An Intuitive Theory of Gravitic Light and Articulated Quantum Gravity

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Abstract

The concept of elastic spacetime[1] to describe the nature of gravitational fields is an idea strongly supported by observations such as gravitational lensing. A spacetime that is elastic for cosmological bodies is not a different spacetime for fundamental material particles, nor for light. At every scale, particles and massive bodies alike occupy the same experiential universe we observe within the same three spatial, plus time, dimensions. If spacetime is elastic on the cosmological scale, then it is elastic on all scales, including at the fundamental quantum level. A theory of quantum gravity is presented in which the gravitational and electromagnetic fields are not disparate fields in need of unifying but rather they are identical, fully integral manifestations of the same elastic spacetime source-field. By applying essentially classical wave mechanical principles to a novel superfluid quantized spacetime[2] as an elastic and compressible matrix, the electromagnetic oscillation becomes an electromagnetic distortion, a deformation in which incumbent energy both stretches and compresses the matrix transversely, resulting in photons that describe gravity-antigravity oscillations with vortical geometry[3]. From this energy-field architecture a mechanism for light-to-matter energy confinement naturally emerges through concentric wave interference to yield a stable concentric wave singularity as toroidal structured light[4] locked into an intrinsic poloidal oscillation with signature spin, charge, magnetic dipole and discrete mass. The ideas developed in this theory are drawn from a series of thought experiments based on spacetime as a singular source-field and light energy as the harmonic wave oscillations of that field. These thought experiments explored the potentialities of a quantized elastic and compressible spacetime on quantum mechanical systems from which the theory subsequently derived. The concept develops geometric continuity between vortical photon and toroidal matter-wave and encompasses a physical explanation of spin, the origin of the magnetic dipole moment, the nature of charge and the meaning of mass and mass-energy equivalence, with a derivation of quantized inertial mass emerging from the curved geometry of elementary confined energy as articulated quantum gravity.

1. Introduction

This paper proposes that light is not only electromagnetic in nature, comprising oscillating electromagnetic properties, but that it is fundamentally gravitic[5], making it more completely electro-magnetic-gravitic waves[6], or rather, a proto-genesis of all three aspects of matter comporting a triple nature of light and that only through the geometry of energy confinement, in which the electromagnetic vector fields of entangled photons become polarised about a common locus, does discrete mass, charge and magnetic dipole emerge as elementary particulate matter.

The singular source-field proposed for mediating electromagnetic waves and gravity is one capable of not only stretching but also compressing to produce the oscillation and propagation of energy so that just as classical wave mechanical processes involve displacements or distortions to an intermediary to produce classical waves, so light energy oscillates the source-field, distorting it by compressions and rarefactions, creating localised oscillating density differentials of spacetime itself. The core principle of the theory is that light energy is warping spacetime, stretching and compressing it through each oscillation and that these field differentials describe oscillating gravity and antigravity fields and as such represent the genesis of gravity at the quantum scale, such that an equivalence principle exists in which gravity equates to and can be defined as a positive density differential or stretching of spacetime. Similarly, antigravity equates to a negative spacetime density differential or compression of the field. In summary, the proposal is that gravity and antigravity originate at the quantum scale in the rarefactions and compressions of spacetime as energy oscillates the field and that these localised field density differentials equate to positive and negative gravitational potentials.

2. Light as the Oscillation of Quantized Spacetime

As in classical wave mechanics, transverse waves form the transmission of energy by the distortion or displacement of a medium from its equilibrium, propagating inductively through the medium via intrinsic bonds between the units comprising its substructure, so light energy also exhibits wave behaviour synonymous with the wave mechanical oscillations of an intermediary. The situation is considered in which spacetime is the mediating field of light wave energy such that energy oscillates the spacetime field by a process of wave mechanical compressions and rarefactions unique to the nature of the field, where these deformations occur due to an intrinsic elastic vacuum equilibrium such that spacetime possesses intrinsic elastic tension that acts between unit field quanta that define the discretisation of spacetime. Elasticity of spacetime is the foundation of Einstein's general theory of relativity with its principle of stretchable spacetime depicted as gravitational curvature and so extrapolating this principle of elasticity to elastic distortions of the field by light wave energy is not a big stretch and poses a natural extension of Einstein's theory.

