the spherical surface of the balloon a curvature in a "surface" of three-dimensional sphere will contract or expand if pressure or mass is added to or removed from its center. This will result in increasing or decreasing the magnitude of the curvature in the "surface" of the three-dimensional sphere.

It will be shown in Chapter twelve that mass causes a spherical curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension and increasing or decreasing it increases or decreases the pressure on the "surface" of that manifold.

As mentioned earlier both gravitational and electrical forces can be derived in terms of a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

How and why understood by using the earlier example of the piece of paper.

As mentioned earlier the orientation of the x and y planes of a surface of a piece of paper are not fixed to the dimension of height or the vertical plain of three-dimensional space because the paper can be pick up, rotated, or distorted with respect to three-dimensional space.

This causes its surface to become distorted with respect to the z or third dimension plain. The force of gravity would then have tangential components relative to its surface because it is curved or distorted with respect to the three-dimensional forces associated with gravity.

Similarly as mentioned earlier the x, y, and z planes of three-dimensional space fixed to the axis of four-dimensional space. Therefore, a "surface" of a three-dimensional space manifold could be "curled" or distorted with respect to the axis of four-dimensional space.

The tangential component of the energy associated with a distortion in "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension is responsible for the forces of nature.

This would be analogous to how gravitational forces would be developed along a distorted surface of a piece of paper in the earlier example.

(This "curvature" or distortion in the "surface" of a three-dimensional space manifold with respect to the fourth *spatial* dimension is analogous to the space-time curvature that Einstein postulated was responsible for the force of gravity in his General Theory of Relativity.)

One might ask how the geometry of four-dimensional space can be altered from three-dimensional space to account for the forces of nature.

Chapter twelve will show when mass is converted to energy, the energy "expands" towards a fourth *spatial* dimension. This results in increasing the "pressure" on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension causing it to become distorted with respect to a "vertical" or "W" axis of the fourth *spatial* dimension.

If the "expansion" of mass to energy is directed only along one of the three axes of three-dimensional space, the "pressure" and the force this "pressure" causes will result in acceleration along that axis.

Another way of describing how objects in a third *spatial* dimension can have an effect on a fourth *spatial* dimension is by comparing the mechanism responsible for their interactions with a fourth *spatial* dimension to that of a steam engine.

In a steam engine, water expands in the form of steam from the two-dimensional surface of the water. This expanding steam generates a force that distorts the two-dimensional geometry of the surface of a piston by causing it to move with respect to vertical axis of three-dimensional space.

As mentioned earlier when mass is converted to energy, it "expands", in the form of energy, from the three-dimensional "surface" of the mass in the "direction" of a fourth *spatial* dimension. This expanding mass, in the form of energy generates a force on a "surface" of a three-dimensional causing it to "move" with respect to the "vertical" or "W" axis of the fourth *spatial* dimensional.

This is analogous to how the steam in a steam engine generates the force on the surface of the piston that results in the two-dimensional surface of a piston to move or become distorted with respect three-dimensional space.

Again, we can use the analogy of a two-dimensional creature to get a better understanding how and why the energy "contained" a three-dimensional mass can cause the forces of nature.

However instead of "living" on the surface of a piece of paper as in the earlier example, the two-dimensional creature will be "living" on the surface of water which will also be considered the surface of a piston in a steam engine.

If the water were heated to the boiling point the steam would expand towards the volume above the surface of the water putting pressure on its surface causing it to move with respect to vertical axis of three-dimensional space.

However, the two-dimensional creature living on its surface could not directly tell where the steam had originated that was causing its geometry to move with respect to three-dimensional space because, as mentioned earlier he or she could not "look" down in the direction that it was coming from.

But, if the two-dimensional creature had placed marks on the wall of the piston he or she could indirectly tell the geometry of his surface had changed by looking along the surface at those marks as the piston moved passed them.

He or she could determine the distance the surface had moved because he or she could "see" and count the marks on the wall of the piston as it passed them. Since the magnitude of the force on the surface of the piston determines the distance it would move the two-dimensional creature would then have a way of determine the total force on the surface of the piston by counting these marks.

Just as a two dimensional creature cannot look down to see the volume of water below its surface

where the steam originates from, we as three-dimensional beings cannot look "down" to see the "volume" of mass below a "surface" of a three dimensional space manifold where energy originates from.

When mass "expands" to energy it generates a force on a "surface" of a three-dimensional space manifold, which results in its "surface" "moving" with respect to a fourth *spatial* dimension.

The "separation" in the "surfaces" of two three-dimensional space manifolds with respect to a fourth *spatial* dimension caused by this movement defines the relative energy volume or "energy position" between two different volumes of three-dimensional space.

In addition, three-dimensional beings could not directly tell the "surface" of a three-dimensional space manifold had "moved" or become distorted with respect to a fourth *spatial* dimension because three-dimensional beings cannot look in the direction of a fourth *spatial* dimension.

It has been and will be demonstrated throughout this paper that all forces of nature are associated with a "curvature", distortion or a "spatial separation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. The depth or magnitude of this "curvature" determines the relative magnitude of the forces between two points in space.

Chapter Eleven

Electromagnetic energy: a matterenergy wave?

Chapter one hypothesized space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

However, Louis de Broglie was the first to theorize space may be composed of a continuous medium when in 1924 he realized that all particles including a photon have a wave component . His theories were later confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, that fact that all particles have a wave component means a continuous non-quantized medium must exist because even the smallest possible particle must have a wave component. Therefore, by definition its wave component must be made up of a continuous medium.

Chapter three derived the propagation of a electromagnetic energy in terms of a matter wave caused by oscillations in a continuous non-quantized form of mass moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

However, it did not define the electromagnetic properties of a matter wave were or how it moved across a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Maxwell was able to define electromagnetic waves in terms of alternating displacements in electrical and magnetic fields but he was unable to define what these fields are made of other than the fact that they had electromagnetic properties.

However, it can be shown electrical and magnetic properties associated with electromagnetic waves are a result of the existence of a continuous non-quantized form of mass.

(Later in Chapter fifteen it will be shown the reason the velocity electromagnetic radiation is universally constant, despite the fact that it is transmitted on a physical medium consisting of a continuous non-quantized of mass is because of a relativistic property of time and four *spatial* dimensions.)

One can understand why by comparing a block of wood floating on the surface of water to a particle or photon of electromagnetic energy on a "surface" of a three-dimensional space manifold.

(Chapter two derived the particle properties of an electromagnetic wave or a photon in terms of a resonant system formed in space by a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.)

The surface of the water will represent a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension and the mass of the wood will represent the internal properties of a continuous non-quantized form of mass.

When an energy source applies a force to one side of the block of wood, part of its surface will become depressed while part of it will become elevated with respect to the surface of the water. The buoyancy of the water would force the part of the wood that was depressed back to the surface. The momentum due to the inertia associated with the mass of the wood would cause the part that was depressed to become elevated above the surface of the water. Gravity would then force the elevated portion of the wood back to the surface of the water. The block of wood would oscillate back and forth in this manner generating a wave on the surface of the water.

Electromagnetic energy is propagated by a similar mechanism.

Chapter ten showed how a force applied to a "surface" of a three-dimensional space manifold will cause it to become either "depressed" or "elevated" with respect to a fourth *spatial* dimension. The energy associated with a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would cause the "depressed" portion back to the "surface" of that three-dimensional manifold. The momentum due to the inertial properties of a continuous non-quantized mass component of three-dimensional space will then cause that "surface" to become "elevated" with respect to a fourth *spatial* dimension above the equilibrium point. Then the energy associated with the "elevated" "surface" of a three-dimensional space manifold will cause it to return to the "surface" of that three-dimensional space manifold. This will cause the "surface" of a three-dimensional space manifold to oscillate back and forth generating a wave on the "surface" of a three-dimensional space manifold.

These alternating "elevations" and "depressions" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would cause a matter wave to move across the "surface" of a three-dimensional space manifold.

As mentioned earlier, [Chapter ten](#) derived all forms of energy or forces in terms of a distortion or "displacement" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The "displacements" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by the peaks and valleys of a matter wave moving on its "surface" would result in it becoming distorted with respect to a fourth *spatial* dimension.

The electrical component of electromagnetic energy is a result of the force associated with the "slope" of a distortion in a "surface" of a three-dimensional space manifold that is parallel to the velocity vector of the matter wave.

However, the magnetic component of electromagnetic energy is a result of the force associated with a "slope" of a distortion in a "surface" of a three-dimensional space manifold that is perpendicular to the velocity vector of the matter wave.

The reason why the electrical and magnetic components of electromagnetic energy are always 90 degrees out of phase is because the slopes associated with these distortions with respect to a fourth *spatial* dimension will always be 90 degrees out of phase with each other.

This shows the electrical and magnetic fields associated with electromagnetic waves can be interpreted as a continuous non-quantized form of mass moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter Twelve **Gravity and the** **Fourth Spatial Dimension**

Gravitational forces are caused by a curvature in a three-dimensional space manifold with respect to a fourth *spatial* dimension and **not** by a curvature in a space-time manifold as postulated by the "General Theory of Relativity".

Chapter one postulated space is composed of four *spatial* dimensions.

Chapter two defined the quantum properties of mass in terms of a resonant system generated by a matter wave moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter ten showed forces can be derived in terms of a displacement in a "surface" of a three-dimensional space manifold.

Therefore, if one can derive gravity in terms of a displacement in a "surface" of a three-dimensional space manifold one may be able to define a physical link between it and the quantum properties of mass. This is because they would share a common element in that the peaks and valleys of matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension that defined a particles energy in Chapter two also cause a displacement in that surface.

One can understand how a curvature in a three-dimensional space manifold causes gravity comparing it to a marble and rod on a surface of a rubber diaphragm.

The marble on the diaphragm will represent a particle or object on a "surface" of a three-dimensional space manifold and the rod will represent the "W" axis of a fourth ***spatial*** dimension.

(The "W" axis of a fourth *spatial* dimension was defined earlier in Chapter ten.)

If the end of the rod is orientated perpendicular to the "surface" of the diaphragm and is allowed to touch it without putting any pressure on it, the surface of the diaphragm will remain flat. The marble on the flat diaphragm would not move.

However, if pressure is applied to the rod, the "surface" of the diaphragm will become depressed and will no longer be perpendicular to the rod.

Gravitational forces will then have a tangential component along the "surface" of the rubber diaphragm. The tangential component of the gravitational force directed along the "surface" of the diaphragm will cause the marble to move towards the apex of the depression.

As mentioned earlier Chapter ten derive all forces in terms of a curvature or displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. Therefore, objects will experience a force generated by a curvature in a "surface" of three-dimensional space directed towards the apex of that curvature. This force is called gravity.

This force is analogous to the force which caused the marble to roll towards the apex of a curvature in the "surface" of the rubber diaphragm.

However, the force on the marble is a result of its displacement of a two dimensional surface with respect three-dimensional space whereas gravity is the result of a displacement of a three-dimensional volume or manifold with respect to a fourth *spatial* dimension.

