

The Continuum Theory Part II: Matter, Time, and the Mechanics of Light

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Part I of this work described a new theory that deals with the source of gravity, whereby evidence introduced indicates that gravity originates from quantum motions in a 4-Dimensional (4D) Electric Scalar Potential (ESD) field that permeates the Universe as stationary aether (totally coupled to mass). Part I led to the formulation of a new theory of gravity, based on quantum motions in this 4 Dimensional aether continuum field. Furthermore, derivations were introduced for the gravitational constant, for gravitational acceleration, and for the permittivity of free space. In this paper (Part II), new definitions for mass and time are developed, and the theory introduces mechanics for the speed of light. The theory also introduces a Universe whereby the Big Bang is just a part of a repeating cycle. As will be described in this paper, manipulating time, expanding or contracting the aether continuum to circumvent the speed of light becomes permissible, and the potential technology for this to occur will be briefly described. In addition, more evidence will be introduced here that point to so-called fictitious forces as being real forces of Nature.

Introduction

In Part [i], the Continuum Theory was developed to explain observations of a certain phenomenon that involves gravity. In the process, a step-by-step development was carried out, which led to the formulation of the continuum theory of gravity. This theory is different than the standard model, and unlike the standard model in this theory there is no absolute quantity in nature, and every fundamental quantity involves some kind of mechanism. The derivations in this theory bring back the aether (ether) theory as a stationary aether (totally coupled to mass); a luminiferous aether made of a 4-Dimensional (4D) Electric Scalar Potential (ESP) field.

The development in Part I led to the equation of gravity that besides the mechanics of the classical gravitational law, it also includes an additional attractive gravitational component much smaller in magnitude, and the radial and the tangential inertial components of gravity. Gravity is generated by motions of quantum particles in a 4D ESP differential gravitational field of a source body. The equation of gravity developed in Part I, also describes and explains the effects of the so-called fictitious forces. The additional attractive component of gravity is a key gravitational component, which besides the inertia components of gravity, this component is also responsible for the rest of the fictitious forces, and it is also responsible for some other effects such as for orbital plane alignments, and for clumping of matter. In part I mechanics have been derived for the gravitational constant, for gravitational acceleration, as well as for the permittivity of free space. Based on the formulation of the gravitational constant, singularities in matter are not possible and black holes should poses sustained oscillations like a heart bit.

Except for this fundamental 4-D ESP continuum aether field, nothing in Nature is absolute, not even the speed of light, nor is

time-itself absolute, and as such Part II extends this development to describe the origins of time and matter. The development also covers the mass-energy equation, and the fundamental mechanics responsible for the speed of light. The theory addresses the strong force under the premise that gluons or chromo-dynamics are not the foundation of the strong force, and that ultimately all the 4-fundamental forces originate from the 4D ESP continuum aether field via interactions with constituents of matter-energy. The theory points to a cyclic universe, dark energy which is nothing more than a high density ESP aether bumble of the universe expanding into the low density surroundings of the cosmos, and dark matter which is just embryonic constituents of matter with no light reflection properties.

2. Definition of Mass

In Part I of the theory it was mentioned that central to matter are quanta constituents that originate from the 4D ESP continuum aether, which are quanta fields of electric scalar potentials in units of volt. The 4D ESP continuum aether is the only fundamental quantity in the universe, and under certain conditions such as those that existed during the time of the Big Bang, portions of this continuous field under extreme gradient field stresses broke-down to form discrete field quanta. Also, fundamental to the continuum aether is an extremely high frequency resonance and because of this, a natural resonant coupling is developed between the continuum aether and these quanta constituents. Because of this coupling and once the discrete quanta fields come to existence, their existence perseveres through this coupling mechanism. As such, the quanta mist created in the continuum aether ocean is preserved, which then through this coupling becomes the foundation of all physical existence. This fundamental resonance coupling of the aether with quanta constituents forms the fundamental tick of time, and without it, everything will stand still

as there will be no notion of time or any concept of physical existence.

From the development of gravity carried out in Part I, it appears that kilograms as currently define by the International Bureau of Weights and Measures (BWM), is not be a base unit of Nature. Thus, the attempt here will be to redefine the quantity for mass, under the general definition that mass is a measure of how much matter is contained in an object, and that mass should be referring to a substance that is locality invariant. Currently, mass in any locality is referenced to kg on Earth. In this regard, the universal law of gravity truly refers to mass based upon the evidence that gravity is dependent on mass, rather than weight. As such, the reference of mass to kg on Earth allows the computation of gravitational forces, while at the same time circumventing the lack of understanding of the true substance of mass. The Higgs boson concept offers a fundamental mechanism for particles to obtain mass. However, the theory developed here negates the existence of the Higgs boson. The recent discovery of the Higgs boson is instead, attributed here to the nature of the continuum aether resonance and its couplings with mass quanta constituents, which through this fundamental coupling mechanism tends to favor certain sub-harmonics and momentary fusion of quantum particles at certain energy levels or frequencies. In essence, the continuum aether is the only fundamental entity in Nature, and its two fundamental properties of a very high frequency resonance with its varying density throughout the cosmos, (the known Universe and beyond) are responsible for all physical existence.

Mass quanta constituents couple electrostatically through the fluctuating ESP continuum resonance to develop an electrostatic-like flux field, related to the acceleration of these quanta fields in this oscillating continuum aether field. Similarly - in macro sense; for inertia, an accelerating mass with its accelerating mass quanta in the continuum, will locally generate an elevated gravitational field or gravitational potential.

