Quantum Gravity, Fictitious Forces as Real Manifestations of Gravity, and Related Effects

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Abstract

The paper delves into the intricate relationship between gravity and quantum mechanics, drawing upon a previously developed physical-mathematical theory of gravity. The theory posits that gravity and mass originate from a stationary four-dimensional electrostatic energy field, wherein fragments of energy at Planck length scales electrostatically interact with this field. The article further elucidates the mechanics of this coupling mechanism and presents pertinent equation relations. In this context, gravity is not associated with quantum probability or the Born Rule, as gravitational mechanics operate at the deepest fundamental level. The theory assumes that randomness is not an inherent aspect of reality. Consequently, the article also explores the concept of fictitious forces, which are regarded as genuine manifestations of gravity. The theory suggests that the gravitational constant is contingent upon the velocities of quantum particle constituents relative to a gravitational field gradient and, consequently, dependent upon the composition of matter. As will be discussed, however, this variability does not necessarily in contradict the equivalence principle, while related results from binary pulsar period measurements are being considered.

Introduction

Albert Einstein's renowned equation, $E = mc^2$, postulated the equivalence between matter and energy. This equation posits that energy is the fundamental element of matter, while quantum mechanics theories identify the particle-wave duality as the building blocks of matter. Despite developing GR (General Relativity) independently of quantum mechanics, Einstein retained the belief that matter is composed of energy. The "one-stuff" interpretation of $E = mc$ was adapted in Einstein and Infeld (1938), Ref. 1. In Silverberg and Eischen, (2020), Ref. 2, an energy field theory based on fragments of energy was proposed as the foundation of mass. This concept was utilized to solve the Mercury precession and the bending of light independently of GR. This article delves into a physical-mathematical theory that posits matter at its most fundamental level is composed of discrete quanta of energy. Consequently, this theory facilitates investigations into quantum gravity, fictitious forces, and other related phenomena.

The belief here is that identifying the fundamental substance that matter is composed of is crucial in bridging the gap between gravity and quantum mechanics, as well as illuminating other areas of physics. The article is grounded on the Continuum Theory of Gravity (CTG), proposed by Kopasakis (2017), Ref. 3. Investigations conducted led to findings that gravity originates from a stationary four-dimensional (4D) electrostatic field, similar to the Higgs field, coupled with electric scalar potential energy quanta at the Planck length scale, thereby forming the foundation of matter. Consequently, the theory asserts that there exists a fundamental building block beyond the particle and wave. Regarding the formulation of G provided in this theory, evidence suggests that the gravitational constant is not a constant. As it currently stands, the non-constancy in G violates the *equivalence principle*. However, it will be clarified that this may not necessarily be the case. In Bisnovatyi-Kogan, Ref. 4, the constancy of G over time was investigated through analysis of measurements involving the period of binary pulsars. Nevertheless, the variations in G described here are not over time but rather involve material composition or ordinary versus degenerate matter. Furthermore, CTG also indicates the existence of an additional, typically a significantly smaller component of gravity due to the velocity vector relative to a gravitational field gradient, acting in the same direction. This component would be challenging to discern but can have noteworthy effects on matter clumping, fictitious forces, circular orbital discs planes formations, etc. Based on the principles presented here, the influence of gravity on fictitious forces will also be investigated. Fictitious forces are presented as legitimate forces of nature. Based on the theory of gravity described here, the article also explores the possibility that instead of mass approaching infinity with the speed of light, the efficiency of applying energy to accelerate to the speed of light may asymptotically approach zero, necessitating infinite energy at the speed of light. This and similar inquiries will be further investigated in present article.

The strength of CTG presented here and the postulated hypotheses are rooted in a physical-mathematical theory of gravity developed to elucidate phenomena that may not conform to conventional physics interpretations.

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Ultimately, based on this theory, the contention is that physics may not be contingent upon customary universal constants. Instead, universal constants could potentially manifest as relationships of fundamental parameters of this universal 4D field, as presented herein for such relations of *G*, permittivity, permeability, and inertia.