The source-field proposed to describe spacetime is a quantized liquid-crystal matrix, an isometric, isotropic and homogeneous dot matrix field, at rest, in which dots designate dimensionless point constructor units as the fundamental quanta comprising the spacetime field matrix structure. No flow of the dot quanta occurs within a crystal matrix, but the field oscillates locally as unit quanta extend and shorten their interstitial distances in response to incumbent energy, generating localised stress and strain in the field by means of dot flux differentials, which define compressions and rarefactions as elastic deformations of the matrix. The source-field proposed, therefore, is a quantized elastic and compressible continuum in which perfectly elastic energy-field coupling describes superfluid energy flow and from which time emerges as energy is constrained to negotiate the matrix by distorting it, necessitating process and therefore temporal evolution as the oscillations and propagations of an intrinsically tensile field.

3. Classical to Quantum Mechanics: Gravity-Antigravity Oscillations

The wave geometry of energy oscillating within a bulk matrix will naturally be different from such as water waves which oscillate at a boundary interface. For light wave energy oscillating fully within a three-dimensional spatial field, a different interplay of the wave mechanical energy-field architecture for spacetime must be considered. This treatment explores how energy exciting an elastic and compressible matrix generates energy-field architecture and how such architecture describes the photons that emerge from field differentials as compressions and rarefactions.

The situation is considered in which excitation energy E impacts the field matrix at initial coordinate xyz=0, introducing a force F in the x direction, which pushes the unit field quanta along x so as to separate quanta a distance x=r from equilibrium (where r becomes the amplitude of the wave). With linear displacement and separation of the field quanta from equilibrium, compression of the field occurs at amplitude due to the increased dot flux density, so that energy imposes a force that displaces dot constructor units from equilibrium up to a maximum distortion r, where the matrix reaches an elastic and compression limit. At this limit, the field resists further distortion and a linear restoring force incumbent on the region of compressed spacetime pushes the displaced quanta back towards equilibrium. Conversely, within the region between equilibrium and wave amplitude, rarefaction of the spacetime field occurs, due to decreased dot flux density in that region between xyz=0 and x=r, as the unit quanta have been displaced and pushed out to amplitude r and increased elastic tension between the separated field quanta defines a region of stretched, rarefied spacetime which then acts to pull the distortion linearly back to equilibrium. By imposing a flux differential, energy exciting the matrix produces a transverse deformation as a region of both compression and rarefaction of the field.

Where the field compresses at amplitude of oscillation, this region experiences a repulsive restoring force between the high flux of compressed quanta that have been pushed together, reached maximum displacement at amplitude and are now pushing apart, repelling from one another. This region of spacetime compression describes negative gravity and behaves as an antigravity field. Where the oscillating field is rarefied, as quanta are pushed away from equilibrium, that region experiences an attractive restoring force between field quanta that have become separated and stretched apart, pulling them back to equilibrium. This force of attraction between separated quanta defining stretched, rarefied spacetime, describes positive gravity and behaves as a gravity field. As transverse compressions and rarefactions of the propagating light wave form the harmonic oscillation, the antigravity (compression) and gravity (rarefaction) fields of the wave oscillate synchronously, effecting a constantly zero resultant of the ± gravitational fields at every point along its phase and therefore yielding a zero resultant mass for light. However, fluctuating gravity, as field rarefactions within the dynamic field geometry of the oscillating light wave, represents a mass-potential of light as the stretched field of a rarefaction gives the photon, as it were, gravitic substance, rendering it, in effect, a proto-mass particle and as such a building block of elementary matter.

4. The Photon as a Gravitic Vortex

The previous situation considers the general wave mechanical principle for the field distortion along one degree of freedom, produced as fundamental field quanta are displaced linearly along the x axis. For energy oscillating within a bulk matrix, the complete, spatially 3-dimensional wave mechanical process is now considered.