Since the fundamental continuum field is in the form of a 4D electric scalar potential, this coupling energy acquired by mass in the local continuum should be in the form of an electrostatic potential energy as $P_e \propto q_d Q_l / r$, where q_d stands for the space charge of a given differential mass, and Q_l is the local equivalent or aggregate space charge of the continuum as explained in Part I. As such, the energy in Einstein mass-energy equation, $E=mc^2$, should also depends on the local energy acquired through the overall local mass-continuum couplings (i.e., $E=mc^2$ has locality dependence). In essence, the couplings of mass quanta with the local continuum can be seen as giving rise to continuum Coulomb forces that are associated with continuum electrostatic potential energy.

Instead of an electrostatic potential energy relation between the overall space charge, Q_l , and a differential charge, q_d it may be more appropriate to directly express electrostatic potential energy in terms of a mass-energy relationship, or as a relation between Q_l and these volt quanta constituents of mass, as

$$E_m = Q_l \sum \xi_i \quad , \quad (1)$$

where ξ_i is an indivisible fundamental quantum constituent of mass in units of volts (V), and the summation represents the total number of these quanta fields in a given mass. Equation (1) would be the electrostatic potential energy or simply the energy that a given differential mass acquires in its local continuum. Base on this definition, mass, ξ_i in units of volts is a fundamental unit of mass at comparable Planck length scales, while mass as defined in kg would be expected to have local continuum potential energy dependency. However, the referencing of solar body masses to Earth's kg, computed by using the universal law of gravity, removes this dependency, and as such mass as currently defined in kg still pertains to the same amount of mass quanta constituents, ξ_i .

By setting Eq. (1) to the Einstein's energy equation, $E=mc^2$, m can be solved as $m = Q_l \sum \xi_i / c^2$, where $Q_l = Q_e + Q_c$ on Earth and as described in Part I, if the base continuum equivalent space charge, Q_c , is neglected for this calculation, $m \approx (q_M M_e / c^2) \sum \xi_i$. For simplicity, the summation of quanta contained in one kg of mass, m_u , on Earth can be represented as a base unit, ξ_u , and by solving this equation for the base unit ξ_u , the following relation is obtained:

$$\xi_u = \xi_i / m_u = c^2 / (q_M M_e) \quad (2)$$

By substituting the values of $q_M M_e$ or the value of Q_e that was found in Part I, the value of this base unit can be calculated as:

$$\xi_u = (2.9979 \times 10^8)^2 / 6.5082 \times 10^{10} = 1.3809 \times 10^6 \text{ V/kg.}$$

Since it can be assumed to be impossible to physically measure this new quantity of mass, which is observable only at Planck-length scales, the mass for different localities other than Earth can still be referenced to the Earth's mass in kg, or alternatively this unit of mass can be calculated using the law of gravity. Let us see, however, if this new unit of mass is supported by respective known quantities. By utilizing the previous derived equation, $m = Q_l \sum (\xi_i / c^2)$, and by substituting this mass unit ξ_u , the following calculation can be made:

$$\begin{aligned} 1 \text{ kg} &= Q_l \xi_u / c^2 = (6.5082 \times 10^{10})(1.3809 \times 10^6) / c^2 \\ &= 8.987 \times 10^{16} / c^2, \text{ CV/c}^2 \end{aligned}$$

Knowing that $1 \text{ GeV/c}^2 = 1.783 \times 10^{-27} \text{ kg}$; that is, a proton is 0.938 GeV/c^2 , which is $1.672 \times 10^{-27} \text{ kg}$, 1 kg can be calculated as

$$1 \text{ kg} = (1 \text{ GeV/c}^2) / 1.783 \times 10^{-27} = 5.608 \times 10^{35} \text{ eV/c}^2.$$

It is also known that the charge of one electron is $e=1.602 \times 10^{-19} \text{ C}$. By substituting this value in the equation above the following calculation can be made:

$$\begin{aligned} 1 \text{ kg} &= (5.608 \times 10^{35})(1.602 \times 10^{-19}) \\ &= 8.984 \times 10^{16} \text{ C V/c}^2 \end{aligned}$$

The value from this calculation for 1 kg of mass agrees with the previous calculation within the calculated accuracy using the new

definition for mass, which shows that this derived base unit of mass, ξ_u , is in concert with other known base quantities of Nature.

Even though, the unit volt is in units of $\text{kg m}^2 / \text{C s}^2$, at Planck length scales kg is not a base unit, and at these scales the volt will be the base unit and this relation will be reversed as

$$m = Q_l \xi_m / c^2 \quad (3)$$

While in Part I the continuum aether parameters q_M and q_a were derived using kg as the unit of mass in the gravitational law and in the inertial relation, instead of volt for the fundamental constituent of mass or energy, these parameters are nevertheless correct considering that the gravitational forces are dependent on mass rather than weight.

3. The Mass-Energy Equation

Based on Eq. (3), mass, kg , is proportional to $1/c^2$. By substituting Eq. (3) into the Einstein energy equation the following relation is obtained, $E = Q_l \xi_m$, which is essentially the same as Eq. (1). As shown in the previous section, the amount of energy contained in 1 kg of mass on Earth is 8.987×10^{16} joules, which agrees with the equation $E = m c^2$. If the equation for Q_l from Part I is substituted in the above equation, then the energy equation can be expressed as

$$E_m = (q_M M_k + Q_C) \xi_m \quad (4)$$

which has locality dependence, because of the of the presence of the local mass, M_k , in the equation.

According to Eq. (4), one kg on Earth when taken into deep space and totally converted into energy will produce approximately $Q_C/Q_e = 1.5691 \times 10^{-7}$ times the amount of energy it would produce on Earth. Taking one kg of mass from Earth and transporting it into space (away from the Earth's gravitational influence), it would be expected to take the same amount of energy as the kinetic energy of the object moving with the required Earth's escape velocity. Knowing that Earth's escape velocity is $11,175 \text{ m/s}$, this energy can be calculated as $E_{ke} = 1/2(m)v^2 = 6.2 \times 10^7 \text{ J}$. This amount of energy is substantially less than the difference in energy that can be calculated using equation $E = Q_l \xi_m$ with the value calculated for Q_l for Earth in Part I and for the value of ξ calculated in the previous section for 1 kg of mass. So there appears to be a discrepancy, assuming that conservation laws also apply with respect to the space-time continuum, which may or may not be the case. It could also be that nowhere near 100% mass to energy conversion efficiency is possible.