A. The Mechanics of Gravity

In the context of CTG, a physics-based mathematical development was undertaken to elucidate certain phenomena that appear incomparable with prevailing theories. The investigation commenced with a white paper approach, involving the creation of perspective fields and the corresponding equations to describe these fields. From this exploration, a theory emerged, positing that all matter-energy in the universe originates from a fundamental energy that permeates the universe as a stationary aether. Within this framework, bodies such as Earth and matter in general are stationary with respect to the aether or, alternatively, they are coupled and moving in tandem. It is noteworthy that Michelson himself did not rule out the possibility of a motionless aether with respect to matter in the Michelson-Morley experiment. However, Einstein and Infeld (Ref. 1) employed thought experiments to eliminate the possibility of light propagation through both a stationary and a moving aether by drawing mechanical analogies to sound wave transmission. Nevertheless, they acknowledged that the omission of the aether is not a remedy. The issue with such thought experiment lies in the fact that light propagation through a stationary 4D electrostatic field is not precisely analogous to the mechanics of sound waves (discussed furter later). Nonetheless, the theory regarding the existence of a luminiferous aether, a medium for propagating electromagnetic radiation, has not been abandoned (refer to online sources for more information). In the context of CTG, this stationary aether continuum field has been identified as a 4D electric scalar potential field in space and time.

The aether continuum is characterized as stationary relative to matter and possesses a 4D spatial an temporal structure due to an intrinsic resonance at Planck length scales (refer Ref. 3). This resonance exhibits a topological coupling and oscillates with the fundamental quanta constituents of energy. The aether continuum is likened to a multidimensional vibrating honeycomb, where every energy-matter fragment at Planck length scales is coupled to this honeycomb-like field. A baseline potential with resonant peaks and trough (or anti-peaks) vibrates slightly above or below the baseline reference. Charge pairing is hypothesized to occur between electrostatic energy fragments, while simultaneously coupling of these quanta energies with the respective peak and trough of the continuum resonance. Consequently, this field coupling constitutes the origin of both energy and matter, rendering its existence indirectly observable. These fundamental electric scalar potential constituents of energies are theorized to have emerged during the Big Bang. The aether space-time continuum is envisioned to have undergone concentric collapse, leading to the fragmentation of the continuum due to significantly large gradient field stresses at the central region of the collapse. The continuum is expected to have shattered at the resonant peak and trough locations of the Planck frequency resonance, resulting in comparable Planck length quanta fragments of energies. Immediately after these fundamental quanta energies emerged, they reconnected with the continuum through this intrinsic electrostatic continuum resonant oscillations. This process is analogous to colliding ocean waves that generate a cloud of mist. However, unlike the water mist, the quanta of energies persist through this electrostatic coupling and do not dissolve back into the continuum ocean. These quanta of energy are fundamentally identical, with the exception of possessing positive or negative charges contingent upon the peaks or troughs of the resonance from which they originate, and potentially, due to the alignment of their motions with respective peaks and troughs of the continuum resonance.[11] This process is hypothesized to have formed the fundamental building blocks of both energy and matter. As the continuum underwent concentric collapse, at some point energy-matter was being created at the central region of the collapse, while opposing pressures continued to increase unabated. At a certain juncture, the outward pressure surpassed the inward pressure, initiating the Big Bang and subsequent universe expansion.[3] Singularities are excluded in this theory, but further discussion will be provided later. Consequently, the concept of dark energy would not be applicable based on this reasoning.

The fundamental principles governing gravity are as follows.[3,5] At Planck length scales, mass forms an electrostatic coupling with the continuum through energy-mass quanta that oscillate in resonance with the continuum's 4D electric scalar potential. This coupling elevates the base 4D electric scalar potential of the continuum proportionally to the presence of mass. According to CTG and its derivations, Newton's law of gravity emerges from the quantum particle velocities relative to the gradient of such a gravitational source field. The 4D electric scalar potential field of a space body like Earth superimposes on the base continuum field, with the Earth's field dominating in near-Earth localities. This source field is generated by the coupling between the quanta constituents of a mass, such as Earth, with the base continuum intrinsic resonance. The "base continuum field" represents the base 4D electric scalar potential field of the local universe, excluding masses like space bodies. It is

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envisioned to be locally approximately constant and exhibit variations only over larger cosmological scales within the universe and beyond. This electric scalar potential field, coupled with this mechanism, forms the foundation or origins of all physical phenomena.