Energy impacting the matrix at point xyz=0 and time t=0 introduces a force in the x direction, causing linear elastic distortion along x, such that the dot quanta of the field matrix situated along the x axis are displaced away from equilibrium as they are pushed successively into one another, effectively forming a string of quanta that are expressed out from equilibrium and pushed progressively together until a maximum distortion of the field is reached at amplitude. With this elastic limit, an energy-driven, short-range, amplitude-limited deformation along x forms as a single string of aligned dot quanta displaced from equilibrium and compressed together at amplitude. At the moment the field quanta begin to displace from equilibrium, moving from xyz=0 along x, they move away from quanta adjacent to them in the bulk matrix field. Intrinsic elastic tension between all constructor units of the quantized matrix causes the moving string of quanta to pull on those adjacent to them so that induction occurs along the y axis of the transverse plane, as the tangential pull (-y direction) induces adjacent quanta towards the moving string, pulling them also away from equilibrium and into radial displacement. This process of induction continues in the transverse plane, anchored around equilibrium, as adjacent quanta of each moving string are successively induced to displacement, forming radial strings induced sequentially that trace out a circular, rotating displacement around the equilibrium axis, with a radius set by the elastic limit of the field, defining the amplitude of the wave. This transverse plane induction results in a rotating radial displacement with a complete 2π cycle as the wave oscillation describing a full rotation as the spin of a photon. Uniform intrinsic elastic tension between all unit field quanta of the spatially 3-dimensional unit matrix field means induction also occurs simultaneously along the z axis resulting in propagation. Both inductions, transverse and longitudinal, -y and z axes, in an isometric field, occur simultaneously, so that the light wave oscillation traces a circular transverse spin pathway which propagates as it circulates, causing the energy to transit effectively along a spiral or helical pathway. Applying this model of spacetime, light expresses vortical geometry[7], as the oscillation circles (spins) by transverse induction, it possesses orthogonal components of compressing radial (magnetic) and induced rotating (electric) displacement vector fields and the distortion produced by the radial field displacement is gravitic as the energy distorts the field by rarefying and compressing it in forming the wave, rarefying the field at the centre of the vortex as the energy expresses field quanta out away from equilibrium to elastic limit which is the perimeter of the vortex, the wave amplitude. This expressing of field quanta radially to amplitude results in a rarefied or stretched field core with a field compression at amplitude that rotates by induction so that energy exciting the matrix spins open an iris in spacetime as a gravitic vortex[8].

If energy distorts spacetime in the transverse plane by expressing field quanta away from equilibrium out to amplitude, inducing tangential traction that rotates this displacement about equilibrium, then energy E_γ of a photon executes a centrifugal force F_γ on the field of spacetime with mass-potential m_γ generated by virtue of the elastic field deformation, the stretch and compression of spacetime a distance r, the radius or wave amplitude, producing elastic potential energy of stretched spacetime as gravitational potential energy. The photon, as a gravitic field with a compressed field rim, possesses an effective mass-potential rotating at the rate of energy induction through the field, the speed of light, c. With centrifugal force $F_\gamma = m_\gamma c^2/r$

A photon has centrifugal energy: $E_\gamma = m_\gamma c^2$

For energy expressed as a transverse compression-rarefaction of spacetime that rotates by induction around equilibrium in the transverse plane to produce a vortical photon, the elastic potential energy generated by radial distortion constitutes its gravitational potential energy and the rotating tangential inductive displacement constitutes its spin. As the centrifugal force results in a stretched radial field tension, it produces centripetal force. Equating with Newton's $F_\gamma=m_\gamma g_\gamma$ gives gravitational field strength g_γ of the photon as $g_\gamma=c^2/r$. Substituting $c^2= g_\gamma r$ into the photon energy equation $m_\gamma c^2=h\nu$ gives:

$$h\nu = m_\gamma g_\gamma r$$

In this equation in which $h\nu$ expresses a photon's gravitational potential energy, Planck's constant h then effectively defines the gravimetric energy density[9] of the matrix in terms of the energy-field architecture of vortical photons, quantifying the specific gravitational potential energy available to a photon per unit oscillation as a single revolution (spin) of the photon. Spin angular momentum $\hbar$ then has physical meaning as rotating mass by virtue of a rotating gravitational field: $\hbar = m_\gamma g_\gamma r/\omega$