4. The Speed of Light

So far the nature of the 4D electric scalar potential continuum has been described as fluctuating with a wavelength comparable to the Planck length scale. Currently, there is no proven physical significance for Planck's length, even though according to the uncertainty theoryⁱⁱⁱ - the uncertainty relation between the Schwarzschild radius and the Compton wavelength, the Planck length is the limit below which the very notions of space and length cease to exist. If the assumption is that Planck's length is

the smallest possible length scale, and as the continuum according to this theory encompasses all physical scales, then it is assumed that the wavelength of the continuum resonance is at the Planck scale.

Much like mass quanta constituents, photons too are envisioned as made of the same electric scalar potential quanta, or constituents of mass-energy. The arrangement of a photon at its lowest energy state is envisioned to be consisting of 2 opposite charge quanta, which are bounded together to develop a neutral charge. The photon quanta constituents are also assumed to have an intrinsic or a continuum resonance-induced oscillation that aids their electromagnetic bonding. The continuum resonance is envisioned as a standing wave with oscillating peaks and troughs in space, resembling a 3 or 4D foaming structure. The wavelength of this standing wave is constant in all 3 dimensions of space, and while the oscillating peaks and troughs provide for the electrostatic force that propels the photon quanta, the constancy of the continuum wavelength in all 3 spatial dimensions provides for the constancy of the speed of light. Through this electrostatic resonance, the electrostatic force that propels the photon comes directly from the continuum and as such it is not subject to the physical law of energy conservation.

Objects in space elevate the local ESP of the continuum in proportion to their mass, and even though this doesn't change the constancy of the wavelength of the continuum resonance, it causes the reference of the local ESP to slant upwards towards the object. As such, adjacent peaks of the continuum resonance, in the direction of the object, sit at an ever slightly higher ESP. This causes the trajectory of a passing photon to bend ever so slightly in the direction of the elevated electrostatic potential or in the direction of a space body, for every passing wavelength. Inside a black hole this ESP continuum elevation is more exaggerated, which causes light that originates inside a black hole horizon to completely reverse its course and fall back inside the black hole.

In the Michelson-Morley experiment, for the same distance light travels on Earth, it should take exactly the same time, independently of the direction of the beam of light. This is because, **a)** the aether is stationary or tightly coupled to mass, and **b)** for the same distance light travels and for gravity being the same in all direction in the experiment, light encounters a fundamental resonance with constant frequency, constant wavelength, with constant electrostatic magnitude in all directions, while it encounters an equal number of resonant wavelengths in its path.

Figure 1a shows a cartoon depiction of this continuum resonance in 1D, at a reference local ESP, Φ_r , an amplitude Φ_a , with the solid line signifying the standing waveform at a time $t + T_C/2$, while the dash line signifies the resonant waveform at time $t + T_C$, where T_C is the period of the fundamental continuum resonance. The Figure also shows a cartoon of a photon at its lowest energy state comprised of two quantum constituents; one of them topologically situated above the reference potential (- charge), and the other situated below this potential (+ charge). One way these

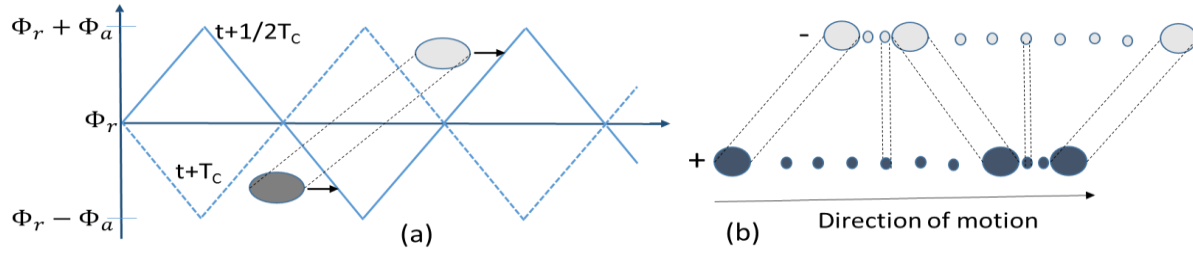


Figure 1. Depiction of topological continuum resonance in 1D showing a) a lowest energy photon translating through the resonance, and b) the induced oscillation of the photon constituents as they translate through the resonance.

2 constituents may be bounded together is through their opposing electrostatic charges, but also electromagnetically through a foreseeable oscillation, such as the one shown in Fig. 1b. There is however, another possibility that will be covered later. The constituents of mass-energy are Gaussian wave packets, such as those generally described by the Dirac equation. At a certain instant in time the 2 constituents of the photon are electrostatically attracted and moving towards their respective peak-trough shown in Fig. 1b. As they are about to come into contact with these peaks, the standing wave changes to the shape shown by the dash line, at time $t + T_c$. Continuing in this path, the photon constituents are attracted next by the peaks of the dashed line wave. Due to the electrostatic attraction between the photon constituents and the spatial proximity of these peaks, an oscillation between these constituents is expected to be induced as they successively translate through these peaks and troughs, as shown in Fig. 1b.