The derivation of the gravitational constant in Ref. (3) involves the computation of the gradient of this 4D electrostatic field (i.e., in Ref. 3, it should have been state as the gradient rather than the divergence of a vector field). This computation is presented as follows:

$$G = \frac{1}{\pi^2}\frac{q_m q_g |\bar{V}_r|}{2\epsilon_o} \tag{1}$$

With the parameter $q_m = 1.0895x10\text{-}14$ C/kg,[3] representing an intrinsic charge per unit mass, observable at Planck length scales and associated with a mass that a gravitational body exerts an influence on. Similarly, the same numerical value in units of C· s/kg· m, q_g represents the source intrinsic 4D electrostatic gravitational flux per unit mass. The factor $\frac{2}{\pi}|\bar{V}_r|$ in m/s and with a $\bar{V}_r$ value of $9.8264x10{+}7$ denotes the mass-weighted average quantum orbital or vibrational velocity component in the direction of a given electrostatic gravitational source field gradient. Quark orbital velocities predominantly contribute to this component, which are essentially back-and-forth motions approximated as orbitals.

Temperature significantly influences quantum vibrational velocities, affecting frequencies, amplitudes, and even vibration randomness and decoherence. These parameters all increase with temperature. Conversely, gravity experiences minimum temperature-related changes. While gravity decreases with temperature, the effect is not substantial. Perhaps, with reduced randomness and increased coherence, quantum motions may align closer with the gravitational source gradient. This is because in a reduced energy state with lower temperature, the electrostatic coupling vibrations in the direction of a gravitational source field, at Planck scales, would be expected to have a more determining influence on the outcome of particle motion direction. This directional alignment could result in a minor net change in the effective quantum velocity, $\bar{V}_r$, due to temperature. Such directional bias motions should not violate the uncertainty principle.

In Eq. (1), the value of *G* remain positive, as the possible conditions are either a negative velocity vector in a negative field gradient or a positive velocity vector in a positive field gradient. Consequently, Eq. (1) is a simplification, as the actual equation should display $\bar{V}_r$ without the absolute value and include the sign of the gradient of q_g, which would make *G* a vector in $\hat{r}$. Therefore, gravity in this theory originates from a longitudinal 4D electrostatic flux, implying that its propagation speed would be instantaneous. While this aspect may be subject to debate, it is worth emphasizing that the Sun's gravitational influence on planets is based on its instantaneous position rather than its light-delayed position. Equation (1), and all the equations presented herein or in CTG, have been verified for their units and numerical accuracy, which were aimed to demonstrate the conceptual validity of the theory. The non-constancy of *G* implied by Eq. (1) appears to contradict the equivalence principle, which is considered fundamental to the theory of GR. However, as it will be addressed in the subsequent section, this may not necessarily be the case.

The parameters q_m and q_g, including the intrinsic continuum resonant frequency and its wavelength, are predicted to be characteristics of the 4D aether continuum field discussed earlier. It is anticipated that the parameters of this fundamental field will eventually play a pivotal role in defining all universal constants. For instance, the permittivity of free space has been derived in CTG as follows:

$$\epsilon_o = \frac{q_g^2}{4\pi}\frac{M_e}{R_e} \tag{2}$$

where M_e in kg and R_e in m are the Earth's mass and radius, respectively. The factor M_e/R_e is a consequence of the current definition of mass contained in a kg of matter on Earth. Given that $c = 1/\left(\sqrt{\epsilon_o \mu_o}\right)$, the permeability of free space can also be expressed in terms of aether parameters as:

$$\mu_o = \frac{4\pi}{\left(q_g f_P \lambda_P\right)^2}\frac{R_e}{M_e} \tag{3}$$

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where f_P, λ_P signify the continuum resonance parameters, also known as the Planck frequency and the Planck wavelength, respectively. These Plank frequency parameters at the most fundamental quantum level are indicative of the intrinsic continuum resonance identified in this theory. By substituting Eq. (2) into Eq.(1), the gravitational constant can also be expressed in terms of this aether field parameters as follows:

$$G = \frac{2q_{m|\bar{V}_r|}}{\pi}\frac{R_e}{M_e}\Lambda_g \qquad => \qquad \boldsymbol{F}_g = -G\frac{m_1 m_2}{r^2} \tag{4}$$