5. Confinement and the Articulated Gravitational Field

For the vortical photon, a mechanism for energy confinement is considered through the superposition resultant of concentric wave interference. In this unique interference, wave maxima converge in phase to produce a concentric wave singularity, a circular resultant of concentric constructive interference. In water waves such a singularity is evidenced as a spike wave[10] where the maxima and minima of the wave phase are described by peaks and troughs that occur at the boundary interface of water and air so that the superposition resultant of concentric interference for a boundary wave configuration produces a circular constructive amplification as the spike wave singularity. In the case of light waves oscillating within a bulk elastic matrix, however, and not at a boundary interface, the superposition for a concentric wave interference of, minimally, three photons, as gravitic vortices, is considered, where the transverse planes of the photons are paraxial, converging plane to plane with angular incidence, so that the radial magnetic string displacements at the rim of each photon superposition to amplify the vortical geometry, resulting in a dilated vortex with radially compressed strings of the interfering photons enclosing the vortex perimeter.

5.1 Mechanism of Energy Confinement – Collapse of the Magnetic Vector Potential

As vortical photons converge and superposition staggered with respect to one another, due to angular incidence, they form a concentric wave singularity as a phased core so that the radially compressed strings of the photons that form the core wall are prevented from restoring back to equilibrium due to this vortical wall of high flux dot quanta which holds the strings compressed at the vortex perimeter in a state of mutual repulsion. Concentric superposition thereby momentarily freezes the transverse oscillations of the photons, compelling the compressed magnetic strings to instead release compression by redirecting out of the transverse plane of the photons orthogonally through the vortex, rerouting the oscillation pathway longitudinally to form an elongated core wall of magnetic strings aligning parallel along it. The magnetic strings therefore release transverse radial compression longitudinally through the vortex and reflux in a loop back around to complete their oscillation cycle. Concentric interference of photons thus causes the resultant singularity to execute a unitary collapse as the photon vortices superposition. Photons translate from 2D propagating transverse vortices to a 3D structured-light toroid as the energy anchors to a quantum hole in the spacetime matrix and to a new oscillation pathway that articulates through it. In this way, the strings of magnetic flux become confined to circulating poloidal pathways that articulate through the core and then loop around from pole to pole as the energy transits along them. Through collapse of the magnetic vector potential and rerouting of the oscillating pathway, the concentric wave singularity takes the form of an intrinsically oscillating toroid[11][12], causing the photons to become trapped or confined in toroidal oscillation[13][14].

5.2 Charge and the Electric Field as Inverse Torque of Spin Induction

As energy transits along poloidal magnetic flux loops of a magnetic flux torus, spin is conserved as tangential induction continues between flux strings, circuiting the toroid laterally, orthogonal to the magnetic core alignment. This results in a spinning induction field that traces a path laterally around both the inner flux core wall and the outer flux surface of the torus. As tangential induction spinning between the poloidal flux at the outer surface of the toroid extends its pull along the tangent vector, it engages extrinsic spacetime, polarising and stretching the field matrix towards the tangent, inducing an elastic displacement of the extrinsic field as inverse torque[15]. This inverse torque therefore tracks with spin, polarising the induced field sequentially as it circulates the lateral circumference, charging, as it were, the extrinsic field with a polarising inductive displacement along the tangent vector. Quantized elementary charge then emerges as a spin phenomenon which describes, not a divergent Gaussian field, but, rather, a circularly polarised, rotating or spinning induction of local spacetime, effective laterally over its entire extrinsic surface. Similarly, the electric field component of the photon, that is generated as inverse torque of its spin induction, describes circular polarisation.

5.3 The Intrinsic Magnetic Dipole

With collapse of the magnetic vector potential through the core of the concentric wave singularity, the transverse string compression is released and redirected longitudinally, so that the magnetic strings form a core wall of parallel aligned flux. This polarised, core-aligned flux effectively constitutes a coherent energy-field 'laser' as the oscillation energy traces the inner core surface topology of the magnetic flux torus[16]. In this way, the toroidal core describes a magnetic dipole with the direction of energy translation along the flux wall defining north and south poles. Thus intrinsically oscillating energy, locked into magnetic flux loops, anchored through the core, is coupled, as it were, to itself so that, by construction, there is no magnetic flux divergence for the confined energy toroid, as expressed by Maxwell's Div.B=0.