Some say that is it impossible to define gravitational forces only in terms of the geometry of four *spatial* dimensions.

However, observations of our environment indicate otherwise.

We observe that we can move or change the orientation of a two-dimensional plane such as the surface of a piece of paper in three-dimensional space independently with respect to each axis of three-dimensional space.

Similarly we observe we can move or rotate three-dimensional objects independently in any direction in three-dimensional space.

This suggests each axis of three-dimensional space may be embedded in a universe consisting of four *spatial* dimensions. In other words the origins of the axes of a four dimensional universe is not rigidly fix to each other but are embedded in it allowing for the independent movement of each individual axis of four *spatial* dimensions with respect to the other axis of four *spatial* dimensions. Therefore, it would be possible to orient each axes of a "surface" of a three-dimensional space manifold independently of its orientation to the axes of four *spatial* dimensions. This would be analogous to how it is possible to orient a two-dimensional surface of piece of a paper in any way we chose in three-dimensional space.

We also observe that it is possible to curl a two-dimensional surface into a sphere forming a balloon in three-dimensional space because as mentioned earlier the axes of a two-dimensional surface are not fixed to the axis of three-dimensional space. Additionally we observe that we can increase or decrease the magnitude of the curvature of the "surface" of the balloon by increasing or decreasing its internal pressure.

Similarly, a "surface" of three-dimensional space manifold can be curled to form a three-dimensional "sphere" in four *spatial* dimensions because axes of the "surface" of three-dimensional space are not fixed to the axes four *spatial* dimensions. This is analogous to how a two-dimensional surface can be curled to forum a three-dimensional sphere in three spatial dimensions. The force developed by this spherical curvature is responsible for gravitational forces.

Similar to the spherical surface of the balloon a curvature in a "surface" of three-dimensional sphere will contract or expand if mass is added to or removed from its center. This will result in increasing or decreasing the magnitude of the curvature in the "surface" of the three-dimensional sphere.

This suggest that gravity may be a result of a spherical curvature in a "surface" of a three-dimensional space manifold with respect to a fourth spatial dimension.

Additionally it shows is possible to derive gravity in only in terms of the geometry of four *spatial* dimensions.

The difference between gravitational and electromagnetic force is related to the causality of the physical mechanism responsible for their generation.

Electromagnetic forces were defined in Chapter eleven in terms of a slope caused by the "peaks" and "valleys" of a matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth "spatial" dimension. This would cause a tangential

"movement" with respect to a "surface" of three-dimensional space of objects affected by a by the "peaks" and "valleys" of a matterenergy wave.

However, gravity is caused by a "perpendicular" force on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension by a stationary "depression" in with respect to a fourth spatial dimension. This will cause the movement of an object along a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension towards the apex of the cone generated in a "surface" of a three-dimensional space manifold.

Chapter Thirteen

The relative mass of a Unit Electric Charge

Chapter one postulated space is composed of a continuous non-quantized form of mass and four *spatial* dimensions instead of four-dimensional space-time.

Chapter two derived the properties of all particles including the proton and electron in terms of a resonant system formed in a continuous non-quantized form of mass.

Chapter nine defined the electrical potential of the unit positive or negative charge of a proton and electron in terms of displacements in a "surface" of a three-dimensional space manifold space manifold with respect to a fourth spatial dimension. Additionally it showed the polarity of a charge is determine by the direction of the displacement with respect to a fourth *spatial* dimension in a "surface" of a three-dimensional manifold.

However this means the absolute magnitude of the "displacements" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension will be identical because the absolute value of the energy of unit charges are identical.

The mechanism responsible for generating a "displacement" in "surfaces" of a three-dimensional space manifold was define in Chapter twelve where it was shown that the energy released when mass is converted to energy, "expands" "towards" a fourth *spatial* dimension. This results in the formation of pressure "gradients" on a "surface" of a three-dimensional space manifold that have similarities to the pressure gradients associated with high and low pressure areas on the earth's surface.

In a high-pressure area, the energy of air molecules is directed downward towards the surface of the earth. This results in the density of the air molecules at the apex of a high-pressure area to be greater than the density of the air molecules in the volume of air adjacent to the apex of a high-pressure area.

Conversely, in a low-pressure area the energy of the air molecules is directed upward away from the surface of the earth. This result in the density of the air molecules at the apex of a low-pressure area to be less than the density of the air molecules in the volume of air adjacent to the apex of a low-pressure area.

However, the same effects would occur in the continuous non-quantized mass component of space that define the resonant system and the mass a proton and electron in Chapter two.

In other words, the mass of a proton could be interpreted as being the result downward movement of a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This would result in the density of the continuous non-quantized mass component of space to be relatively denser with respect to what it would be if that "surface" had moved in an upward direction with respect to a fourth *spatial* dimension.

While the mass of an electron could be defined as being the result of an upward movement of a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This would result in the density of a continuous non-quantized mass component of space to be relatively less dense with respect to what it would be if that "surface" had moved in a downward direction with respect to a fourth *spatial* dimension.

Since as mentioned earlier Chapter two derived a particle in terms of a resonant system in a continuous non-quantized form of mass, a proton should be relatively more massive than an electron because the density of its non-quantized mass component would be greater than that of an electron even though the absolute magnitude of the displacements in a "surface" of a three-dimensional space manifold is the same.

Therefore, the mass of a proton will be greater than the mass of an electron because the oppositely directed displacements in a "surface" of a three-dimensional space manifold associated with their unit charges results in the density of the continuous non-quantized mass component of a proton to be greater than that of an electron's.

This completes the explanation of why the relative masses of a proton and electron are different despite the fact that the absolute value of their charge.

This cannot be done in terms of a universe consisting of four dimensional space-time because time can only move or be displaced in one direction forward while a spatial dimension can be displaced in two, up and down or backwards and forwards.

Chapter Fourteen

The Link between Gravitational and Electrical forces

Richard Feynman on pages 24 and 25 of his book "The Character of Physical Laws" indicates both gravitational and electrical forces share a common relationship with respect to the inverse square law.

"The inverse square law appears again in the electrical laws, for instance, Electricity also exerts forces inversely as the square of the distance, this time between charges, and one thinks perhaps that the inverse square of distance has some deep significance. No one has ever succeeded in making electricity and gravity different aspects of the same thing."

Later he talks about the ratio of gravitational attraction to electrical repulsions:

"The ratio of the gravitational attraction to electrical repulsions is given by a number with 42 digits trailing off. (The exact number was given in a diagram as Gravitation attraction / Electrical repulsion = $1/(417 \times 10^{42})$) Now therein lies a very deep mystery. Where could such a tremendous number come from? If you ever had a theory, from which both of these things are to come how could they come in such disproportion? What equation has a solution which has for two kinds of forces an attraction and repulsion with that fantastic ratio."

One may be able to derive an equation defining this fantastic ratio if one views space, as we have done in terms of the existence of a continuous non-quantized form of mass and four *spatial* dimension instead of four dimensional space-time.

Chapter one postulated space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter twelve derived gravitational forces in terms of the quantity of a continuous non-quantized form of mass contained a curvature or displacement in a "surface" of a three-dimensional space manifold with respect to a fourth "spatial" dimension.

(This curvature is analogous to the space-time curvature Einstein postulated is responsible for the force of gravity.)

Chapter nine derived electrical forces and their polarity in terms of the "slope" of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension between two particles. It was shown the displacement associated with a positive charge was oppositely directed with respect to a negative.

This indicates "electricity and gravity (are) different aspects" of a displacement in "surface" of a three-dimensional space manifold and why as Richard Feynman points out they share common relationship with respect to the inverse square law.

Chapter two defined the physical relationship between a continuous non-quantized form of mass and the electrical energy of a particle in terms in terms of the equation $E=mc^2$ and a resonant system made up of a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. Where "E" equals the magnitude of a displacement in four-dimensional space "m" equals the magnitude of the continuous non-quantized form of mass associated with that displacement and "c" equals the speed of light.

However, this also defines the reason why "The ratio of the gravitational attraction to electrical repulsions is given by a number with 42 digits trailing off" because Chapters two, twelve and nine defined the relationship between the magnitude of a particles mass and electrical forces in terms of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

If this is true, one should be able derive an equation that will define "The ratio of the gravitational attraction to electrical repulsions" in terms of four *spatial* dimensions and the equation $E=mc^2$.

Solving the equation $E=m*c^2$ for "m" or the continuous non-quantized form of mass responsible for gravitation forces gives $m=E/c^2$.

The law of gravitation states that $F=g*m*m/r^2$.

Substituting the equation that defines the magnitude of a continuous non-quantized form of mass in terms of the electrical energy of associated with that mass or E/c^2 into the equation that defines the law of gravitation $F=g*m*m/r^2$ gives $F=(E/c^2)^2/r^2$.

Since, as mentioned earlier the quantity of a continuous non-quantized form of mass in a "depression" in a "surface" of a three-dimensional space manifold is responsible for gravitational forces and the slope in the "surface" of a three-dimensional space manifold is responsible for electrical energy, the equation $F=(E/c^2)^2/r^2$ would define the ratio of the magnitude of gravitation force to the magnitude of the electrical energy associated with that continuous non-quantized form of mass.

Using 9.0×10^{10} cm/sec for the speed of light (c) squared and substituting we obtain $F=E/(9.0 \times 10^{10})^2/r^2$ or $F=E/(8.1 \times 10^{41})$.

The value of $1/(8.1 \times 10^{41})$ represents the value of the ratio of "Gravitation attraction / Electrical repulsion" Richard Feynman was referring to in the earlier quote from his book "The Character of Physical Laws" because it numerically defines the ratio of gravitational energy to electrical energy.

The result of $1/8.1 \times 10^{41}$ differs from the experimental value of $1/(417 \times 10^{42})$ because some

of the gravitational and electrical energy of particles is physical dissipated in deformation of a continuous non-quantized mass component of space that exists between all charged particles.

Therefore, it appears one can solve the "very deep mystery" as to why the inverse square law can be applied to both gravitational and electric forces by "making electricity and gravity different aspects" if one assumes they are both caused by a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This assumption also allows one to answer Mr. Feynman's question as to "how could they (gravitational and electrical forces) come in such disproportion".

Chapter Fifteen **The "Relativity" of** **Four Spatial Dimensions**

Einstein's "Theory of Relativity" has been one of the most successful theories in the history of modern science.

It has had remarkable success in explaining and predicting the causality of gravitational forces and the experimentally observed time dilation and mass increase associated with velocities based primarily on the consistency of the velocity of light.

However, it has also had some remarkable failures in that it has been unable to define a mechanism that can simultaneously explain or predict both the quantum properties of mass and the relativistic properties of space and time.

This paper has and will show that it is possible to explain and predict both the relativistic properties of space, time and the quantum properties of mass and energy in terms of a common mechanism with respect to the geometry of four *spatial* dimensions.

Chapter one postulated that space was composed of four *spatial* dimensions.