For the minus sing in Eq. (4), refer the derivations presented in Ref. 3. The parameter, $\Lambda_g = 1/q_g$,[3] also represents the per unit mass 4D gravitational flux in $\hat{\boldsymbol{r}}$, in units of volts· s/m, expressed in more familiar units, due to its similarity to magnetic flux. However, this electrostatic field is scalar-4D-longitudinal-zero delay.

In the context of CTG, a novel gravitational component has been identified, directly proportional to the velocity vector of a mass relative to the gravitational source field gradient. The origin of this gravitational influence is analogous to the previously described quantum velocities of the primary gravitational component, as outlined in Eq. (1). However, in this case, quantum motions are also attributed to the overall motion of a mass. For celestial motions, this additional gravitational factor is significantly smaller than the primary gravitational component, whose quantum vibrational velocities are comparable to the speed of light. The following equation encapsulates this gravitational component, denoted as G_V, due to a mass in motion with velocity, $\boldsymbol{V}_m$, which includes here a correction or clarification relative to $cos\theta$ as follows:

$$G_V = \frac{q_m q_g |\boldsymbol{V}_m|}{4\pi\epsilon_o} cos\theta_{min} \tag{5}$$

In this case, θ_{min} represents the smallest angle between the velocity vector and the +/- $\hat{r}$-line of the gradient of the gravitational field, Δq_g. This is analogous to the main gravitational component in Eq.(1); whereby, motion either towards or away from the gravitational source should produce an attractive force. This should also make G_V a vector in $\hat{r}$ as Eq. (5) is also a simplification. Consequently, G_V will be zero for a mass with a perfect circular orbit around a gravitational source, as θ will be 90 degrees. Typically, the magnitude of this additional gravitational component is quite small, but its effects can be significant over extended periods or in specific situations where this additional gravitational force dominates in a particular direction. This additional gravitational component is expected to promote circular orbital motions, as it should cause elliptical orbits to continuously bend in the direction of the gravitational source field. This component should also promote the clumping of matter and orbital disc alignments, as observed in galactic satellites, etc. For orbital mechanics, the omission of this gravitational force is anticipated to lead to overestimation of gravitational mass. It would be intriguing to investigate whether such an additional gravitational component could predict galactic orbital motions in the absence of dark matter. However, the author lacks the necessary computational resources to conduct appropriate N-body type simulations.

B. Fictitious Forces as Real Forces of Gravity

According to CTG, the fictitious forces are essentially natural forces with gravitational origins. Related to Ref. 3, this article provides more detailed explanations of these mechanics, including those involving acceleration, such as inertia and the centrifugal force. In this context, these forces are considered *inertia forces of gravity*.[3,5] This section also covers the Coriolis force, which is determined to be a combination of forces.

As discussed earlier, the aether continuum field is stationary relative to mass, acting as a single entity. It is assumed that the act of acceleration disrupts the electrostatic attraction force between the intrinsic continuum resonance and the affected mass quanta constituents. Consequently, the force of inertia appears to be the result of inter-source gravitational flux coupling. This would involve a flux related to the continuum resonance portion coupled to a specific mass and a flux related to the accelerating mass itself. Regardless whether it occurs in free space or in the presence of another gravitational source (such as a more compact space-time), the same number of continuum resonances are expected to be involved in the interaction of the respective gravitational fluxes. As a result, the inertial force is universally the same. The following relation was derived in CTG for the inertia force:

$$\boldsymbol{F}_I = q_g^2\left(\frac{m}{4\pi\epsilon_o}\right)\frac{M_e}{R_e}\boldsymbol{a} \tag{6}$$

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where $\boldsymbol{a}$ represents the acceleration vector of mass, m. The inertia force is simply defined by the relation $\boldsymbol{F}_I = m\boldsymbol{a}$, while as derived, the remaining terms in Eq. (6) are found to equate to unity. The mechanics of the centrifugal force are similar to those of free space inertia as it causes objects in a rotating frame of reference to accelerate away from the center of rotation.