5.4 Articulated Quantum Gravity – The Origin of Inertial Mass

The magnetic strings that comprised the photon's radial distortion now form the core wall inner surface of the torus and emerge from the core, separating out as they loop around forming the outer surface of the torus, like lines of longitude spreading apart as they articulate the extrinsic polar route. In this way, the topology of the flux torus lends itself to the polarisation of flux density between core compressed flux and outer surface rarefied flux as strings articulate first the inner and then outer toroidal surface areas. This resolves to a compressed flux antigravity core and a stretched, rarefied flux gravitational surface field that constitutes a gravitational surface tension[17] over the outer surface of the torus. The surface tension acts to not only try to pull the magnetic flux strings together and so contract the torus but, as a rarefied surface field, pulls also on the spacetime matrix extrinsic to the toroid with an inductive restoring force. This induction by gravitational surface tension on extrinsic spacetime stretches and polarises the extrinsic field matrix inwards, producing a static Gaussian traction field as it pulls, stretches and displaces spacetime towards the confined energy surface, generating elastic tension in the extrinsic field. Confined energy units can in this way gravitate together, as they each exert an attractive restoring force on the stretched gravitational field of the other, so that a concentric wave singularity of vortical photons, as toroidal structured-light, induces a gravitational traction field that enables quantifiable mass to be assigned to it as a measure of the energy confined. In this way, the confined energy magnetic flux torus describes a quantized matter-wave.

While a stretched gravitational field between articulated magnetic strings forms the outer surface of the torus as gravitational surface tension, the repulsion between the compressed flux of aligned magnetic strings along the core forms an antigravity field attempting to push the compressed strings apart. This amounts to an outwards antigravity force from the core wall that results in an effective outwards field pressure. For a stable elementary matter-wave particle, the antigravity pressure pushing outwards and gravitational surface tension pulling inwards must be in equilibrium in order for the confined energy to maintain a stable state.

If gravitational surface tension conforms the confined energy toroid to spheroidal[18] geometry, then it behaves like a bubble of spacetime for which the Law of Laplace relates gravitational surface tension T_s, from the stretched field pulling between extrinsically articulated magnetic flux strings, to the antigravity pressure P_a, from the core compressed flux, where r is the radius of the confined energy matter-wave:

$$P_a = \frac{2\,T_s}{r}$$

As gravitational surface tension acts to try to contract the surface, it effects an inward (gravitational) pressure P_g at its surface towards the centre of the spheroid. For the configuration to establish stability, the gravity and antigravity pressures must balance. Equating the gravity and antigravity pressures at the surface of the confined energy:

$$P_a = \frac{2\,T_s}{r} = -\,P_g$$

Assuming a spherical surface, the inward pressure P_g can be expressed as the inward force F_g generated by gravitational surface tension acting over surface area $4\pi r^2$:

$$\frac{2\,T_s}{r} = \frac{-\,F_g}{4\pi r^2}$$

$$F_g = -\,8\pi r T_s$$

Force F_g expresses the effective inward (gravitational) force acting from the surface towards the centre of the spheroid due to its gravitational surface tension. The surface is, however, prevented from contracting due to the antigravity pressure from the core wall of aligned compressed flux strings pushing outwards. The surface tension, as a rarefied field, engages extrinsic spacetime with this same restoring force F_g pulling inwards as an induction which attempts to restore equilibrium to the stretched, rarefied surface of the confined energy. In this way, gravitational surface tension of confined energy engages the extrinsic field with this inward pulling traction force F_g, stretching and polarising the spacetime matrix towards the confined energy surface to produce a rarefied induction field that describes a gravitational field as traction on spacetime. This traction force induces also the already stretched spacetime gravitational fields of other local masses, causing masses to mutually attract as their fields each exert a restoring force on the other.