Chapter two showed how and why the quantum characteristics of mass could be explained and predicted in terms of a resonant "structure" formed by a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth spatial dimension.

This chapter will show how and why the relativistic properties of space, time, and mass can be explained and predicted in terms of four *spatial* dimensions.

Time is defined only as being a measure of the sequential ordering of the causality of an event and will be linked to each coordinate plane of four-dimensional space by the mathematical and experimentally observed sequential ordering of events that occur in each coordinate plane. It will be shown the geometric properties of four *spatial* dimensions is responsible for time dilation.

Chapter twelve defined gravitational energy and mass in terms of a curvature or displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. The magnitude of the "rest" mass of an object was derived in terms of the magnitude of a curvature or displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(The curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension this paper postulates is responsible for gravitation force would be analogous to the space-time curvature the "General Theory of Relativity" postulates is responsible for gravitational forces.)

Chapter ten showed a "displacement" in a "surface" of a three-dimensional space manifold with

respect to a fourth "spatial" dimension is responsible for all forces and that the magnitude of a displacement in a "surface" of a three-dimensional space manifold determines the magnitude of the force of a system.

Therefore, if the rest mass object is related to a "displacement" in a "surface of a three-dimensional space manifold one should be able define the mass associated with kinetic energy of velocity in terms of a oppositely directed displacement with respect to a fourth *spatial* dimension in that surface.

There is observation evidence to support this conclusion. For example, the kinetic energy of the mass of an orbiting satellite opposes the gravitational energy of the mass it is orbiting.

However, this means that the total displacement of a "surface" of a three-dimensional space manifold caused by mass of a object relative to another object would be the sum of the absolute value of the displacements, with respect to a fourth *spatial* dimension associated with their rest mass and relative velocities.

Therefore, the mass of objects in relative motion increase because one must add the mass associated with the kinetic energy of that motion to its rest mass.

This defines the mechanism responsible for why the mass of an object increases when viewed by an observer who is in relative motion to it in terms of four spatial dimensions..

The following analogy can be used to understand and define the relativistic properties length and time

Assume that two "2 dimensional creatures" are living on the surface of two pieces of paper resting on a desktop.

Also, assume the two creatures can view the surfaces of the other piece of paper, which are separated a pencil.

If the diameter of the pencil is increased, the curvature between the surfaces of the two pieces of paper will increase.

Each of these creatures, when viewing the other piece of paper will only perceive the two-dimensional translation of the three-dimensional curvature generated by the pencil.

Therefore, each will view the distance between two points on the surface of the other as shorter since they will view that distance as a two-dimensional translation of a three-dimensional curvature in the surface of the paper.

Similarly, because three-dimensional beings can only view a three-dimensional translation of a "curvature" or displacement in four *spatial* dimension caused by the motion of an object the distance it moves will be longer with respect to a similar object that is not in motion.

The "movement" of "time" on both surfaces will also be affected.

Each two dimensional creature will view the others "time" as moving slower because the three-dimensional curvature in the paper makes the distance longer than its two dimensional translation. Therefore, it will take longer for events "move" through a curvature in three-dimensional space relative to the time it would take for them to occur if there were no curvature.

As mentioned earlier, time will be defined as only being a measure of the sequential ordering of the causality of an event.

Therefore time will become dilated in reference frames that are in motion because three-dimensional beings can only view a three-dimensional translation of a "curvature" in four *spatial* dimension caused by that motion. This means they will view the distance traveled to be longer than it would be relative to non-curved space. Therefore, time is dilated because it takes longer for events to "move" through curvature in four *spatial* dimensions that it would if there were no curvature.

However, as was mentioned earlier the magnitude of the displacement or the "curvature" an object generates in a fourth *spatial* dimension is dependent on its velocity Therefore the magnitude of the time dilation and the foreshortening of length will be related to its relative velocity of an object.

The velocity of light is constant despite the relative motion of an observer because the foreshortening of the length or distance the light travels is proportional to the motion of the observer. Therefore, the velocity of light will be constant in all reference frames despite the relative velocities of the observers to those reference frames.

It should be remember this scenario applies to all forms of energy including gravitational because, as Chapter ten showed, three-dimensional beings perceive energy in terms of the magnitude of a "curvature" in "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The Lorentz transformations derived from this theoretical model will take on the same form as the Lorentz transformations derived from Relativity.

This is because this theoretical model postulates that a displacement or curvature in "surface" of a three-dimensional space manifold, with respect to a fourth *spatial* dimension caused by the gravitational or kinetic energy of an object is proportional to the velocity of light.

Therefore, because both Relativity and the above mechanism predict a physical shortening of length and a slowing of time are the result of a "curvature" or displacement in space related velocity of light, the form of the Lorentz transformations associated with the foreshortening of an object and slowing of time will be identical for both of these models.

However, this theoretical model defines the magnitude of a foreshortening of length and a slowing or dilation of time in terms of a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension instead of curvature in four dimensional space-time manifold as Einstein did.

As mentioned earlier Gravitational energy also causes time to slow and length to decrease for the same reason a relative velocity causes time to slow and length to decrease.

Chapter twelve derived the mechanism responsible for gravitational energy in terms of a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Earlier the mechanism responsible for kinetic energy or velocity was derived in terms of a oppositely directed "curvature" in a "surface" of a three-dimensional space manifold.

Therefore, because both gravitational and kinetic energies are derived from a common "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension they will have a similar effect on physical properties of length and time.

This means both Relativity and this paper predict an observer in a gravitational field will measure the length of an object to be shorter and passage of time to be slower with respect to an observer who is located outside of a gravitational field.

However, as mentioned earlier this paper defines this shortening of length and slowing of time in a gravitational field in terms of four *spatial* dimension instead of four-dimensional space-time manifold.

The "relative" characteristics of a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension associated with kinetic and gravitational energy would also make it impossible for an observer to determine if an acceleration is caused by a gravitational field or kinetic energy such as that from an exhaust of a rockets engine.

This is because the mechanism defined above indicates the magnitude of a force associated with both gravitational and kinetic energy is related to the absolute magnitude of a "curvature" a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, because a three-dimension observer can only observe the three-dimensional effects of a curvature in four spatial dimensions he or she could not determine whether an he or she is in a gravitational field or an accelerated reference frame.

Therefore, both this paper and Relativity make identical predictions with respect to the relativistic properties of space and time and the inability to determine what is causing acceleration.

However, as mentioned earlier the model presented in the Shadows paper is a broader based because it has and will define a common mechanism responsible for both the relativistic properties of space and time and the quantum properties of mass and energy in terms four spatial dimensions.

Chapter Sixteen

A link between Relativity and Quantum Mechanics

One of the primary goals of a "Theory of Everything" is to provide a physical link between gravity, the relativistic properties of space and time and the quantum properties of mass and energy. We have shown in this paper that the best way of achieving this goal may be to define the universe in terms of the existence of a continuous non-quantized form of mass and four *spatial* dimensions instead of four dimensional space time.

Chapter one postulated that space is composed of a continuous non-quantized form of mass and four *spatial* dimensions instead of four-dimensional space-time.

Chapter two defined the quantum properties of mass and energy in terms of a resonant "structure" formed on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension by a matter wave supported by a continuous non-quantized form of mass.

Chapter three derived the propagation of electromagnetic energy in terms of matter wave in a continuous non-quantized form of mass moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth "spatial" dimension.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

However, deriving the properties of particles in terms resonant system form by a matter wave

supported by a continuous non-quantized form of mass provides a physical link between the wave and particle characteristics of mass and electromagnetic energy. It shows the particle properties of mass are a result of wave properties of a resonant system while its wave properties are a result of the particle properties of a resonant system in the continuous non-quantized form of mass that supports its wave properties.

Chapter twelve defined mass and gravitational force in terms of the quantity of a continuous non-quantized form of mass contained a "curvature" in a "surface" of a three-dimensional space manifold with respect to a fourth "spatial" dimension.

This provides a link between gravitational force and the quantum properties of mass and energy because it derives them in terms of a common mechanism related to the existence of a continuous non-quantized form of mass and four *spatial* dimensions.

Chapter fifteen showed a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension can define the relativistic properties of space and time as consistently as can be done in terms of four-dimensional space-time. It demonstrates the Lorentz transformations that define the relativistic properties of space and time would be identical for a universe consisting of four *spatial* dimensions as for one that consisted of four-dimensional space-time.

Additionally, it shows how and why it is possible to redefine time only in terms of the sequential ordering of the causality of events while defining its relativistic properties in terms of a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This provides a physical link between the wave and quantum properties of mass and energy and relativistic properties of space, time, and gravity because Chapters fifteen, twelve, two, and three derived them in terms of a common mechanism related to the existence of a continuous non-quantized form of mass and four *spatial* dimensions.

Adopting this theoretical model over the present quantum and relativistic theories for scientific investigations would have several advantages in achieving modern science's goal of defining "Theory of Everything", primarily because it would enable scientists to define a common mechanism responsible for the both quantum and relativistic properties of mass, energy, and space and time in terms of the existence of a continuous non-quantized form of mass and four *spatial* dimensions.

Chapter Seventeen

A link between Gravitational and non-gravitational forces

To establish a physical link between gravitational and kinetic forces requires an understanding of their causality.

Chapter one postulated the universe is made up of four *spatial* dimensions instead of four-dimensional space-time.

Chapter fifteen defined the causality of kinetic energy in terms of the "slope" of an "elevation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter twelve derived the causality of gravitational forces in terms of the "slope" of a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(This "curvature" caused by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension responsible for gravitational forces is analogous to a

curvature in a space-time manifold that Relativity postulates is responsible for gravitational forces.)

The link between gravitational and kinetic forces can be understood by comparing the effects a "slope" in a "surface" of a three-dimensional space manifold have on an object in three-dimensional space to the effects the slope an inclined plane have on a marble.

The direction of the downward force or acceleration experienced by a marble on an incline is proportional to the slope of the incline which in turn is proportional to the magnitude of the elevation in the incline.

Chapter fifteen showed the magnitude of a "slope" of an "elevation" in a "surface" of a three-dimensional space manifold would be directly related to velocity or kinetic energy of an object.

This means the forces or accelerations caused by the interaction of the kinetic energy of two moving objects would be directed away from those objects because the direction of that force would be away from the apex of an "elevation" in a "surface" of a three-dimensional space manifold. Additionally, the magnitude of those forces would be directly related to the kinetic energy of the interacting objects because the magnitude of the "elevation" and therefore the "slope" in a "surface" of a three-dimensional space manifold is directly related to the magnitude of the kinetic energy of an object.

This is analogous to how the magnitude and direction of the downward acceleration of the marble on the incline in the earlier example was proportional to the slope of the incline.

Chapter twelve derived gravitational force in terms of a "slope" generated by "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. It was shown the magnitude of a "slope" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension generated by that "depression" is proportional to mass of an object.

Therefore, the magnitude of force or acceleration experienced by an object in three-dimensional space due to an interaction with the "slope" of a gravitational "depression" in a "surface" of a three-dimensional space manifold would be proportional to the mass of that object.