The Coriolis force is arguably the most intricate to elucidate, as it is conceived to involve the simultaneous action of three distinct forces. For instance, the initial force acting on draining or free-falling water is Newton's gravitational force, directed towards the Earth's center. If an x-y coordinate system is drawn near the North Pole latitudes, with the + x-axis oriented eastward and the + y-axis oriented northward or in the opposite direction to Earth's center, free-falling water will fall along the – y-axis. The subsequent gravitational force component responsible for the Coriolis affect would be identical to Newton's gravitational force, but with the gravitational constant replaced by Eq. (5). As previously discussed, a differential 4D electric scalar potential field is superimposed upon the underlying 4D continuum by the presence of a mass. Such a differential field can also be generated by material interfaces.[3] From electromagnetic field theory (Ref. 6), if an electric scalar potential is distributed within a region of space and material interfaces exist within that field, the gradient of the field at these interfaces adjusts to accommodate step discontinuities in the corresponding electric field. For instance, in the context of the falling water, this differential field is generated by material interfaces where different materials come into contact. For water particles to experience rotational motions, such as in a draining toilet, material discontinuities must exist within their trajectory or within the falling water column, which give rise to a differential electrostatic field(s). For instance, air voids within the draining column of water or surrounding air or structures can serve as material interfaces. This differential field acting on a falling water particle would be perpendicular to Earth's gravitational vector, dominating in that particular direction. In the presence of a differential field, centered at the midpoint of the falling water column, the initial particle's velocity vector towards the Earth's center should experience a continues bending force in the direction of a field. This continuous bending force acting on a falling water particle should establish orbital or spiral falling water motions. Consequently, the swirling motion of the Coriolis force would be attributed to this gravitational force, as described by Eq. 5. Given only the action of these two forces identified so far, the direction of the swirl motion observed would remain undefined. In the case of the falling water in a toilet, the small initial force (third force) is provided by the Earth's rotational direction towards the east or the + x-axis in the coordinate system described. The primary force of gravity points towards the Earth's center. In lower latitudes in the northern hemisphere, the x-y plane should be adjusted so that the – y-axis always points towards Earth's center. Consequently, the third force will be in the easterly direction, and the net force should be in the fourth quadrant, slightly shifted from the – y-axis. Such a third force and net force direction are expected to initiate and progress a counterclockwise swirl for the northern hemisphere, which is indeed the case. Following the same logic, in the southern hemisphere, the main force of gravity points towards the + y-axis. The third force acting on a falling water particle will again be in the easterly direction, and the net force should be slightly pointing towards the first quadrant, near the + y-axis. The combined force direction would promote the initiation and establishment of a clockwise swirl in the southern hemisphere, which is indeed the case. The same mechanics are responsible for the Coriolis Effect involving hurricanes, etc.

C. Variability of the Gravitational Constant and Related Effects

The gravitational constant, a universally accepted constant, has been the subject of debate regarding its potential variability. While the equivalence principle, purportedly the cornerstone of GR, relies on the constancy of G, numerous studies over time have suggested a possible variation in its value. For further information, one can conduct an online search. However, experimentally determining the variability of G presents significant challenges due to the difficulty of distinguishing G from GM measurements. Direct measurements of G outside controlled laboratory settings, such as the Cavendish experiment, may not be feasible. The theory presented in this article proposes that the gravitational constant, G, varies with orbital or vibrational velocities of matter particles, particularly quarks, based on Eqs. (1) & (5). As Eq. (1) is typically dominate, it suggests that G should noticeably differ between normal and degenerate matter as particle velocities in degenerate matter approach the speed of light.