With the assumed wavelength of the continuum resonance at Planck length and with the mechanism described for the translation of a photon through the continuum aether, the speed of light can be formulated as

$$c = f_c \lambda_c = \lambda_c / T_c \quad (5)$$

where f_c is the frequency of the fundamental continuum resonance, and λ_c is its wavelength. Substituting this equation into Eq. (3), the mass-energy equation can be expressed in terms of the fundamental continuum resonance as

$$m = Q_l \xi_m / (f \lambda)_c^2 \quad (6)$$

As seen, Eqs. (5) and (6) remove the speed of light from being an absolute or a fundamental quantity of nature, and the Einstein energy equation can now be stated as $E = m(f \lambda)_c^2$. The effective wavelength of the continuum is expected to be increasing as the universe continues to expand in an accelerated expansion, and as such the speed of light is expected to change accordingly as this acceleration effectively stretches this wavelength at the Planck length.

5. The Definition of Time

This fundamental resonance is actually responsible for the Planck length, defined in literature as $l_p = \sqrt{\hbar G / c^3} = 1.61619926 \times 10^{-35}$ (\hbar is the reduced Planck constant), which in this development is defined as the wavelength of this

resonance, λ_c . Besides the speed of light, this fundamental resonance is also responsible for the smallest possible discrete unit of time. From Eq. (5), the frequency of the continuum resonance can be calculated as $f_c = c / \lambda_c$, and by neglecting any stretching of the wavelength, λ_c , due to the accelerated expansion of the Universe, the frequency of the continuum resonance can be computed as

$$f_c = 299792458 / 1.61619926 \times 10^{-35} = 1.8549226 \times 10^{43} \text{ Hz.}$$

As this fundamental continuum frequency becomes the seat, or the origin of, all electromagnetic and gravitational effects, then this frequency can also be associated with the most fundamental unit of time, meaning that without such a continuum resonance, time will not be a defined quantity. As such, the fundamental quantized unit of time can be calculated as

$$t_c = 1 / f_c = 0.539106 \times 10^{-43} \text{ s.} \quad (7)$$

This would be the smallest unit of time, or theoretically the smallest time measurement that will ever be possible, below which time can neither be subdivided nor can it be defined. This time unit is defined in literature as the *Planck time* [iii](#), as $t_p = \sqrt{\hbar G / c^5} = 0.539106 \times 10^{-43} \text{ s}$. As it stands in current literature, the significance of the Planck time is that this is the time it would take a photon traveling at the speed of light to cross a distance equal to one Planck length.

A question can be raised as to whether the elongation or stretching of this fundamental wavelength can be neglected due to the present expansion rate of the Universe. The expansion rate of the Universe at present is defined experimentally by the Hubble constant [iv](#). Locally, this expansion rate is approximately $H_o = 7 \times 10^{-10} \text{ m/s}^2$, so that the distance that the Universe expands locally in 1s can be computed using the acceleration-to-distance relation as $d_t = H_o t^2 / 2 = H_o / 2$. During the time of 1 sec, there are f_c number of wavelengths. Thus, the delta wavelength is $\Delta \lambda_c = H_o / (2 f_c)$. The percent wavelength elongation due to the present rate of expansion of the Universe can be expressed as

$$\lambda_{c, \text{enlg}} = [(1/2 H_o) / f_c] / \lambda_c \times 100 = H_o / 2c \times 100\%,$$

which can be calculated as

$$\lambda_{c, \text{enlg}} = \frac{7 \times 10^{-10}}{2(299762458)} \times 100$$

$$= 1.17 \times 10^{-16} \% ,$$

which is negligibly small and can be neglected.

Similarly to Fig. 1, Fig. 2 shows a cartoon of mass quanta constituents in a 1D slice as they oscillate with respect to the continuum resonance, with the solid arrows showing direction of motion at time $t + T_c / 2$, and the dash arrows showing motion at time $t + T_c$.

At this point it may be prudent to step back to contemplate how these quanta constituents came into existence and how they are coupled or situated with respect to the continuum resonance, which besides matter, gravity, and time, it also defines charge polarity in electrostatics. Just prior to the Big Bang, and due to large gradient stresses of the collapsing continuum, quanta constituents came into existence as they broke-off from the peaks and troughs of the continuum resonance, while the continuum and its resonance remained in place. Then, an electrostatic coupling came into existence between these quanta constituents and this fluctuating continuum resonance. Because of the different topological arrangements between the peaks and the troughs, at the instant the quanta constituents broke-off, their respective coupling oscillations with the continuum resonance resulted in the establishment of an equal number of opposing quanta spins. Referring to Fig. 2, these resonant oscillations in 3-D space would be in the form of circular or orbital type motions, instead of back and forth motions. If quanta constituent motions were back and forth as shown in Fig 2, the magnitude of the acceleration of this motion would be enormously large, considering the fundamental time cycle and wavelength of this motion. Therefore, as the clouds of these fundamental quanta constituents spin or orbit, while the local resonant peaks fluctuate, an electrostatic force is exerted from each peak or trough, which causes relatively modest accelerations of the constituent clouds in the course of an orbital. The acceleration of the volt quanta clouds in turn results in a local charge flux density, which becomes the sit of gravitational potential, and at the same time the orientation or spin of these Planck scale motions becomes the foundation of charge. This orbital motion and interaction with adjacent quanta also becomes the foundation of electromagnetism.

While the aggregate coupling of the volt or space charge quanta constituents with the continuum resonance is responsible for elevating the local gravitational flux or potential (i.e., gravity is proportional to mass), the distinction between positive and negative charge is because of the opposing spins of these quanta constituents with respect to the continuum. For instance, the reason opposite charges attract, is because topologically their adjacent opposing spin quanta orbitals and respective coupling with the continuum resonance causes no continuum interference or a minimum energy state with the continuum 4-D ESP.