However, the direction of the forces or accelerations associated with the "slope" of a gravitational "depression" in a "surface" of a three-dimensional space manifold will be oppositely directed with respect to those generated by a Kinetic energy "elevation" in a "surface" of a three-dimensional space manifold.

This is because an object interacting with a gravitational "depression" would attain acceleration towards, not away, from the object it is interacting with.

This defines causality of gravitational and kinetic forces in terms of common "incline" or "slope" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The mechanism responsible for gravitational forces is derived in terms of an "incline" caused by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This results in a force being directed towards the apex of the "depression" in a three-dimensional space manifold associated with the mass of an object.

While the mechanism responsible for forces associated with kinetic energy is derived in terms of a similar "incline" caused by a "elevation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. This results in a force being directed away from the apex of the "elevation" in a three-dimensional space manifold associated with the velocity of an object.

Principle of Equivalence or the inability to distinguish gravitational and kinetic or non-

gravitational forces is due to the relative characteristics of the "inclines" generated by a kinetic energy "elevation" and a gravitational "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension .

In Chapter fifteen, the forces associated with kinetic energy or non-gravitational forces such as those generated by a rocket engine were defined in terms of the absolute magnitude of a *slope* in a three-dimensional space manifold caused by an "elevation" in a "surface" of a three-dimensional space with respect to a fourth *spatial* dimension.

In Chapter twelve, the forces associated with gravitational forces were defined in terms of the absolute magnitude of a "slope" in a three-dimensional space manifold generated by a "depression" in a "surface" of a three-dimensional space with respect to a fourth *spatial* dimension.

Since the absolute magnitude of a "negative slope" generated by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would be indistinguishable from the absolute magnitude of a "positive slope" generated by an "elevation" in the "surface" of a three-dimensional space manifold gravitational and non-gravitational or kinetic forces are indistinguishable.

This defines a physical link between gravitational and kinetic energies in terms of their casualty and in terms of the absolute magnitude of a slope in a common curvature in four *spatial* dimensions.

Chapter Eighteen

The Principal of Equivalence, and Four Spatial Dimensions

Chapter one hypothesized a volume of space is composed of four *spatial* dimensions instead of four-dimensional space-time and defined some theoretical advantage to doing so. One of these is that it allows one, as was shown in Chapter sixteen to derive a common mechanism for gravity and the quantum properties of mass and energy.

However, it also allows one to define a mechanism responsible for "The Principal of Equivalence" or the fact that the laws of physics are the same in a gravitational or accelerated reference frame in terms of the classical laws of physics.

Chapter twelve derived gravitational accelerations in terms of a "slope" caused by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(This "depression" in a "surface" of the three-dimensional space manifold with respect to a fourth *spatial* dimension is analogous to a depression or curvature in a space-time manifold the General Theory of Relativity is postulates is responsible for gravitational accelerations.)

Chapter seventeen derived causality of non-gravitational accelerations in terms of the "slope" caused by an "elevation" a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The laws of physics are the same in a gravitational field as in an accelerated reference frame because, as was shown in Chapters twelve and seventeen the forces responsible for those laws are generated by the absolute value of a "slope" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. Since the absolute magnitude of a "negative slope" generated by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would be indistinguishable from the absolute magnitude of a "positive slope" generated by an "elevation" in the "surface" of a three-dimensional space manifold the laws of physics will be the same in a gravitational field and as in an accelerated

reference frame.

This means that one can apply the classical laws of Euclidian geometry of four spatial dimensions to derive the Principal of Equivalence instead of have to rely on the non-classical concept of Relativity.

Another aspect of "The Principal of Equivalence" is that all mass free falls with the same acceleration in a gravitational field.

The mechanism responsible for this can be understood by examining how a particle defined in Chapter two interacts with four *spatial* dimensions.

Chapter two derived a particle in terms of resonant "systems" formed in space by oscillations in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The reason all masses free fall with the same acceleration in a gravitational field can be understood by comparing the forces generated by a gravitational field to the forces in an accelerated reference frame such as that generated by a rockets exhaust on a box of marbles.

The box will represent a mass and the marbles in the box will represent the individual particles in that mass.

If a constant force, such as that produced from rocket's exhaust were applied to a box containing marbles it would move with a constant acceleration. However, the rate of acceleration of the box would be inversely proportional to the number of marbles in the box because the mass of the box is directly proportional to it.

Another way of describing this would be to attach a string to each marble and apply a force individually to each string.

If the total force applied to all of the strings were kept constant, the rate of acceleration of the box of marbles would be inversely proportional to the number of marbles in the box.

However, if a constant uniform force was applied individually to each string the total force on the box will vary in direct proportion to the number of marbles in the box and the rate of acceleration of the box will remain unchanged no matter how many marbles it contained.

Attaching a string to each marble in a box and applying constant uniform force individually to each string illustrates why all masses "freefall" with the same acceleration in a uniform gravitational field.

The string will represent the "attachment" or interaction each individual particle in an object has with a "surface" of three-dimensional space manifold with respect to a fourth *spatial* dimension.

The conclusion that particles interact with the "surface of a three dimensional space manifold is consistent, as mentioned earlier with fact they are made up of resonant "systems" on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

As mentioned earlier Chapter twelve derived the magnitude of gravitational force to be directly related to the magnitude of the "slope" caused by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. Additionally, it was shown the mass of an object was directly related to the number of particles it contained.

Because each individual particle in an object would be "attached" to a "surface" of a three-dimension space manifold associated with a gravitational field the total force experienced by an object in gravitational field will be a directly proportional to the number of particles is contains.

This is analogous to why the total force experienced by the box of marbles with the strings attached in the earlier example varied in direct proportion the number of marbles contained in the box.

Therefore the reason all masses free fall with the same acceleration in a gravitational field is because the mass of an object would be directly proportional to the number of particles it contains, the total gravitational force on an object will be directly proportional to its mass. Therefore, all masses will freefall in a gravitational field with the same acceleration.

This explains another aspect of "The Principle of Equivalence", that an observer inside a laboratory could not determine if he or she was in a gravitational field or was in constant accelerated motion. This is because each particle that makes up a laboratory in a gravitational field or an accelerated reference frame will be interacting "freely" with the curvature in space associated with that form of acceleration.

This means an observer inside a laboratory could not determine if his or her laboratory was in uniform accelerated motion or a gravitational field because as mentioned earlier the absolute value of the "slope" in a "surface" of a three-dimensional space manifold with respect to fourth *spatial* dimension caused by a gravitational or non-gravitational acceleration is indistinguishable.

Chapter Nineteen

The Geometry of Quarks

The purpose of this discussion is to derive the electrical properties of quarks in terms of pressure gradients in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(The mechanism responsible for generating pressure "gradients" in a three-dimensional space manifold was defined in Chapter twelve where it was shown that the energy released when mass is converted to energy, "expands" towards a fourth *spatial* dimension thereby causing a pressure gradient to be formed in three-dimensional space.)

It is based on the following definitions.

There are six types of quarks UP/Down, Charm/Strange and Top/Bottom. The Up, Charm and Top have a fractional charge of $2/3$. The Down, Strange and Bottom have a fractional charge of $-1/3$.

A proton is made up of two Up and one Down quark, so two quarks of $2/3$, which add up to $4/3$, is balanced by a quark of $-1/3$, to give the proton an electrical charge of $+1$. By contrast, neutrons are made up of one Up quark ($2/3$) and two Down quarks ($-1/3 + -1/3$), so they add up to 0 . Thus, the neutron has electrical charge of zero.

Chapter one postulated space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter ten derived all forms of energy including electrical in terms of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

However, we as three-dimensional beings can only observe three of the four spatial dimensions. Therefore, the energy associated with a displacement in its "surface" with respect to a fourth *spatial* dimension will be observed by us as being directed along that "surface". However, because two of the three-dimensions we can observe are parallel to that surface we will observe it to have $2/3$ of the total energy associated with that displacement and we will observe the other $1/3$

as being directed along the signal dimension that is perpendicular to that surface.

This means the 2/3 fractional charge of the Up, Charm and Top may be related to the energy directed along a "surface" of a displaced three-dimensional space manifold with respect to a four *spatial* dimension while the -1/3 charge of The Down, Strange and Bottom may be associated with the energy that is directed perpendicular to that "surface".

The reason why quarks come in three configurations or colors with a fractional charge of 1/3 or 2/3 may be because, as was shown in c Chapter ten there are three ways the individual axis of three-dimensional space can be oriented with respect to a fourth *spatial* dimension. Therefore, the configuration or "colors" of each quark may be related to how its energy is distributed in three-dimensional space with respect to a fourth *spatial* dimension.

However, it may also explain why it takes three quarks of different "colors" to form a particle because, as mentioned earlier one can define a particle in terms of a resonant system on a "surface" a three-dimensional space manifold with respect to a fourth *spatial* dimension. If the colors of each quark represent the central axis associated with its charge then to form a stable resonate system would require three quarks that have different central axis to balance its energy with respect to the axes of three-dimensional space. A particle could not exist if two quarks have the same central axis or color because it would cause an energy imbalance along that axis. Therefore, a particle consisting of anything but quarks of three different colors would not stable.

This shows that it may be possible to define the electrical properties of quarks and how they combine to form particles in terms of the geometry of four *spatial* dimensions.

Chapter Twenty

The relative masses of the Fundamental Quantum Particles

As Brian Greene pointed out in his book "The Elegant Universe", one of the unsolved mysteries of modern particle physics is why every fundamental particle encountered to date can be group into three families.

"Physicists have recognized a pattern among these particles displayed in the following table. The matter particles neatly fall into three groups, which are often called families. Each family contains two of the quarks an electron or one of its cousins and one of their neutrino species. The corresponding particle types across the three families have identical properties except for their mass, which grows larger in each successive family."

Family 1		Family 2		Family 3	
Particle	Mass	Particle	Mass	Particle	Mass
Electron	.00054	Muon	.11	Tau	1.9
Electron Neutrino	$< 10^{-8}$	Muon Neutrino	$< .0003$	Tau Neutrino	$< .033$
Up Quark	.0047	Charm Quark	1.6	Top Quark	189
Down Quark	.0074	Strange Quark	.16	Bottom Quark	5.2

The answer to Brian Greene's question regarding why the particles in the above table can be group into three families is related to the resonant "structures" that defined the quantum properties of mass in Chapter two.

That article was shown that one can derive the quantum or particle properties of mass and energy in terms of a resonant system formed on "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. The mass of the individual particles in each family would then be derivable by extrapolating the laws of classical resonance to four *spatial* dimensions because it tells us that their energy and mass can only exist in discrete packets related to a harmonic of their fundamental frequency.

Additionally Chapter twelve showed that one can derive the mass of a macroscopic objects in terms of a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. It was shown that mass is a result of the spatial *separation* of the apex of this curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(This curvature caused by a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension this paper postulates is responsible for the mass of an object is analogous to the space-time curvature the Einstein postulated is responsible for the mass of an object mass.)