It is a widely recognized that the velocities of quarks in larger atoms are generally slower due to the formation of more proton-neutron correlated pairs in such atoms. This should proportionally affect the value of G according to Eq. (1). This suggests that there would be a difference in G due to material composition. The Eötvös experiment conducted in 1889, Ref. 7, and subsequent experiments with higher precision demonstrated the proportional equivalence between gravitational mass and inertia mass, with an assumed proportionality constant of unity. This led

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to the development of the equivalence principle. Nevertheless, it is anticipated here that the equivalence principle should still hold, even if material composition or extreme types of matter affect the value of *G*.

One way to express the equivalence principle between gravitational and inertial mass is as follows:

$$a = \frac{m_g}{m_i}\frac{GM}{R^2} \tag{7}$$

where m_g, m_i *M*, and *R* represent the gravitational mass, the inertia mass, the active mass, and Earth's radius, respectively, while based on the equivalence principle and substantiated experimentally, $m_g = m_i$. If *G* were not constant, gravitational measurements of celestial bodies would be solely measurements of *GM*. For instance, if the actual value of *G* were 1.25 times its original value, the actual value of *M* would be 0.8 times its originally calculated value, ensuring that *GM* remains constant due to the gravitational influence of *M*. Consequently, the calculated value for the acceleration of gravity, *a*, will remain unchanged, and the equivalence principle should still hold. Based on this, the value of *G* could indeed vary with material composition without violating the equivalence principle or potentially affecting Eötvös-type experimental results. However, this may not be the case with Cavendish-type experiments, which could potentially exhibit variations in the value of *G* due to material composition according to Eq. (1). Nevertheless, such an experiment may not unequivocally demonstrate the precise material composition impact on *G* because even stationary mass is determined by its gravitational influence rather than its inherent substance. Ultimately, the implications of the equivalence principle are only fully realized in the limit sense when accounting for tidal forces.

In Ref. 4 the variation of the gravitational constant (G_{dot}/G) was calculated within the limits (−0.6, 2) x 10^{-12}/year using binary pulsar period data and a combination of analysis that also involves relativity. However, the variability of *G* described here is attributed to material composition. Consequently, it is not anticipated that there would be significant changes in *G* over time unless, in the meantime, significant material composition changes occur in such binary star systems. Nevertheless, the question remains of how GR can be utilized for this type of investigations, considering that it was developed on the assumption of the constancy of *G*, as reflected in two of its equations (i.e. in the equations of mean rate of periastron advance, $\langle\dot{\omega}\rangle$, and redshift/time dilation, γ'), where masses appear independently of *G*.

Given that the vibrational velocity of quantum particles appears to directly influence the value of G in this theory, the vibrational energy of matter should also directly influence *G*. However, it should not contribute to mass as currently understood. In this regard, it would not appear that there is strict *energy-matter equivalence* in the relation $E = mc^2$. As explained in Ref. 3 for the revelations of the *G* relation, black holes would experience oscillatory behavior that prevents singularities. Such a black hole oscillation cycle is anticipated to exist around the boundary where black hole matter collapse begins to violate the exclusion principle, with an expected frequency that is inversely proportional to black hole mass.

According to the principles of GR, mass approaches infinity as velocities approach the speed of light. However, the gravitational mechanics described herein and in CTG,[3,5] suggests that mass may remain unaffected by velocity. Instead, the efficiency by which energy can be applied to accelerate an object to the speed of light would asymptotically approach zero, necessitating infinite energy at the speed of light. A mass with velocity approaching the speed of light may experience asymptotically less coupling with the surrounding continuum. In Ref. 5, it is suggested that a photon consists of two opposing charge fundamental energy quanta that are electrostatically coupled. These quanta are then coupled respectively with opposing peaks of the local continuum resonance. For instance, the negative charged photon constituent would be attracted to a positively peaked resonance in its path. Before this constituent reaches the location of the resonant peak, the peak begins to transform into a trough, and the respective photon constituent is then attracted to the next peak in its path. A similar process would occur for the positively charged constituent of the photon. At the same time, these opposing charge constituents drag each other along the path due to their electrostatically coupled nature. Consequently, there would be an approximately constant electrostatic force propelling the photon in its path. As the velocity of a mass approaches the speed of light, the duration of time that mass constituents spend with a given continuum resonant oscillation asymptotically approaches zero. This reduction in the duration of oscillation leads to a corresponding decrease in its amplitude. The diminished oscillation amplitude results in decreased electrostatic coupling, and consequently, a decrease in electromagnetic energy exchange with higher quantum scales. As detailed in Ref. 5, at the speed of light, this coupling reduces to

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zero. Henceforth, at the limit of the speed of light, the energy required to further accelerate a mass would asymptotically approach infinity, or the energy efficiency would asymptotically decline to zero.