If a quantised unit of confined energy induces a gravitational field that identifies its mass m, then a second mass M, placed at its surface, radial distance r, experiences this attractive force F_g with gravitational field strength g_m:

Applying Newton's $F_g = Mg_m$ $\qquad g_m = \frac{8\pi r T_s}{M}$

Equating this to the Newtonian gravitational field strength, $g_m=Gm/r^2$, at the surface of mass m, radius r, of the quantized confined energy matter-wave:

$$g_m = \frac{8\pi r T_s}{M} = \frac{Gm}{r^2}$$

Rearranges to $$8\pi r T_s = \frac{GmM}{r^2}$$

Simplifying the equation for two confined energy particles of equal mass gives:

$$8\pi r^3 T_s = Gm^2 \qquad (1)$$

$$G = \frac{8\pi r^3 T_s}{m^2}$$

Rearranging equation (1) gives Newton's gravitational constant G as the coupling constant[19] between the gravitational surface tension of confined energy and the extrinsic field, inducing a gravitational traction field that assigns the matter-wave particle a mass m as a measure of the energy confined.

Considering the situation for single isolated mass m, if $E=mc^2$ represents the total intrinsic energy of the matter-wave particle based on the sum of n constituent photons each of energy $m_\gamma c^2$ ($mc^2 = nm_\gamma c^2$) and the surface energy that engages extrinsic spacetime is one half of its total energy ($E_s = ½mc^2$) where surface energy is the product of surface area and surface tension ($E_s = 4\pi r^2 T_s$) then equating the two:

$$E_s = 4\pi r^2 T_s = ½mc^2$$

$$m = \frac{8\pi r^2 T_s}{c^2} \qquad (2)$$

Equation (2) then resolves a definition for quantized unit mass of stable confined energy as a function of its surface tension.

Substituting m from (2) into $g_m=Gm/r^2$ gives surface gravitational field strength generated by the surface tension of quantized confined energy:

$$g_m = \frac{8\pi G}{c^2} T_s \qquad (3)$$

Rearranging equation (3) $$G = \frac{g_m c^2}{8\pi T_s}$$

Newton's gravitational constant G then expresses the gravitational field strength g_m that will be induced at the surface by a gravitational surface tension T_s for a given rate of induction or velocity of light.

6. Overview

By identifying spacetime as a quantized elastic and compressible matrix, the fundamental dot quanta constructing the field matrix respond to incumbent energy by flexing interstitial distances to produce flux density differentials as deformations of the matrix, such that increasing distance between unit quanta stretches local spacetime and, conversely, decreasing the interstitial distance compresses spacetime, resulting in energy that expresses rarefactions and compressions of the field. These localised elastic deformations exercise attractive and repulsive restoring forces, describing regions that define gravity and antigravity fields.

Energy-field architecture of the electromagnetic wave then emerges as energy exciting the matrix displaces unit field quanta away from equilibrium, pushing dot quanta successively into one another along a transverse linear momentum vector, so that these unit quanta naturally align into strings that compress together progressively up to the elastic limit of the field to produce an elastic deformation of spacetime as a stretched and compressed field distortion. These strings identify the magnetic vector of the photon and comprise its radial component, where each string of quanta effectively describes a single filament of magnetic flux. As this flux is compressed to amplitude in the radial field distortion, it generates a magnetic vector potential, which, as it is a stretched field, also defines the gravitational potential of the photon effective along its radius vector. As movement of quanta along one axis of the matrix induces movement of adjacent quanta, the radial displacing string of quanta induces adjacent strings successively in the transverse plane, inductively rotating the string displacement around the equilibrium axis, resulting in a photon that spins[20] the radial displacement and opens a vortex in the spacetime field.

In propagating waves, the field oscillates harmonically in the transverse plane so that the gravity (rarefaction) and antigravity (compression) fields integrally form the transverse harmonic oscillation of the wave, effecting, at every point along its phase, therefore, a constantly zero resultant of the oscillating positive and negative gravitational potentials, yielding a zero resultant mass for light. In the confined energy of elementary matter, however, a concentric wave singularity of vortical photons forms a structured-light magnetic flux torus as magnetic strings compressed radially at the rim of the singularity flip out of 2D transverse oscillations into 3D loops that translate through the vortex and reflux around forming toroidal topology, so that energy then intrinsically oscillates as it articulates through and about a locus of confinement[21]. This localised field topology polarises the electromagnetic oscillations so that discrete resultants of electric, magnetic and gravitic fields emerge as the magnetic flux loops the poloidal pathway to negotiate the two (inner and outer) surface areas of the resulting torus, the inner core wall comprising compressed aligned flux, then spreading apart to become rarefied as it separates and so stretches apart over the extrinsic polar route. This separation of the strings as they spread symmetrically, looping around the extrinsic pathway of a toroidal topology, stretches the field between them, generating gravitational surface tension over the outer surface of the toroid. Surface tension that spherizes the toroid to a spacetime bubble requires, for stability, an equilibrium of core pressure and surface tension.