Finally Chapter ten showed one can derived all forms of energy, including gravitational, electrical and thermal, in terms of the of a spatial "separation" between different "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

As mentioned earlier Chapter twelve showed the mass of all objects including particles are a result of a spatial separation in a "surface" of three-dimensional space manifold with respect to a fourth "spatial" dimension. However, this means it would be also dependent on the energy of the environment they are occupying because as was shown in Chapter ten the energy content of an environment determines the spatial separation between the "surfaces" of two three-dimensional space manifolds.

However, this indicates the masses of fundamental particles in each family in the above table cannot take on any random value because their individual energies would be result of the fundamental or harmonic of the resonant frequency of the environment they are occupying.

Therefore, because there are only specific points in space where environments can resonant, each of the corresponding particle type across the three families would have a specific mass related to the energy of the environment in which they were created.

The particles in the first family are found in relatively low energy environments, are relatively stable, and for the most part can be observed in nature. However, the particles in the second and third families are for the most part unstable and can be observed only in high-energy environments of particle accelerators. The exception is the Muon in the second family, which is only observed in the high-energy environment of cosmic radiation.

The relative masses of the fundamental particles increases in each successive family because as shown in Chapter ten the higher-energy environments where they are generated in result in the corresponding particles in each successive family to be formed with a greater relative "separation" in the "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension than the particle in the preceding families.

Therefore, the corresponding particles in the second family will have a greater mass than the particles in the first family because the "separation", with respect to a fourth *spatial* dimension of the three-dimensional space manifold associated with the second family is greater than the "separation", associated with the first family.

Similarly, the corresponding particles in the third family will have a greater mass than those in the second family because the "separation", with respect to a fourth *spatial* dimension, of the three-dimensional space manifold associated with the third family is greater than the spatial

"separation", associated with the second family.

This defines the mechanism responsible for the increase in mass of the fundamental quantum particles across the three families in terms of a "separation" in surface of a three-dimensional space manifold with respect to a fourth *spatial* dimensions and the resonant properties associated with a continuous non-quantized form of mass.

The corresponding particle types across the three families have similar electrical properties because as shown in Chapter nineteen the electrical properties of a fundamental particle are related to the orientation of the "W" axis of the fourth *spatial* dimension with the axis of three-dimensional space. Therefore, each corresponding particle across the three families will have similar electrical properties because the orientation of the "W" axis of the fourth spatial dimension with respect to the axis of three-dimensional space is the same for the corresponding particles in all of the families.

This defines the physical mechanism for why "The corresponding particle types across the three families having identical properties except for their mass, which grows larger in each successive family".

Chapter Twenty-One

The Origin of the Positron in terms of Four Spatial Dimensions

The origin of the positron can be traced to an interaction between a third and fourth *spatial* dimension and the existence of a continuous non-quantized form of mass.

Chapter one postulated of space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter two derived the quantum properties of mass and a photon in terms of integral energies associated with a classically a resonating system formed in space by oscillations with respect to a fourth *spatial* dimension in a continuous non-quantized mass component of space.

Chapter three derived the transmission of a photon in terms of the oscillations of matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

(The fourth *spatial* dimension was defined in Chapter ten.)

Therefore, Chapters two and three explains and predicts particle/wave duality of mass and energy in terms classical law of physics and the existence of a continuous non-quantized form of mass and four spatial dimensions.

(Louis de Broglie was the first to theorize that all particles had a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

However, Chapters two and three also provide the basis for defining a physical mechanism responsible for the generation of an electron-positron pair, described in the following article provided by Elsharony Hemetis in terms of the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

"As is known electrons and positrons are identical twins with anti rotations. This infers that the physical structure of electrons and positrons are polar structures. Yes they are. A Photon is a magnetic field tornado of double conical structure with the Electron and positron connected at the base. If a Photon hits or enters the premises of a (super intensity) magnetic field, it breaks up forming a positron-electron pair. The electric charge is a function of the direction of the magnetic flux entering the base of the tornado or leaving out from it. Think of positrons as a magnetic flux pump made of magnetic flux similar to air and tornadoes. This theory infers that there is nothing such as elementary particles. The word elementary is a relatively absolute or a temporarily absolute that reflects the latest scientific analysis of physical structures."

The mechanism responsible for generating an electron positron pair can be understood by comparing the oscillations in a continuous non-quantized form of mass to the oscillations associated with a wave on a surface of water.

Oscillations generate a wave on a surface of water, which displaces its vertical volume below the surface with air while the peak of the wave displaces the air above the surface of the water with water.

Similarly, oscillations of a continuous non-quantized mass component of space would generate a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The trough of a matter wave would displace a continuous non-quantized mass component of three-dimensional space below a "surface" of a three-dimensional space manifold with a component of four-dimensional space. While the peak of a matter wave would displace a "volume" of four-dimensional space above a "surface" of a three-dimensional space manifold with a quantity of a continuous non-quantized mass component of three-dimensional space.

In Chapter eleven, the electrical and magnetic components of a photon were derived in terms of the "direction" of the forces associated with oscillations in a continuous non-quantized form of mass with respect to a fourth *spatial* dimension.

The electrical component of a photon's energy was derived in terms of the energy associated with the sinusoidal oscillations in a continuous non-quantized form of mass that are parallel to the velocity vector of a photon and the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

While the magnetic component of a photon's energy was derived in terms of the energy associated with sinusoidal oscillations in continuous non-quantized form of mass that are perpendicular to the velocity vector of a photon and that surface.

The formation of an electron-positron pair described in Hemetis's article is caused by a "torque" generated by a super intense magnetic field on the polar magnetic field of the matter wave responsible for the propagation of a photon's energy.

This is because the torque experience by the magnetic component of a matter wave as it traverse a super intense magnetic field will cause a "twisting" of its "orientation" so that its energy will no longer be moving parallel to the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

But because the energy of the matter wave will no longer moving parallel to the "surface" of a three-dimensional space manifold a portion of continuous non-quantized form of mass component of will become "elevated" with respect to a fourth *spatial* dimension while some of it will become "depressed". The "elevated" portion of a continuous non-quantized of mass component of space that is "above" a surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension will be identical but oppositely directed from the one "below" a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter nine, derived a negative charge in terms of the energy associated with a separation in a "surface" of a three-dimensional space, while a positive electrical charge was defined in terms of an oppositely "directed" separation in a "surface" of a non-quantized mass component of three dimensional space

As mentioned earlier, when a photon passes through a super intense magnetic field a twisting force or torque will be generated on a matter wave, which will result the "surface" of a three-dimensional space manifold to become "elevated" with respect to a fourth "spatial" dimension and a portion to become "depressed" with respect to it.

The energy directed "above" the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension will have all of the electrical properties associated with an electron defined in Chapter thirteen.

However, the energy directed "below" the "surface" of a three-dimensional space manifold will be oppositely directed with respect to the one associated with an electron. Therefore, it will have a positive electric charge associated with a positron.

In Chapter eight the mass of an electron was derived in terms of the "quantity" of a continuous non-quantized mass component of space contained "elevation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

As mentioned earlier the "torque" caused by the passage of a photon through a super intense magnetic field would generate two oppositely but identical displacements in continuous non-quantized form of mass; one "above" and one below a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

The continuous non-quantized mass component of space contained in an "elevation" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension generated when a photon passes through a super intense magnetic is responsible for the mass of an electron.

However, as previously mentioned, the torque generated on a photon as it transverses a super intense magnetic field will generate an oppositely directed displacement or "depression" in a "surface" of a three-dimensional space manifold that is equal in magnitude to the "elevation" associated with an electron.

This means it will have the same quantity of a continuous non-quantized mass component of space as an electron but it will be oppositely "directed" with respect to a "surface" of a three-dimensional space manifold. Therefore, it will have the mass associated with positron.

Chapter ten derived energy in terms of the absolute magnitude of a displacement caused by an "elevation" or "depression" in a "surface" of a three-dimensional space manifold with respect to fourth *spatial* dimension.

Therefore, when a positron and electron combine they will release the energy associated with their combined mass.

This defines the origin and physical characteristics of the positron in terms of an interaction between a fourth *spatial* dimension and a continuous non-quantized form of mass and energy.

Chapter Twenty-Two **Dimensional Mechanics in terms** **of four *spatial* dimensions**

Einstein predicted the relativistic properties of space, time and that $E=Mc^2$ based primarily on the observation that the velocity of light remained constant despite the motion of an observer. He used conceptual thought experiments and mathematical arguments to justify the equation $E=mc^2$. His arguments were credible enough for some to expend the energy necessary to see if his predication that mass could be converted to energy was possible.

This resulted in the development of nuclear power.

This paper also uses mathematical and conceptual thought experiments similar to those of Einstein to demonstrate the universe is composed of a four-dimensional *spatial* manifold instead of four-dimensional space-time.

Additionally Chapters two, three, and fifteen derived the relativistic properties of space and time, the quantum properties of mass and the consistency of the velocity of light in terms of a common physical mechanism with respect to four *spatial* dimensions.

Unfortunately, Einstein's theories could only derive a mechanism responsible for the relativistic properties of space and time and not one that could account for the quantum properties of mass and energy.

Therefore, the arguments presented in this paper would appear to be more credible and universally applicable than those presented by Einstein because they define a common mechanism responsible for both relativistic properties of space and time and the quantum prosperities of mass where his theories could not.

What humankind must determine is if the arguments presented in this paper are credible enough to justify expending the energy necessary to examine the all of the possibilities, including high-speed inter-dimensional communications systems and energy "wave guides" for transporting energy from one point in three-dimensional space to another through a fourth *spatial* dimension.

However, the development of a device called a "Magnetic Resonator" may be another potential benefit that could arise from analyzing the concepts presented this paper.

Chapter eleven derived the accelerations associated with magnetic forces in terms of a tangential force on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

If one could fabricate a "Magnetic Resonator", a device that generates two concentric independently rotating spherical magnetic fields it MAY be possible to use power generated by this device to accelerate objects to velocities close to that of light.

It must be designed so that the orientation of the rotational axes of the magnetic spheres can be change with respect to each other.

According to the concepts developed in Chapter eleven if one misaligns the orientation of the rotational axis of the two magnetic spheres so that their magnetic poles do not line up a **differential** "force" with respect to a fourth *spatial* dimension, will be developed between the internal and external volumes of space associated with the "Magnetic Resonator". This will result in accelerating the "Magnetic Resonator" and its contents through space.

If the generators of the magnetic fields were located internal to the spheres, the acceleration could be maintained as the magnetic spheres moved thought space.

Additionally, if the strength of the magnetic fields is large enough it may be possible to "lift" the "Magnetic Resonator" and its contents "out" of a three-dimensional space into a fourth *spatial* dimension were according to the theoretical predictions of this paper it could travel faster than the

speed of light.

It should be pointed out that traveling through space is different from traveling in space.

This can be understood by comparing space travel using these concepts to traveling in an aircraft.