Thus, gravitational flux field is generated from the aggregate acceleration of these constituents in the course of their orbits, which is a summing process and independent of the direction of the spins. However, for electrostatics or electromagnetism, the direction of the spins matters. In the deepest quantum levels (the Plank length scale) volt is the base unit, instead of charge. Because gravitational and electrostatic fields have the same origins

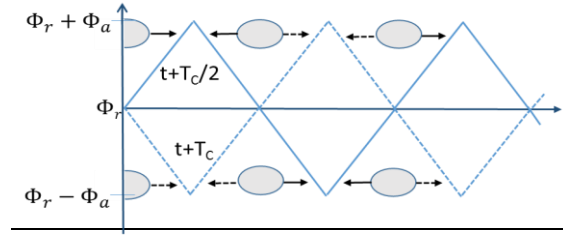


Figure 2. Depiction of continuum resonance in 1D showing the oscillation of mass quanta constituents with respect to the resonance, with the solid arrows showing the motion of these-quanta at time $t + T_c / 2$ and the dashed arrows showing the motion at time $t + T_c$.

involving this quanta-continuum coupling mechanism, both of these fields are longitudinal type fields with seemingly no propagation time delay. This is in contrast to electromagnetism, which is based on transverse fields that propagate by the motion of photon quanta.

The opposing spin motions of these adjacent quanta in 3D coordinates generates electromagnetic couplings, and becomes the means for the fundamental electromagnetic cycle for energy exchange and thus, it provides for the fundamental tick of time. As the velocity of a mass approaches the speed of light, the resident time of quanta in the continuum resonance will be reduced accordantly, which correspondingly reduces the amplitude of the quanta oscillation with the continuum resonance. At the limit of the speed of light, this oscillation will be reduced to zero, and since this oscillation is the foundation of time, time ceases for a mass who's velocity approaches the speed of light. As the amplitude of quanta constituents oscillations reduce to zero, the electromagnetic cycle that facilitates energy exchange or energy transfer correspondingly reduces and at the speed of light limit. Thus, there will be no electromagnetic interaction between mass quanta, and no way to transfer energy to cause a mass to travel at or beyond the speed of light, and effectively causing time to cease for a mass moving at the speed of light. Also, reduction in the amplitude of this oscillation or coupling, proportionally effects apparent time in a moving frame of reference. As it will be seen later however, the speed of light cannot be violated, but it can be circumvented.

Based on that, the Einstein mass equation $m = m_0 / \sqrt{1 - V^2/c^2}$, is not correct. As mass will not increase to infinity as speed approaches the speed of light. Rather, the efficiency by which energy can be applied to accelerate a mass to the speed will precipitously fall to zero near the speed of light. Thus, as the energy in the Hadron Collider is increased to accelerate protons to nearly light speeds, it will be found that the acceleration energy utilized and the resulting theoretical calculations of particle speed and mass will be considerably different than those found in the energy of the collisions.

It is known that closer to a space body time passes slower than away from it. This is due to the elevated ESP near such bodies that causes reduction in the amplitude of the fundamental oscillations

and thereby, causing reduction in the amplitude of the corresponding electromagnetic cycle. Thus, reducing the coupling and the rate of energy exchange between quanta constituents, which effectively reduces the passage of time.

6. Circumventing the Speed of Light

While a mass cannot travel faster than the speed of light, there is nothing preventing an aether-mass system from traveling faster than the speed of light, if the aether is propelled or is in motion rather, than the mass itself. As in such a system, the aether is in motion, while the mass can remain stationary with respect to its local aether. In actuality, a mass in motion constitutes an aether-mass system in motion with respect to the surrounding aether.

Based on instantaneous gravitational effects that space bodies have on each other, it has been ascertained before that gravitational waves can propagate instantaneously, or at the very least, many orders of magnitude faster than the speed of light. Or else, how can the Sun attract the Earth based on its instantaneous location, rather, than its light delayed position in the sky. It is an accepted fact however, that the influences of scalar electric fields are felt instantaneously or without involving propagation delay. Since in this development gravitational waves are a form of scalar electric like waves, it will be assumed that gravitational waves are indeed, much faster than the speed of light.

The reason that electric scalar waves are faster than the speed of light is attributed here to the nature of these waves, which are longitudinal \underline{v} (i.e., amplitude varies in the direction of propagation), which are not photon derived waves. In contrast, electromagnetic energy radiation is based on transverse waves that are derived from photon propagation. Because longitudinal scalar waves are not quanta propagation waves, such waves are not bounded by the quanta-continuum coupling mechanism described in this theory. Therefore, it is expected that longitudinal type waves can also directly couple to and elevate the 4D electric scalar potential of the continuum.

Recent observations that are claimed to have detected gravitational waves are attributed here to be due to either electromagnetic energy radiation - rather than gravitational, miss interpretation of the data, or even errors accounting for noise sources. Gravitational or scalar electric waves should be extremely difficult, if not impossible, to measure, even with very long space-based interferometers, as their propagation speed is at least many orders of magnitude faster than the speed of light.

If somehow the local space-time continuum could be made to move, one could potentially travel with the speed of gravitational waves, without necessarily violating the speed of light limitation. That is because the quanta of mass inside this locality would not be in motion with respect to the local continuum. A spaceship can remain stationary with respect to local space-time continuum, while the local continuum can be put in motion with respect to the global 4D continuum aether.

A high intensity longitudinal electrostatic potential field could be artificially generated and such a field would naturally become superimposed on the local continuum to raise its potential. Such a generated field should produce an electric scalar like wave,

which potentially could propagate with the speed of gravity. If an electrostatic like wave can be generated and pulsed, then it is foreseeable that this wave will be expanding with every pulse to propagate with the speed of gravitational waves. If the expansion of such a wave could be directionally controlled, then the expanding continuum should be dragging with it the local space-time continuum, and any mass that resides inside its locality. It is foreseeable that the higher the pulsing frequency of longitudinal waves is, the more efficient the dragging and propagation should be for the local space-time continuum. Also, to effectively be able to propel the local space-time continuum, it would likely require a relatively high intensity longitudinal field.