Gravitational surface tension of confined energy then describes articulated quantum gravity as a stretched field formed between and by the curved magnetic flux loops as they articulate the extrinsic polar route. This spheroidal stretched spacetime surface induces an attractive restoring force on the extrinsic field as a total external traction to produce a Gaussian induction field in which surrounding spacetime is polarised as it is stretched towards the surface of the confined energy. This induction field describes the inertial gravitational field[22] in which all diametric inductive force vectors normal to the surface are equal in magnitude where they are opposite in direction due to topological flux symmetry, so that there is no resultant force acting on confined energy due to its coupling with extrinsic spacetime, causing confined energy to be inertially locked to the field by symmetrical traction. Confined energy, then, cannot move unless acted on by an external force sufficient to overcome inertial locking and break its surface traction bonds with the extrinsic matrix.

When inertial mass moves, it relocates its gravitational field as the traction generated by its gravitational surface tension continually polarises the surrounding spacetime towards it, so that matter can never experience any wind of relative motion with respect to the field. One could say that spacetime is itself gravitationally locked to mass, being always induced, polarised and stretched towards it, whether the mass is moving or stationary and for polarising induction defined by the speed of light, the gravitational field is always induced faster than mass can translate. As mass therefore always configures its own spacetime gravitational atmosphere at the speed of light, the field does not flow past it because it is always, by inductive coupling, compelled to stretch towards it. It can be argued from this that force is required to move inertial mass because the coordinates of spacetime are absolute[23] and, in relocating, matter must decouple and recouple its traction bonds with the extrinsic field as it changes position in the field, breaking polarisation bonds in the matrix location from which is moving as it engages polarisation in the location to which it is moving.

For confined energy that generates its own inertial gravitational field by inductive coupling of its surface tension with extrinsic spacetime, the equation for kinetic energy $ke = \frac{1}{2}mv^2$ should derive, at its quantum origin, from the energy required to break and engage surface coupling bonds with the matrix in a perfectly elastic exchange. For quantized inertial mass m given by equation (2) kinetic energy becomes:

$$ke = \frac{1}{2} \frac{8\pi r^2 T_s}{c^2} v^2$$

Which simplifies to:

$$ke = 4\pi r^2 T_s (v^2 / c^2) \qquad (4)$$

The kinetic energy for a translating inertial mass, as given in equation (4), can then be interpreted as the surface energy of the elementary particle (surface area x surface tension), divided by both the rate of field polarising induction and the rate of field depolarisation ($c.c=c^2$), that is, the velocity of light squared, multiplied by the square of the velocity of the translating mass, that is, the velocity at which the mass is decoupling from the matrix in its old location and also the velocity at which it is recoupling to the matrix in its new location ($v.v=v^2$).

7. Conclusions

If electromagnetic energy expresses transverse compressions and rarefactions of spacetime as ±gravitational fields, then, at its quantum origin, gravity is not generated by mass, but rather, mass is generated by gravity, that is, by gravitational potential, which is the elastic potential produced by deformations of the field matrix. If induction about an equilibrium axis compels energy to negotiate the field as vortices, the transverse radial compression and tangential induction generating the vortex identify the magnetic and spin-electric vectors respectively, indicating not just the direction and magnitude of the fields, but the direction and degree to which spacetime is being stretched and compressed transversely. Tangential induction that spins the radial displacement, inducing inverse torque on extrinsic spacetime as a circularly polarised electric field displacement, explains the quantum origin of the electromagnetic relationship and the curl of the electric field. If electromagnetic fields are indeed elastic distortions of spacetime generating elastic potential energy, then they are also fundamentally gravitic in nature. Their fields must therefore have mass equivalence[24], so that mass, in its most fundamental sense, defines a field deformation of stretched and compressed spacetime having elastic potential energy and this is its mass-energy equivalence.