In relation to this subject, a pertinent question can arise regarding the conversion of kinetic energy into mass, as observed in particle collisions. If the kinetic energy in particle collisions is sufficiently high, it is postulated that the gradient stresses at the impacted continuum resonances would escalate to a point where the local continuum would fracture, similar to the conditions described earlier for the Big Bang, where energy quanta fragments were generated. In this scenario, the heightened gradient stresses would be attributed to larger resonant vibrational amplitudes resulting from collision energy. Subsequently, the newly born quanta constituents would couple back to the local continuum resonance, thereby forming new or distinct particle matter. As stated in Ref. 8 regarding particle collisions, "A particle-particle collision is detected when there is a large enough overlap between particles (i.e. the distance between the centers of the particles is smaller than the sum of their radii)."

The speed of light is governed by the following relationship:[5]

$$c = f_P \lambda_P = \lambda_P / t_P, \tag{8}$$

where t_P would be the fundamental tick of time,[5] commonly referred to as the Planck time. The speed of light is a fundamental concept in many physics formulations because, based on Eq. (8), it is defined by fundamental parameters of the aether continuum. The mechanics described here suggest that the Lorenz factor, $\gamma = 1/\sqrt{1 - v^2/c^2}$, may be applied to either the energy or the force required to accelerate an object rather than mass. In this context, the intrinsic fundamental continuum electrostatic oscillations with fundamental quanta energy constituents are the most fundamental continuum field oscillations in this theory, from which mass-energy, gravity, electromagnetism, and time arise.

In the context of CTG, fundamental forces would not be fundamental in the traditional sense. For instance, as quarks are theorized to be fundamentally composed of energy quanta clouds, these quanta constituents are expected to be stretchable. Accordingly, when protons and neutrons are subjected to collision forces, their quanta and, consequently, quarks would undergo significant elongation due to electrostatic attraction forces, resembling thin pancakes. As a result of this process, their separation distances would progressively diminishing, potentially by two orders of magnitude or more.[5] This would result in substantially increasing electrostatic binding forces, as $F \propto 1/r^2$, as required to adequately account for the observed strong force. Regarding the existence of gluons, gluons are hypothesized by the jets of hadronic particles they produce in a particle detector shortly after their creation. However, this may not necessarily imply the existence of gluons.

Independently, whether mass or energy requirements approach infinity at the speed of light, there is little argument with the concept that the speed of light represents the ultimate speed limit. In the context of CTG, electrostatic, and by extension, gravitational fields are considered to be truly zero-delayed fields. In this regard, the transmission effects of electrostatic or gravitational fields should be perceived instantly, despite justifications for their adherence to the speed of light. When a mass is in motion relative to the surrounding continuum as defined in this theory, its speed should be constrained by the speed of light, as it would require infinite energy input to reach the speed of light. However, there may be no speed limit, or the speed limit could be orders of magnitude faster than the speed of light[5] when objects remain stationary with respect to their surrounding continuum and instead, motion is due to continuum expansion and/or contraction.[5] In this regard, the speed of light may not be violated, but it could be circumvented. According to CTG, if a pulsating electrostatic field of sufficient strength, approximately 92x10+12 volts, is applied, the encompassing continuum could be made to expand or contract. This phenomenon would be attributed to the matter-aether stationarity property described herein. For these types of continuum expansion or contraction motions, the laws of physics are expected to differ. Namely, the speed of light limit could be circumvented, and the law of conservation of momentum will cease to exist, along with inertia. A notable example of continuum expansion is the inflation of the universe, including the Earth, at least a few times faster than the speed of light. That is because the observable universe is approximately 93 billion light-years in diameter, while the universe itself is estimated to be approximately 13.8 billion years old. In Ref. 5, a prospective apparatus was described to potentially circumvent the speed of light by expanding and/or contracting the local continuum surrounding a spacecraft. Such a continuum propulsion system would necessitate the generation of a high-intensity pulsating electric scalar potential field, ultimately employing a Tesla electrostatic type coil apparatus. By aligning the field polarity direction relative to that of the universal continuum aether and manipulating the field direction, it is