A simplified schematic of a potential continuum contraction and expansion system is shown in Fig. 3. Such a space-time drive could be comprised of a longitudinal type, high-frequency pulsing electric potential generator. Such longitudinal waves could be produced with Tesla type pancake transformers, with resonant primary and secondary winding circuits. For example, a capacitor could be used in the primary with the transformer winding inductance forming an LC tank, with a spark gap or other appropriate transistor switching used for resonant pulsing. The secondary of the last transformer stage would be designed as a pancake transformer. Either the positive or the negative terminal of this secondary, depending whether the generator is designed for continuum contraction or expansion, would be connected to a conducting metallic surface or sphere, which transmits the longitudinal waves in space. It may be necessary to employ electrostatic screens in the transmitting apparatus to provide wave directivity.

Such longitudinal wave generators; one for continuum contraction and the other for expansion could be attached on either side of a spacecraft, as shown in Fig. 7. Even though, only one type of this generator system could be sufficient to make this

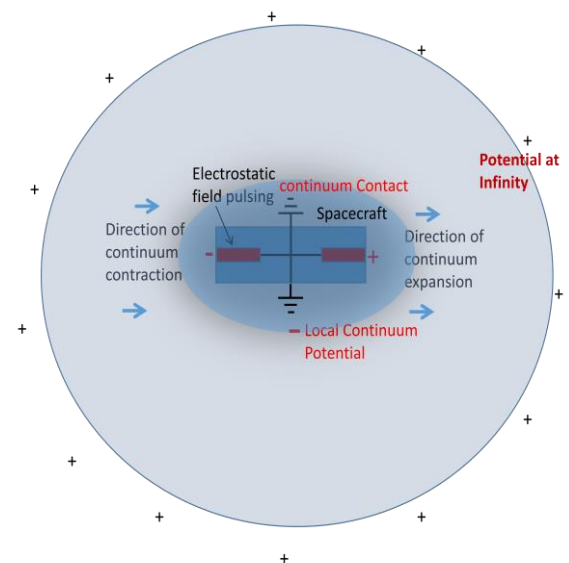


Figure 3. A potential configuration for a future propulsion system based on contraction and expansion of the continuum.

system work. In the two-generator configuration, the center of the spacecraft would be electrically grounded to the local continuum potential via a plasma contactor or via an exposed electric contact surface, like a metallic ring or a metallic disc around the craft. One of these generators would be pulsing with a high positive potential with respect to the ground, while the other would be pulsing with a highly negative potential. Assuming that the outskirts of the continuum bubble that contains our universe has a positive potential with respect to the inner continuum, then this highly negative pulsing electrostatic potential should cause the space-time continuum to collapse on the aft side of the craft, propelling the local continuum together with the craft forward. Similarly, a highly positive pulsing potential on the port side of the craft should cause the continuum to expand in the direction of motion - dragging the craft forward in this process. If instead, our universal bubble potential polarity was reversed, then the exact opposite would be true. Thus, by collapsing and/or expanding the continuum, this could potentially propel the local space-time and the spacecraft that resides inside it with speeds comparable to those of gravitational or electrostatic waves.

In terms of determining the relative electrostatic potentials that may be necessary to develop a practical space-time drive, the strength of the continuum potential on the surface of the Earth could be used as a starting point. This would be the differential electric scalar potential discussed before, due to the presence of the Earth's mass in the continuum. Given the effective space charge of the Earth, Q_{Me} , as calculated in Part I, and equivalently assuming that this charge is located at the center of the Earth, the electric scalar potential on the surface would be

$$\Phi_{es} = \frac{Q_{Me}}{4\pi\epsilon_0 r_e} = \frac{6.5082 \times 10^{10}}{4\pi \times 8.854 \times 10^{-12} \times 6.321 \times 10^6} \\ = 9.254 \times 10^{13} \text{ volts,}$$

which implies that on the surface of the Earth a differential continuum 4D electric scalar potential exists of about 93 trillion volts. Coincidentally or not, this scalar potential is about the same as the continuum scalar potential, Φ_c , calculated in Part I. To produce such a high voltage potential it would probably require several electrical transformers in series. Such a high voltage would be expected to present challenges for a relative compact size design, and for transformer winding isolation to prevent arcing and breakdown, which may require an enclosure with a high vacuum containment. Successfully generating such a longitudinal scalar like wave, there would be no containment or shielding that would be able to attenuate its propagation. Since such a wave will penetrate into Planck scales and its propagation will not depend on photon energy transmission.

Such a high potential generated on or near the Earth's surface would be expected to have very visible electromagnetic effects. However, these effects may not be so pronounced considering that the generated scalar wave field would become superimposed on the local 4D continuum and that fundamental quanta of mass in the vicinity would be coupled to this field.

Since the local continuum would be moving with this space-time drive instead of the spaceship, it is also to be expected that

with such a drive there would be no space inertia forces experienced by the spacecraft. This is because the mechanism described in Part I that generates space inertia forces would not be involved in this case. Thus, it is possible that with this kind of drive, the local continuum and a spaceship inside it could theoretically be capable of making extreme maneuvers and 90° turns without violation of momentum conservation.

7. The Cyclic Universe

According to this theory, a 4-D ESP field permeates the universe as a stationary aether. The universe owes its accelerated expansion to the differences in ESP density that exists across the expanse of the universe and beyond, as the higher density bubble of our universe is expanding into the lower ESP density surroundings of the cosmos.

If the Universe is expanding concentrically towards the outer surrounding regions of the cosmos that have a lower density (either positive or negative potential), then over time the central regions of the universe would be expected to become increasingly devoid of the aether. So at some point, this wave motion of the aether will reverse course and begin to collapse concentrically. This collapsing aether continuum is also part of the cycle that preceded the Big Bang, in which case our Universe would be a cyclic Universe. If a continuum collapsing was taking place prior to the Big Bang, then some process during this collapse was responsible for creating matter or energy quanta constituents, which subsequently led to the Big Bang.