When an aircraft is flying only the external parts of an aircraft, the wings and fuselage, are traveling in the atmosphere and are exposed to the forces associated with the velocity of the wind. However, the people in the cabin of the aircraft are flying through atmosphere and therefore do not experience the forces associated with the wind.

In other words, the wings and fuselage absorb all of the forces associated with the wind generated by the motion of the aircraft thereby shielding the people traveling in the cabin from them.

A similar effect would occur when a "Magnetic Resonator" is moving in space.

Only the external parts or the magnetic shells of the "Magnetic Resonator", which are traveling in space, will be exposed to the forces associated with acceleration and motion. However, the objects internal to the magnetic spheres would be moving through space and therefore would not experience the forces associated with acceleration.

This is analogous to how objects and people in the cabin of an aircraft do not feel the forces associated with the wind.

In other words, the magnetic spheres of a "Magnetic Resonator" will absorb some, if not all, of the forces associated with the accelerations generated by the motion of a "Magnetic Resonator" through space.

Unfortunately, human civilization presently does not have the technology or access to the large energy resources required to make this mode of transportation practical.

However, as mentioned earlier there are a number of ways in which the dimensional properties of space can be developed with present technologies for the benefit of humankind such as the development of high speed communications networks by using the faster than light data transfer speeds in the fourth *spatial* dimension and inter-dimensional energy "wave guides" for directly "tapping" the internal energy of stars.

The explanation of the "Magnetic Resonator" was not meant to show us how to build it, but to give a very basic understanding of the dimensional mechanics of a universe composed of four *spatial* dimensions and give direction to our imagination and intellect.

[Imaginations search](#)

[Intellects explore](#)

Chapter Twenty-Three

The Unification of Quantum and Relativistic Theories

The theoretical model presented in this paper has and will shown it is possible to define a common unifying mechanism for the particle/wave duality of mass and energy and relativistic properties of space and time in terms of the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

In this chapter a procedure will be outlined that will allow for a quantitative measurement of the physical properties associated with a fundamental component of this theoretical model, a

continuous non-quantized form mass, which will enable the experimental verification of the mechanisms and processes presented in this paper.

Chapter one postulated a volume of space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter two derived the quantum or particle characteristics of mass in terms of integral energies with a classically resonating "system" formed in space supported by "oscillations" in a continuous non-quantized form of mass.

Chapter three derived the propagation of a photon in terms of a matter wave moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. It was shown this matter wave generates the "oscillations" in a continuous non-quantized form of mass that defined its particle characteristics in Chapter two.

Therefore, Chapters two and three define a common mechanism responsible for particle/wave duality of mass and energy because they derive both in terms of "oscillations" in a continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

Chapter fifteen derived the relativistic properties of space and time in terms of a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Chapter twelve derived gravitational forces in terms of the quantity of a continuous non-quantized form of mass contained in a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, Chapters two, three, fifteen and twelve derives a common mechanism responsible for the relativistic properties of gravity, space and time and connects them to their particle/wave properties in terms of the classical laws of physics and the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

The following discussion will describe an experimental technique, which will allow for direct observation and quantification of a continuous non-quantized form of mass this theoretical model postulates is fundamentally responsible for both the quantum properties of mass and energy and the relativistic properties of space and time.

The following article which appeared in the Physics News Update The American Institute of Physics Bulletin of Physics News <http://www.aip.org/physnews/update/> Number 391, September 15, 1998 by Phillip F. Schewe and Ben Stein of NASA reported observing an anomalous acceleration in several of its space probes that is consistent with this paper concept of a continuous non-quantized form of mass. (These findings of Phillip F Schewe and Ben Stein were confirmed in Physics News update <http://www.aip.org/physnews/update/> article 447)

ANOMALOUS ACCELERATION Data from several spacecraft, including Pioneer 10 and 11, Galileo, and Ulysses provide evidence for an unexplained, weak, long-range acceleration, a new report shows. Position and velocity information is derived from radio signals sent from the craft to the Deep Space Network back on Earth. Any change in velocity over time can be ascribed to a variety of known sources: the sun and planets, the solar wind, the Milky Way, the Kuiper belt, etc. But even after taking this all into account, as well as other possibilities such as the presence of

dark mass in the solar system (only a millionth of a solar mass of dark mass could reside within the orbit of Uranus, it is estimated) or gas leakage from the vehicles themselves, a small acceleration in the direction of the Sun--- 8×10^{-8} cm/sec² for Pioneer 10---remains unaccounted for. Signs of this anomaly first appeared in the Pioneer tracking as long ago as 1980 Pioneer 10 was launched in 1972 and is presently 70 astronomical units from Earth. Now six space scientists, armed with many years of Pioneer data, supplemented with trajectory information from Galileo and Ulysses, have carried out the first thorough analysis of the problem and find the anomaly to be as persistent as ever. (The Voyager spacecraft are less useful for determining acceleration anomalies.) The researchers doubt but do not rule out the possibility of a novel gravitational effect or other kind of new physics. Alternative explanations include subtle systematic errors in the data analysis or unexpected aspects of space navigation. Further work on this problem may extend to the observed motions of planets, comets, and the proposed Pluto Express craft. (John D. Anderson et al., Physical Review Letters, 5 October 1998 contact John Anderson at JPL, 818-354-3956, john.d.anderson@jpl.nasa.gov or Michael Nieto at Los Alamos, 505-667-6127, mmn@mmn.lanl.gov journalists can obtain copies of the article from AIP Public Information.)"

As mentioned earlier Chapter one, postulated a volume of space is composed of a continuous non-quantized form of mass.

If space was composed of a continuous non-quantized form of mass, it could be responsible for the anomalous decelerations observed in NASA's space probes.

(The acceleration of NASA space probes is directed towards the sun so therefore it would be defined as deceleration with respect sun)

The deceleration caused by a continuous non-quantized form of mass would be analogous to the slowing or decelerating effects air has on the movement of aircraft.

Air provides resistance to the movement of an aircraft causing it to slow or decelerate.

Similarly, if space did contain a continuous non-quantized form of mass it would provide "resistance" to a space probes movement causing them to decelerate.

It should be possible to analytically verify a connection between the anomalous acceleration NASA has observed on its deep space probes to the existence of a continuous non-quantized form of mass by comparing the energy loss observed in NASA's space probes to the red shift observed in the emission spectra of stars.

Chapter one postulated a portion of the energy loss associated with a red shift observed in star's spectra may be due to the "resistive" or decelerative properties this paper associates with a continuous non-quantized form of mass.

Therefore, if the deceleration of NASA's space probes is due to a resistive property of a continuous non-quantized form of mass, it should be possible to correlate it to the energy loss or red shift of a photon that Chapter one associated with a continuous non-quantized form of mass.

One could determine the energy loss of light as it traveled though a continuous medium by measuring the percentage of energy loss of per distance traveled due by observing the red shift of a star's spectra that was related only to the distance it traveled. (The red shifted of light due to the relative motion of the object being observed must be factored out because it is not related to the decelerative properties of a continuous non-quantized form of mass.)

(Some feel that a photon's energy can only be altered is by an interaction with another particle. This interaction would result in an effect called **Compton scattering**. Since no **Compton scattering** is observed in the red shift coming from star it is assumed by many astronomers it can only be caused by the movement of an object away from an observer.

However, as was mentioned earlier Chapter three showed the particle properties of a photon are the result of a resonant "system" generated by a matter wave in a continuous non-quantized form of mass moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, because a photon is made up of a matter wave in a continuous non-quantized form of mass a portion of the redshift may be the result of an interaction between the matter wave responsible for its particle properties and a continuous non-quantized form of mass.)

One could then use this calculation to determine how much of the observed deceleration in NASA's space probes was due to the existence of a continuous non-quantized form of mass. If the value of the energy loss obtained in the above manner correlates with the anomalous energy loss or deceleration NASA has observed on its deep space probes it would have a tendency to verify the one of the fundamental postulates of this theoretical model; the existence of a continuous non-quantized form of mass.

As was pointed out in the above Physics News Update article even after taking into account "other possibilities such as the presence of "Dark Matter" in the solar system the observed deceleration of these space probes cannot be accounted for.

However, as was shown in Chapter one this theoretical model defines "Dark Matter" in a much broader sense than what was suggested in the article appearing in the Physics News Update regarding the deceleration of NASA space probes. This is because defines "Dark Matter" in terms of a continuous non-quantized form of mass contained in a volume along with any other particular mass such as protons, neutrons, electrons or photons contained in that volume of space.

Therefore, one must add the decelerating properties this paper associates with a continuous non-quantized form of mass to the decelerating properties NASA associates with the particular "Dark Matter" mentioned in the above article to obtain the magnitude of the decelerations experience by the space probes.

The reason NASA's calculations regarding the decelerations on its space probes mentioned in the above article are "anomalous" is because they only used the decelerative properties they associated with the particular "Dark Matter" and did not factor in the deceleration that would be caused by the existence of a continuous non-quantized form of mass.

Chapter fifteen showed time dilation and the foreshortening of length due to a velocity is related to a curvature in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension and not to a curvature in a four dimensional space-time manifold.

In Chapter twelve, gravitational energy was derived in terms of a "curvature" or "depression" in a "surface" of a three-dimensional space with respect to the fourth spatial dimension.

It was shown this curvature in a "surface" of a three-dimension space manifold with respect to a fourth *spatial* dimension is analogous to the space-time curvature the Theory of Relativity predicts is the causality of gravity.

However, Chapter fifteen showed a universe consisting of four *spatial* dimensions instead of four-dimension space-time makes predictions identical in every respect, with regard to the relativistic properties of space and time, to those of the Special and General Theory of Relativity.

It defines the foreshorten of length and dilation of time due to a gravitational field in terms of a "curvature" in the "surface" of the third spatial dimension with respect to the fourth spatial dimension instead of a curvature in four dimensional space time.

Therefore, both this theoretical model and the Theory of Relativity make similar predictions

regarding the positions of NASA's Space probes with respect to the spatial geometry both of these theories associate with a gravitational field.

However, this theoretical model also predicts the existence of a continuous non-quantized form of mass that if taken into account would allow NASA to make a more accurate prediction of the position of its space probes.

Chapter Twenty-Four **Maxwell's equations** **in terms of Four Spatial Dimensions**

Maxwell's equations can be derived in terms laws of classical physics the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter one postulated space is composed of four *spatial* dimensions and a continuous non-quantized form of mass.

Chapter two derived the particle properties of mass, energy and electromagnetic radiation in terms of the integral energies associated with a resonant "system" formed in space by "oscillations" in a continuous non-quantized form of mass.

Chapter three defined the propagation of electromagnetic energy in terms of matter wave in a continuous non-quantized form of mass moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, Chapters two and three define a common mechanism responsible for particle/wave duality of electromagnetic energy in terms of the classical laws of physics, the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles had a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component. However, macroscopic observations of wave energy indicate that it can only be propagated on a medium made up of mass. Therefore, the success of Louis de Broglie theory indicates that a continuous non-quantized form of mass exists.)