The gravitic photon, as centrifugal energy, suggests a physical meaning to Einstein's $E=mc^2$ equation as a formula expressing not only mass-energy equivalence but also mass-energy architecture and with it the most fundamental energy-field relationship, a simple stress-strain elastic response of the matrix to energy, expressed radially in photon amplitude. In toroidal confined energy, the photon electromagnetic fields form the toroidal structure, constituting its binding energy and geometrically expressing both magnetic dipole and spin-electric charge. Inertial gravity then emerges from this toroidal topology as the inductive restoring force of its rarefied spheroidal surface field coupling exhaustively to extrinsic spacetime, so that surface tension, in effect, inductively pulls on the entire matrix field that constitutes the vast cosmos. This explains the weak strength of the gravitational field as the infinitesimally small inductive and displacive effect that gravitational surface tension of toroidal confined energy exercises on a universal field matrix.

A toroidal electron[25] or, more generally, fermionic matter can be explained as toroidal structured-light emerging from the architecture of a photon as a helically propagating gravitic vortex, a configuration that explains how energy with no resultant gravitational field and therefore no apparent mass can transform its mass-potential, its gravitational or elastic potential energy, into inertial matter as a concentric wave singularity that collapses to an intrinsically oscillating toroidal matter-wave. This geometric transformation of energy-field architecture from vortical photons to higher-dimensional structured-light effectively describes spinning magnetic monopoles[26] that converge and collapse to a magnetic dipole flux torus. This relatively simple topological reconfiguration of the flux pathway can explain how mass, magnetic dipole, spin and charge of elementary matter all emerge in a single, unified process from the confinement of photons as electromagnetic-gravitic energy.

Substituting equation (2) for quantized mass m into equation (1) gives:

$$8\pi r^3 T_s = G\left(\frac{8\pi r^2 T_s}{c^2}\right)\left(\frac{8\pi r^2 T_s}{c^2}\right)$$

Which simplifies to:

$$\frac{1}{r} = \frac{8\pi G}{c^4} T_s \qquad (5)$$

Equation (5) then describes a field equation expressing not the curvature of spacetime by mass, but rather the curvature of matter itself as a relationship between the radius and surface tension of the quantized confined energy unit.

In summary, quantization emerges naturally from an elastic limit to spacetime that takes effect linearly along a compressing string of displacing field quanta as this sets the vortex radius, quantizing the wave amplitude by fixing, as this limit, the radial stretch of the field for a photon and thus the gravitational potential that can be achieved by a single photon revolution or spin of the transverse oscillation. This explains Planck's constant and its fundamental significance in the quantization of both energy and spin angular momentum.

A theory of photons as gravitic vortices tenders an explanation for optical vortices[27] as amplifications by coaxial or paraxial superposition[28] of this baseline vortical photon configuration, meaning that optical vortices are such because they are dilated multi-photon gravitic vortices. This leads to a prediction that the dark core of an optical vortex is itself gravitic in nature. Indeed, inverse torque generated by spin induction also explains the origin of the mechanical torque of optical tweezers[29]. If, in fact, inverse torque is the rotating electrical inductive component of the photon, then it suggests that the mechanical torque of orbital angular momentum is the resultant of the photons' electrical fields, amplified by superposition and dilation so that orbital angular momentum[30] is the resultant spin.

The proposed source-field consolidates gravity and electromagnetism into a single theory in which electromagnetic waves are gravity-antigravity oscillations that propagate helically as spin vortices, forming fermionic matter as a concentric wave singularity of toroidal structured light[31][32]. The flux torus, as a flux differentiating topology, polarises field density, curving and stretching spacetime through the articulating extrinsic flux, leading to a description of gravitational curvature not as the effect that matter has on spacetime but rather the curvature of matter itself as articulated quantum gravity. If inertial gravity is indeed the signature of gravitational surface tension and this, in turn, signals the presence of field compression, within the toroidal cores of fermionic matter, then in this sense mass could be defined as a measure of the degree to which spacetime has become locally compressed.

"Of course, it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation. Then, for the first time, the epoch of theoretical physics, founded by Faraday and Maxwell, would reach a satisfactory conclusion"[33].

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