When the concentrically collapsing waves reached the central region of the bubble and as the continuum continued to collapse, its density at this central region of space and the associated gradient stresses would have started to increase unabated. The maximum stress points are envisioned to have occurred at the peaks of the standing wave resonance, perhaps in the radial direction. As these continuum stresses increased, at some point the continuum would have started to fragment at these resonant locations, creating individual Planck scale electric scalar potential fields, like the spray mist of an ocean. Once the quanta potentials were created, they immediately coupled with the continuum resonance, and as such, their existence would have persevered through time. Assuming, that in this process the continuum resonances shattered at the peaks or the trough of this wave, the length of these quanta constituents should be comparable to the wavelength of the continuum resonance. Thus, the continuum resonance with its coupling becomes the scaffold upon which quanta constituents of mass or energy adhere to in order to create the foundation of mass and energy, which bring forth the conditions of a stationary aether.

As these quanta started to be created and squeezed inside the concentrically collapsing space-time continuum, all the attributes of matter and gravity should have begun to coexist for the first time. In this process, a very high density and uniformity of mass and energy would have been created within a confined central region of space. The uniformity of this matter-energy bubble would have been aided by increasing quantum orbital speeds and perhaps orbital plane alignments with radial planes in order to

generate maximum tangential orbital velocities without violating the exclusion principle. At the same time while temperatures and outward pressures would have continued to increase. Based on the mechanism for the gravitational constant described in Part I, this bubble of mass and energy would have undergone an oscillation cycle of repeated squeeze and expansion, against the pressure of the collapsing continuum. At some point during this oscillation cycle, as temperatures and outward pressures kept increasing while the continuum collapsing was taking place, parity was reached in terms of the pressures and continuum densities, and in a final gasp the Big Bang explosion took place.

After the Big Bang explosion, the Universe and its continuum aether began to expand. For some time afterwards, the universe continuum expansion could have still been crashing against the incoming collapsing waves of the continuum, and perhaps this may explain why for the next five billion years the universe continued to inflate at a decelerated rate of expansion, (III).

Assuming this accelerated expansion continues long enough, then at some point during this expansion the effective resonant wavelength of the continuum should become long enough that quanta constituents will no longer be able to maintain the resonant oscillation cycle and thus, their coupling with the continuum will cease. At that point, it would be expected that the quanta that makes-up matter and energy will return and become part of the continuum ocean, at which point all quanta derived energy, all mass, as well as time in a physical sense will cease to exist. In this process of the universe's demise however, a new cycle begins and a new universe will be born.

Based on this cycling universe hypothesis, it would not be unreasonable to imagine that our universe may not be the only universe in the vast expanse of the Cosmos, and that the cycling or the faith of our Universe and its ESP bubble may even depend on the nature of neighboring universes, as universes may be spread out as stars are spread in a galaxy.

8. The Strong Force and Atomic Orbitals

The equation of the radial acceleration component of gravity introduced in Part I also has the proper structure to be a candidate for the strong force. Using that equation for the strong force, the force should increase, pointing towards the nuclear center when acceleration increases in the opposite direction, and similarly the force should decrease when acceleration is towards the nucleus center. However, for the size of the masses involved in the nucleus, this force would be negligibly small to be a candidate for the strong nuclear force, which is in the order of 10,000 N. Nevertheless, in this theory massless force-carrying particles like the graviton should not exist, and along the same lines the existence of the strong force as fundamental force in nature may need to be rethought.

It can be assumed that the three quarks are not exactly solid spheres and that they may contact each other on the surface, or even overlap with one another in pancake like arrangements, as these quarks may even share quanta mass constituents. If there are quanta constituents of mass shared between quarks, obviously there should be additional bonding forces. Especially, if

continuum couplings and resulting electromagnetic couplings are taking place to aid this bonding. If quanta mass constituents are shared between quarks, there is no reason that such constituents could not be shared between protons and neutrons in a nucleus. The scale of the proton is of the order of 10×10^{-15} m, while the Planck scale of mass constituents is in the order of 10×10^{-35} m, which is a vast difference of scale. Thus, there is so much room that remains for coupling and bonding between quanta and for forces to take place.

Besides these potential couplings, the strong force which is approximately 10,000 N, may still be primarily or exclusively an electrostatic force. If the 3 quarks in a proton were spheres, with the down quark sandwiched between the 2-up quarks, their separation distance would be approximately $1/(3 \times 10^{-15})$ m. For pancake shapes, however, the separation distances between quarks could be even less. The quarks are also expected to resemble flexible or elastic cloud sheaths, instead of solid masses. As such, if a force is applied to separate them, these clouds can stretch or rub against each other, which can cause their separation distances to further decrease, as they are electrostatically attracted. The separation distance required to produce an electrostatic attraction force of 10,000N can then be calculated as

$$r = \sqrt{\frac{K_e q^2}{F}} = \sqrt{\frac{8.99 \times 10^9 ((1/3) 1.6 \times 10^{-19})^2}{10000}} = 5.06 \times 10^{-17} \text{ m},$$

which is only a factor of 6.5 or less reduction of the original estimated distance between quarks. This is not even taking into account the distributed effect of the electrostatic force in the quarks *vs.* that of the point source assumed here, which could also significantly increase this force. Therefore, it is conceivable that the strong force is primarily or purely an electrostatic force.

Quarks that make-up protons and neutrons and their quanta constituents could also have certain topological arrangements and a vibrational relation with the continuum - in the process creating associated energy wells that are responsible for electron orbitals in the atom.