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envisaged that local continuum expansion or contraction can be controlled while simultaneously providing a means for stirring.

Conclusion

This article delved into the Continuum Theory of Gravity (CTG), a theoretical framework aimed to elucidate the fundamental principles of quantum gravity. Drawing upon empirical observations and mathematical derivations, CTG posits that gravity is mediated by quanta vibrational motions relative to the gradient of a stationary 4-dimensional (4D) differential electrostatic source field of a given mass. The article presented a comprehensive description of a universal 4D electrostatic field and its relation to an associated gravitational field. The electrostatic coupling mechanism of this universal field with fundamental quanta energy constituents was described, along with how this mechanism is responsible for the origin of mass, gravity, electromagnetism, photon propagation, and even time itself. Through CTG, the article provided formulations for the gravitational constant (G), inertia, permittivity, and permeability of free space. Furthermore, it described a novel component of gravity ariseing from the velocity vector of an object relative to the gradient of a gravitational field. Although typically much smaller and aligned in the same direction, this component holds significant importance in elucidating certain phenomena. In this regard, and with greater precision than CTG, this article described the underlying mechanisms of fictitious forces as tangible manifestations of gravity, including inertia, centrifugal, and the Coriolis forces. Additionally, through the G relation, the article discussed the variability in G due to quantum particle velocities and, consequently, due to material composition, while still adhering to the equivalence principle. The article also provided the rationale behind why matter may not approach infinity at light velocities and instead, the energy efficiency to accelerate at light speeds may asymptotically approach zero, necessitating infinite energy at light speeds. The article also discussed the potential and possible means to achieve superluminal speeds by expanding or/and contracting the 4D electrostatic continuum. Similarly to the equations presented, CTG proposed a theoretical framework that may ultimately transcend conventional universal absolutes. According to CTG, the universe is composed of a singular energy field permeating both before and after the Big Bang, from which all physical entities originate.

References:

1. Einstein, A. and Infeld, L. 1938. "The Evolution of Physics," Cambridge University Press, Bentley House, London
2. Silverberg, L. M. and Eischen, J. F. 2020 "On a New Field Theory Formulation and a Space-Time Adjustment that Predict the Same Precession of Mercury and the Same Bending of Light as General Relativity," Physics Essays 33, 4.
3. Kopasakis, G. 2017. "A Physical Continuum Theory: Part 1, Gravity," Galilean Electrodynamics Journal, Vol. 28, No 6, Nov./Dec. https://drive.google.com/file/d/1BMoHpyXgDC19BJmAgqokcJDgFGvyP_IG/view
4. Bisnovatyi-Kogan, G. S. 2006. "Checking the variability of the gravitational constant with binary pulsars," arXiv:gr-qc/0511072v3.
5. Kopasakis, G. 2019. "The Continuum Theory: Part 2, Matter, Time, and the Mechanics of Light," Galilean Electrodynamics Journal, Vol. 30, No. 1, Jan./Feb. https://drive.google.com/file/d/1Kxo9zFaQS2A1Xbi9fzcTHLhlX2hvEyWN/view
6. Rantajeevan, S. and Hoole, H. 1989. "Computer-Aided Analysis and Design of Electromagnetic Devices," Elsevier Science Publishing Company book publication.
7. Brewer, J. H. 1998. "The Eötvös Experiment"
8. Montastruc, L. and Negny, S. 2018. "32nd European Symposium on Computer Aided Process Engineering," Elsevier Publication Series on Computer Aided Chemical Engineering, Vol. 41, Pg. 9-187.

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