However, the existence of a continuous non-quantized form of mass and four *spatial* dimensions also provides the ability to define a mechanism responsible for Maxwell's equations in terms of the classical laws of physics

The "oscillations" in a continuous non-quantized form of mass responsible for generating a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would be analogous to the oscillations associated with a wave on water.

In a classical world, the trough of a wave on water displaces the vertical volume of water below the surface of the water with air while its peak displaces the air above the surface of the water with water.

Similarly, a "trough" of a matter wave on a "surface" of a three-dimensional space manifold would displace a volume of three-dimensional space below its "surface" with a component of four-dimensional space. While a "peak" of a matter wave would displace a "volume" of four-dimensional space above a "surface" of a three-dimensional space manifold with a continuous non-quantized mass component of three-dimensional space.

Chapter ten derived all forms of energy in terms of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

As mentioned earlier Chapter three defined the propagation of electromagnetic energy in terms of matter wave in a continuous non-quantized form of mass moving at the velocity of light on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This means the sinusoidal displacements in a "surface" of a three-dimensional space manifold caused by the "peaks" and "troughs" of a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would be responsible for the propagation of electromagnetic flux.

First the mechanism responsible for Gauss's law of Electricity, the total electric flux out of a closed surface is equal to the charge enclosed divided by the permittivity will be derived in terms of the geometric properties of four *spatial* dimensions.

Next Gauss's law of Magnetism, the net magnetic flux out of any closed surface is zero and that there are no magnetic monopoles will be defined in terms of the alignment of the axis of a fourth *spatial* dimension with respect to the axes of three-dimensional space.

Following that the physical mechanism responsible for Ampere's Law, the magnetic field in space around an electric current is proportional to the electric current that serves as its source, will be derived in terms of an energy gradient in a three-dimensional space manifold that Chapter thirteen derived as being responsible for an electric charge.

Then the fourth of Maxwell's equations or Faraday's law of induction that any change in a magnetic environment of a coil will cause a voltage to be "induced" in the coil that is equal to the negative rate of change of the magnetic flux times the number of turns of the coil will be derived in terms an energy gradient associated with a charge and inertial properties of a continuous non-quantized form of mass defined in Chapter one.

Gauss's law of electricity states the total electric flux out of a closed surface is equal to the charge enclosed divided by the permittivity or "integral of $E \cdot dA = Q / \text{permittivity}$ ".

The mechanism responsible for the total electric flux out of a closed surface being equal to the charge enclosed is related to the "peaks" and "troughs" of a matter wave on a "surface" of a three-dimensional space manifold.

Chapter nine derived the magnitude of an electric charge in terms of a displacement of the "surfaces" of a three-dimensional space manifold with respect to a fourth *spatial* dimension. A positive charge was defined in terms of a "depression" in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension while a negative charge was defined in terms of an "elevation" in that same surface.

As mentioned earlier the displacements in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension caused by the "peaks" or "elevations" and "troughs" or "depressions" of a matter wave are responsible for the propagation of electrical flux through space.

However, as was shown in Chapter two and three that all particles are composed of a matter wave because they show that a particle of energy is made up of a standing matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, as was shown in Chapter nine the displacements caused by the alternating "elevations" and "depressions" in a "surface" of a three-dimensional space manifold generated by this standing matter wave would be responsible for the transmission of positive and negative electrical flux

through space.

Therefore, the total electric flux or energy out of a closed "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension surrounding a charge will be equal, as Gauss's Law of Electricity states, to number of charge particles enclosed by that surface.

The fact that the total electric flux out of a closed surface must be divided by the permittivity of the volume of space an electric flux is transversing is related to the mechanism responsible for the propagating electric flux in space.

As mentioned earlier electrical flux is propagated through space by a matter wave in a continuous non-quantized form of mass moving at the velocity of light.

However, Chapter twelve showed there would be direct relationship between the density or permittivity of space and the density of a continuous non-quantized form of mass in that space.

Therefore, the electric flux out of a closed surface must be divided by the permittivity of a volume because the attenuation of the energy of a standing matter wave in a continuous non-quantized form of mass would be directly related to the density of the continuous non-quantized form of mass that it was moving through.

This completes the derivation of the physical mechanism responsible for Gauss's law of electricity in terms of the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

We will now derive the mechanism responsible for Gauss's law for magnetism, that the net magnetic flux out of any closed surface is zero and that magnetic monopoles do not exist or the integral of $B \cdot dA = 0$ in terms of the existence of four *spatial* dimensions.

The mechanism responsible for net magnetic flux out of a closed surface being equal to zero is related to the "alignment" or angle the axis of a fourth *spatial* dimension has with respect to coordinate planes of a three-dimensional space.

(The axis of the fourth *spatial* dimension was defined in Chapter ten.)

Chapter eleven showed magnetic flux was due a "tangential" force generated on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension by a "misalignment" of the axis of a fourth *spatial* dimension with respect to the coordinate planes of three-dimensional space.

Therefore, the misalignment of a "surface" of a three-dimensional space manifold with respect to the axis of a fourth *spatial* dimension caused by the "peaks" and "troughs" of a matter wave on a "surface" of a three-dimensional space manifold would be responsible for the alternating polarity of the magnetic flux associated with propagation of electromagnetic energy.

However the "angle" or "alignment" the axis of the fourth *spatial* dimension makes with a coordinate plane in a three-dimensional space manifold would be analogous to the angle a line makes when drawn through a plane on a coordinate graph.

A line will always make symmetrically equal and opposite angles above and below the coordinate plane it transverses.

Similarly, the axis of a fourth *spatial* dimension will always make symmetrically equal and opposite angles "above" and "below" the coordinate plane in three-dimensional space.

Therefore, as was indicated in Chapter eleven the net magnetic flux or force out of any closed

surface always being equal to zero because the magnitude and "direction" of a force responsible for magnetic flux will be equal and opposite "above" and "below" a three-dimensional coordinate plain it is transversing.

This also defines the physical reason why magnetic monopoles cannot exist.

Magnetic monopoles cannot exist because the axis of a fourth *spatial* dimension is infinite in length

This is analogous to how the each axis in three-dimensional space is infinite in length.

Therefore, magnetic monopoles do not exist because the axis of a fourth *spatial* dimension is infinite in length it must generate two magnetic fields of equal and opposite polarity "above" and "below" any coordinate plain in three-dimensional space it transverses.

This completes the derivation of the physical mechanism responsible for Gauss's law of Magnetism in terms of the orientation of the axis of a fourth *spatial* dimension with respect to the axes of three-dimensional space.

We will now move on and derive a physical mechanism responsible for Ampere's law that the magnetic field in space around an electric current is proportional to the electric current which serves as its source or the integral of $B \cdot ds = \mu_0 I$ the permeability of space times the current or "I".

The mechanism responsible for Ampere's law can be derived from the "alignment" of the axis of a fourth *spatial* dimension with respect to the tangential forces associated with an electron defined in Chapter thirteen.

Chapter thirteen derived charge in terms of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension while Chapter eleven defined the magnetic flux associated with a moving charge in terms of a tangential force on a "surface" of a three-dimension space manifold caused by that displacement.

In an electric current, the tangential forces associates with the magnetic flux of a charge will have a common "alignment" along the velocity vector associated with the electrically charged particles.

Therefore, the "tangential" force, which defines magnetic field in Chapter eleven, on a "surface" of a three-dimensional space manifold by the individual particles in an electric current will be aligned and additive because each will contribute to the "tangential" force on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This results in the magnetic field in space around an electric current to be directly proportional to the electric current because, as was shown in Chapter eleven, the magnitude of a magnetic field is directly proportional to the magnitude of a "tangential" force along a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

This completes the derivation of the mechanism responsible for Ampere's law in terms of the "alignment" of the "W" of the fourth *spatial* dimension and the existence of the existence of four *spatial* dimensions

Lastly we shall derive the mechanism responsible for Faraday's Law of Induction, that any change in a magnetic environment of a coil will cause a voltage to be "induced" in that coil that is equal to the negative rate of change of the magnetic flux times the number of turns of the coil or the integral of $E \cdot ds = -dB/dt$.

The mechanism responsible for Faraday's Law of Induction is related to the inertial properties of a continuous non-quantized form of mass responsible for a unit charge defined in Chapter thirteen.

In the derivation of Gauss's law of Electricity it was shown why the total electric flux out of a closed surface is equal to the charge enclosed in terms of the existence of a continuous non-quantized form of mass and four *spatial* dimensions.

This means each additional turn of a coil will add charges to the space effected the movement of them through that coil. This will increase the total "tangential" or force generated on a continuous non-quantized form of mass in the space affected by those charges.

Later in the derivation of Ampere's law, it was shown the "tangential" force generated on a continuous non-quantized form of mass by an electric current is directly related to the number of changed particle

This means each additional turn of a coil will make a proportional increase the magnitude of the magnetic flux or force associated with the current in that coil.

This defines the mechanism responsible for why the magnitude of the magnetic flux around that coil that is carrying an electric current is directly proportional to the number of turns in that coil.

One aspect of electrical energy that has not yet been mentioned in this chapter is the mechanism responsible for the force or voltage associated with the unit electric charge.

Chapter nine derived the energy associated with the voltage and magnetic flux of an electric charge in terms of energy gradients, which as mentioned earlier, are caused by the "peaks" and "troughs" of a matter wave in a continuous non-quantized form of mass.

This suggests the change in the magnetic environment of a coil, which causes a voltage to be "induced" in that coil, may be related to the inertial properties of a continuous non-quantized form of mass associated with a charged particle.

This means that Newton's third law of motion involving an interaction between masses which states "For every action there is an equal and opposite reaction" may be applied to the magnetic environment of a coil.

In other words, the voltage is induced in a coil is equal to the negative rate of change of the magnetic flux because a change in a continuous non-quantized component of space associated with a voltage could be considered to be an equal and opposite reaction to the change in a continuous non-quantized mass component space associated with a magnetic flux based on Newton's third law of motion.

This completes the derivation of the physical mechanism responsible for Faraday's law in terms of the inertial properties of a continuous non-quantized form of mass responsible for a unit charge defined in Chapter thirteen.

This also completes the derivation of Maxwell's equations in terms of the existence of four *spatial* dimensions, a continuous non-quantized form of mass and the laws of classical physics.

Chapter Twenty-Five

The Evolution of the universe in terms of Four Spatial Dimensions

The Standard Cosmological Model of the Universe hypothesis the universe began as a small compact "ball" of mass that exploded producing a "big bang" and that the universe is expanding due to the aftermath of the "big bang" based, in part, on the frequency shifting of the spectral lines in EM radiation called the red shift.

Many astronomers have interpreted the red shift in electromagnetic radiation as an indication the galaxies are moving away from the earth and have calculated the rate of expansion of the universe based on the magnitude of this frequency shift. They have assumed the frequency shift of EM radiation coming from galaxies is entirely due to their velocity with respect to the earth.