9. Satellite Galaxy Orbital Alignment

Recently it has been found by telescope observations that satellite galaxies orbit in alignment with the galactic planes of their mother galaxies.^{vii} Because satellite galaxies are captured galaxies, and based on the standard model, these galaxies should be instead swarming their mother galaxy in no particular orbit orientation. However, observations show that the orbits of satellite galaxies are more aligned with host galactic planes, suggesting that there should be a different kind of physics that explains this behavior. The continuum theory however, can explain this behavior with its prediction of an additional gravitational force component as stated in Part I (*i.e.*, the second component in the following equation:

$$F_{gm1} = -q_M m \frac{\Psi_M}{r^2} \left(\frac{2}{\pi} |\bar{V}_r| + |\bar{V}_{mr}| \cos \theta_{mr} \right) .$$

Figure 4 depicts the galaxy continuum equipotential lines. It also shows an inclined orbit of a satellite galaxy in gray color. Fig.

5 shows a close-up depiction of the ESP equipotential lines in the z-direction. The object's orbit at some moment in time is crossing the galaxy's equipotential, $\Phi_{x=K,z=3}$. As the gradient of the flux field varies in the z-direction, a gravitational force is acting at that moment on the orbiting object, which can be expressed as

$$\mathbf{F}_{gz} = -q_M m_o \left(\frac{\Psi_{x=K,z=3}}{r^2} \right) \mathbf{V}_z, \quad (8)$$

where subscript 'o' signifies the orbiting object. Because both the galaxy's ESP flux density and the satellite's velocity components are in the z-direction, $\cos\theta = 1$. Also, as both the divergence of this field ($\nabla \cdot \mathbf{A}_K$) and the velocity vector are negative at that point, the gravitational force generated from this gravitational component points towards the galactic plane and it's normal to that plane. This shows that over a long period of time this force component, which is normally much smaller than the Newtonian component of gravity, will cause the satellite galaxy to align its orbit with the galactic plane.

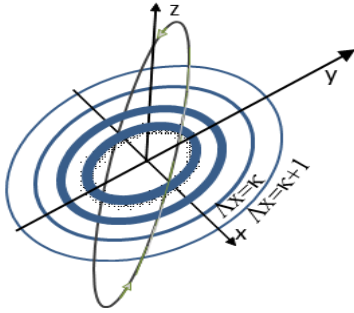


Figure 4. Depiction of the continuum electric scalar equipotential lines along the orbital plane, also depicting an orbit (gray) offset from the plane.

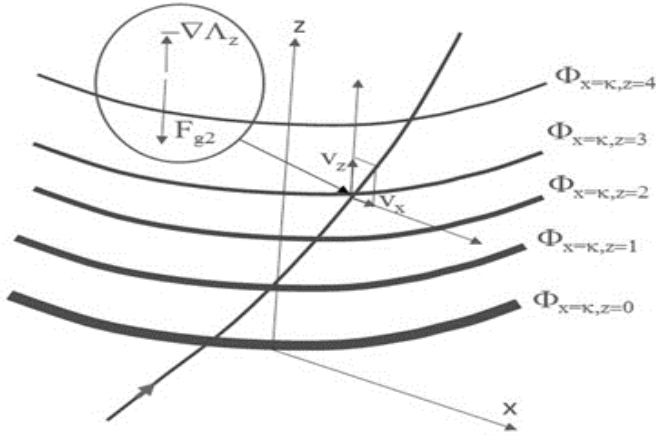


Figure 5. A close-up depiction of continuum electric scalar equipotential lines along the z-axis (normal to the galactic plane). Also shown, the gravitational force generated due to the dot product $[\mathbf{V}_z \cdot \nabla \Lambda_z]$ at the point where the orbit crosses the equipotential line $\Phi_{x=K,z=3}$ situated on the orbital plane (velocity vector away from the source is negative).

10. Fictitious Forces

In Part I it was shown that the inertia force is not a fictitious force, and the same was shown for the centrifugal force, which is also due to the inertia force. Similarly, for the Euler force, which is

perpendicular to the centrifugal force, as this force is also an inertia force.

While the Coriolis force is a little more involved, the Newtonian component of gravity will be pulling a water particles towards the center of the Earth. At the same time, the additional component of gravity will be pulling the water particle towards the center of the pipe, like toilet pipe. The combination of the 2 forces will give a water particle a spiral trajectory - also in combination with centrifugal forces. If all these forces are drawn along spoke planes, through an imaginary pipe extending to the center of the earth and to the other side, it may be noticed that on the other side of the earth (north vs south hemisphere), the combination of these forces will be such that the spiral trajectory will be in the reverse direction, which is a known fact (i.e. water spirals counter-clockwise on the north hemisphere and the reversed in the south).

Frame-dragging in the vicinity of an orbiting mass like the Earth, is the centrifugal force described in this theory, but somewhat in reverse. As described in part I, a rotating object imparts a tangential velocity change on a given differential mass in the object, and velocity change with respect to time is acceleration. As described in this theory, acceleration of mass generates a local ESP flux field or an elevation of the local gravitational field, whose source is the instantaneous location of the mass or differential mass. As the continuum itself, is a 4-D ESP field, the 4-D continuum is also gravitationally attracted to the elevated gravitational potential generated by the acceleration of the collective differential masses in a large object. Thus, this mechanism explains the mechanics of frame-dragging.

11. Conclusion

In this paper the theory of gravity described in Part I was extended to cover the concept or the origins of mass, which is different than the Higgs boson. The theory also describes the quanta constituents that are responsible for both mass and energy, and how it is all manifested through a continuum aether resonant coupling at Planck length scales. The paper also covers the mechanics for the speed of light and shows that the speed of light is not an absolute. It also describes how the speed of light can be circumvented and the potential technology to make this practical has been described. The theory also describes the concept of time and the mechanism for the fundamental tick of time. It also describes a hypothesis for a cycling universe, what may have preceded the Big Bang, the conditions that led to the Big Bang, and how this cycle may repeat itself. The theory also explains the origins of the so called fictitious forces and how these forces are real forces of nature.

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