However, the recent observation that universe contains a measurable quantity of Dark Matter indicates that this assumption may not be valid because it could interact with electromagnetic radiation to cause a frequency shift which would not be related to the expansion of the universe.

To understand how "Dark Matter" would affect the rate of expansion of the universe requires an understanding of how and why it could interact with it.

(It should be remember, we do agree with many cosmologists that the universe is presently in an overall state of expansion however, we disagree with the currently accepted rates at which this expansion is occurring and define this expansion not in terms of a "big bang" but in terms of cycle of expansions and contractions in four *spatial* dimension.)

Chapter one postulated the universe is composed of a continuous non-quantized form of mass and four *spatial* dimensions instead of four-dimensional space-time.

Chapter two derived the properties photon or electromagnetic radiation in terms of the discrete energies associated with a classically resonating "system" formed in space by oscillations in a continuous non-quantized mass component of space.

Chapter three defined the propagation of electromagnetic energy in terms of oscillations in a continuous non-quantized form of mass caused by a matter wave moving on the "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension at the velocity of light.

Therefore, Chapters two and three define a common mechanism responsible for the particle/wave duality of EM radiation in terms of the classical laws of physics, the existence of four *spatial* dimensions and a continuous non-quantized form of mass.

(Louis de Broglie was the first to theorize that all particles have a wave component. His theories were confirmed by the discovery of electron diffraction by crystals in 1927 by Davisson and Germer. However, this means there must be a continuous non-quantized medium for it to be propagated on because even the smallest possible particle must have a wave component.)

These oscillations in a continuous non-quantized form of mass responsible for generating a matter wave on a "surface" of a three-dimensional space manifold would be analogous to the oscillations associated with a wave on the surface of water.

The trough of a water wave displaces a volume of water below its surface with air while the peak of a water wave displaces the air above its surface with water.

Similarly a "trough" of a matter wave on a "surface" of a three-dimensional space manifold would displace a continuous non-quantized form of mass "below" a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension with a component of four-dimensional space while a "peak" of a matter wave would displace a "volume" of four-dimensional space above a "surface" with a component of three-dimensional space.

Chapter ten showed all forms of energy are a result of a displacement in a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, the sinusoidal displacements in a "surface" of a three-dimensional space manifold with

respect to a fourth *spatial* dimension caused by the "peaks" and "troughs" of a matter wave on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension would be responsible of the propagation of EM radiation.

However, a matter and water wave share another similarity in that they would both be affected by the interaction of their wave energy with the mass of the medium they are propagated on.

The frequency and energy content of a water wave decreases as it moves along the surface of the water due, in part, to its interaction with the inertial mass of the water which causes it to heat up. The greater the distance it travels on the water the greater the decrease in its frequency.

Similarly the frequency of a matter wave would decrease as it moved along a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension due to its interaction with a continuous non-quantized mass component of space. This would result in an increase the continuous non-quantized form of mass defined by the equation $E=mc^2$. The greater the distance it travels on a "surface" of a three-dimensional space manifold the greater the decrease in its energy and frequency.

This "Tired Light" concept of the energy loss associated with the red shifting of photons by its interaction with space has been dismissed by many because no Compton scattering is observed in red shifted photons.

Compton scattering is caused by an interaction between high energy particles such as photons and electrons which results in the electron being given part of the energy (making it recoil), and a photon containing the remaining energy being emitted in a different direction from the original, so that the overall momentum of the system is conserved. If the photon still has enough energy left, the process may be repeated. This process would result in a scattering of the energy of a photon.

The reason why many astronomers believe the entire redshift of a galaxies is the result of its movement away from an observer is that classical theory of charged particles interacting with an electromagnetic wave, cannot explain any shift in wavelength.

Therefore, if the red shift was caused by a particle interaction one should observed the **Compton scattering** of light that would be associated with a particle interaction. Since no **Compton scattering** is observed in the red shift coming from galaxie it is assumed by many astronomers it can only be caused by the movement of an object away from an observer.

However, as was shown in Chapters two and three a photon is a result of a resonant "system" generated by a matter wave in a continuous non-quantized form of mass moving on a "surface" of a three-dimensional space manifold with respect to a fourth *spatial* dimension.

Therefore, because a photon is made up of a matter wave in a continuous non-quantized form of mass a portion of the energy loss associates with a redshift may be the result in a conversion of it energy of a matter wave to continuous non-quantized form of mass.

The conclusion the energy loss of red shifted light is converted to a continuous non-quantized form of mass is supported the experimental verification that energy in itself is not quantized because a photon can have any frequency and therefore any energy greater than zero or less than infinity. Additionally, the equation defining the relationship between mass and energy, $E=mc^2$, also indicates that mass is completely convertible to one or more photons with energies greater than zero or less than infinity. Therefore, the conversion of mass to energy must occur on a continuous basis to support the continuous properties of both mass and energy.

Chapter two showed a continuous non-quantized form of mass is responsible for the physical properties associated with spatial volume.

Therefore, the increase in the quantity of a continuous non-quantized form of mass will result in that volume of three-dimensional space physically "expanding" "towards" a fourth *spatial* dimension.

This means that a portion of the observed expansion of the universe associated with the energy loss of red shifted EM radiation may not be due to the recessional velocity of galaxies but instead may be due an increase in the physical volume of three-dimensional space with respect to a fourth *spatial* dimension caused by an increase in a continuous non-quantized form of mass.

However, the rate of expansion of the universe due to a conversion the energy of EM radiation to a continuous non-quantized form of mass would be related to the non-linear formula of $E=mc^2$.

Therefore, if this mechanism does define one of the expansive components of the universe the rate of the expansion would be less than that predicted by many cosmologists because one of those components would be defined by the non-linear formula of $E=mc^2$ and not by the linear recessional velocity of galaxies. This would result in a reduction of rate of expansion of the universe predicted by the assumption that the entire energy loss of EM radiation is due to the recessional velocity of galaxies.

(The non-linear aspect of this expansion caused by the creation of a continuous non-quantized form of mass would have to be added to the linear expansion caused by the recessional velocity of a galaxies is responsible for non-linear or accelerative properties associated with Dark Energy.)

However, it should be remember we are not saying that the universe is not expanding, but we are saying that magnitude of the expansion may be less than predict by many of today's cosmologists.

Presently the universe appears to be in an overall state of expansion with respect to a fourth *spatial* dimension, due to the recessional velocity of galaxies and the physical expansion of a volume of space caused by a conversion of the electromagnetic energy to a continuous non-quantized form of mass.

However someday this expansion will cease and it will enter a contraction phase.

This is primarily due to the mechanism defined earlier in which electromagnetic energy is converted to continuous non-quantized form of mass. This will result in increasing in the total mass content of the universe and causing the total gravitational contractive forces associated with that mass to increase.

The universe will begin to contract when the contractive forces associated with the increase mass of the universe exceeds the expansive forces associated with recessional velocity of the galaxies.

However, the contraction or "compression" of the universe will generate heat for the same reason as heat is generated by the "contraction" or compression of a gas. But the heat of a contracting gas will generate an expansive force that will oppose the contraction of the gas.

Similarly, the heat generated by the contraction of the universe will cause an expansive force that will oppose gravitationally forces that are causing the universe to contract.

The velocity of contraction will increase until the momentum of the galaxies, planets, and the continuous non-quantized mass components of the universe equals the expansive forces generated by the heat caused by its contraction.

At this point in time the total energy of the universe would be equal to the total mass equivalent of that energy or $E=mc^2$, where "E" equals the total energy content of the universe and "m" equals the total mass content of the universe. From this point on the velocity of the contraction will slow

and be maintained by the momentum associated with the remaining mass component of the universe.

However, after a certain point in time the heat generated by the contraction of the universe will become great enough to convert the mass of the stars planets and the continuous non-quantized form of mass to EM radiation. This will reduce the total mass of the universe and the total attractive gravitational forces associated with that mass.

This will result in the universe entering an expansive phase because the expansive forces associated with the heat generated by the contraction of the universe will exceed the contractive forces associated with the remaining mass of the universe.

Earlier it was shown that the interaction of EM radiation with the continuous non-quantized form of mass results in increasing the quantity of a continuous non-quantized mass contained in the volume of space where the interaction occurred.

Therefore, the quantity of a continuous non-quantized form of mass in the universe will increase as its expansion progresses.

This expansion will continue until the total gravitational attractive forces of the mass in the universe exceeds the total expansive forces cause by the heat generated by the contraction of the universe.

At this point, the contraction phase will begin again.

Since the universe is a closed system, the amplitude of the expansions and contractions will remain constant because the law of conservation of mass/energy dictates the total mass and energy of a closed system remains constant.

This results in the universe experiencing in a never-ending cycle of expansions and contractions of equal magnitudes.

The Cosmic Background Radiation discovered by Penzias and Wilson supports the assumption that the universe undergoes a cycle of expansion and contractions.

Chapter two showed that particles are formed by interaction of a continuous non-quantized form of mass with the geometry of four *spatial* dimensions. However, the process of particle formation and disassociation can only occur in extremely high temperature environments. As mentioned earlier the heat is generated by the contraction of the universe. This heating would result in the disassociation of particles into a continuous non-quantized form of mass.

However, the process would be reversed as the universe begins to expand because as was shown in Chapter two a portion of a continuous non-quantized mass component of space would "condense" to form particles as it cooled.

The Cosmic Background Radiation with the equivalent temperature of 3 degrees Kelvin can be interpreted as the remnants of the energy that existed at the time when the universe changed over from an energy or heat dominated to one containing both photons, subatomic particles.

Therefore, one could interpret the cosmic background radiation as being the result of the universe changing over from one domain by the heat generated from the contraction of the universe to one containing both photons, subatomic particles due to the cooling caused by its expansion.

Conclusion

We have just begun a journey of intellect and imagination.

Just as Columbus did not know what he would find at the end of his voyage, we do not know what awaits us at the end of ours.

Many of the ideas and concepts outlined here will be modified because imagination is not reality. It will take the intellect and imagination of many to find and put all of the pieces of this puzzle together.

One person does not make a discovery; it is the result of a building of knowledge and understanding over the course of Humankind's existence.

Neil Armstrong was the first person to set foot on the moon. His voyage did not start on the lunch pad of Cape Kennedy. It began in the imagination of the first human to look at the moon and imagine what it would be like to set foot on it.

Imagination guides intellect and gives it the ability to discover reality.

If nobody had imagined traveling to the moon, no one would have tried to make the tools and devices required to make that journey a reality.

The ideas expressed in this paper allow us to imagine a universe different from the one that we are familiar with by bringing the "Shadows of another reality into clearer focus. Who knows where this imagination may take us.

By moving a piece of paper you can transport a two-dimensional creature "living" on its surface through three-dimensional space.

Just as our imagination guided our intellect to generate the tools and devices necessary to enable humankind to explore the moon it may guide us to generate the tools and devices necessary to transport humankind through four-dimensional space and allow us to explore a world limited only by our imagination.

[Reality casts Shadows](#)
[Imagination illuminates Shadows](#)
[Intellect explores Shadows](#)

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