Unconventional reconciliation path for quantum mechanics and general relativity

Samuel Yuguru (samuel.yuguru@upng.ac.pg)
University of Papua New Guinea https://orcid.org/0000-0001-6312-4033

Research Article

Keywords: monopole, quantum mechanics, general relativity, multiverse

Posted Date: April 20th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-63303/v6

Unconventional reconciliation path for quantum mechanics and general relativity

Samuel. P. Yuguru[1]

1. Chemistry Department, School of Natural and Physical Sciences, University of Papua New Guinea, P. O. Box 320, Waigani Campus, National Capital District 134, Papua New Guinea, Tel. : +675 326 7102; Fax. : +675 326 0369; Email address: samuel.yuguru@upng.ac.pg.

Abstract

Physics in general is successfully governed by quantum mechanics at the microscale and principles of relativity at the macroscale. Any attempts to unify them using conventional methods have somewhat remained elusive for nearly a century up to the present stage. Here in this study, a classical gedanken experiment of electron-wave diffraction of a single slit is intuitively examined for its quantized states. A unidirectional monopole field as quanta of the electric field is pictorially conceptualized. Its application towards quantum mechanics and general relativity in accordance with existing knowledge in physics paves an alternative path towards their reconciliation process. This assumes a multiverse at a hierarchy of scales with gravity localized to a body into space. Such an outcome provides an approximate intuitive guide to examine physics in general from alternative perspectives using conventional methods.

Keywords: monopole, quantum mechanics, general relativity, multiverse

1.0 Introduction

Since the late 1800s to early1900s, knowledge acquired in increments for the microscale with the advancement of proper experimentations has come to successfully form a fundamental theory of the atomic state known today as quantum mechanics. An unexhausted list of scientists that contributed to the development of the theory during this period of time can be found in any common textbook. It was only during the 1920s that the theory was fully construed in what came to be widely known as Copenhagen interpretation, a phrase attributed to Niels Bohr and Werner Heisenberg. Other alternative interpretations of quantum mechanics such as Everett's many-worlds interpretations and a few others exist but are not as popular as the previous one.

Coinciding with the development of quantum mechanics in which Albert Einstein also played a key role by defining the particle property of light, he also developed theories for both special relativity and general relativity. The relativistic theories somewhat came to revolutionize physics for the macroscale by successful integration of Newton's gravity among others. Over time, experimental findings and new theories have evolved to affirm the accepted general knowledge in both quantum mechanics and relativity as the two pillars of physics at two extreme scales. To date, any attempts to unify them using conventional methods in both experiments and theoretical applications since earlier attempts by Einstein [1] have somewhat remained elusive for nearly a century up to the present stage. Here, in this study, an unconventional approach is considered for the reconciliation process of quantum mechanics and general relativity.

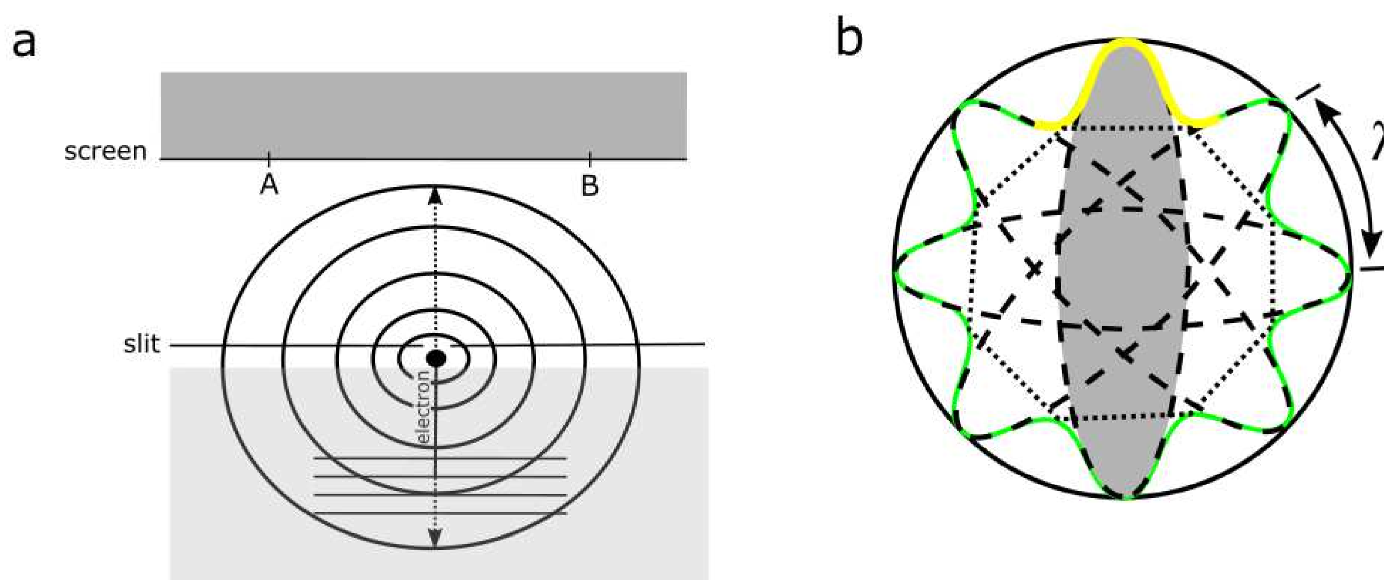
A classical Einstein's gedanken experiment of electron-wave diffraction of a single slit [2] is pictorially examined for its quantized states. Condensed electric field, **E** of the wave diffraction generates a unidirectional monopole field (UMF) as its quanta [3] and this is dissected linearly along inertia frames of magnetic field, **B**. Within a monopole pair (MP) field of an elliptic shape or orbital type, each frame is converted to Bohr orbit (BO) in perpendicular to **E**. A particle in orbit then is naturally quantized along BOs in degeneracy into extra dimensions. Continual precession of the MP field into forward time insinuates the emergence of the MP model into four-dimensional (4D) space-time in flat space. At the periphery of the model, Planck's radiation in accordance with 2^{nd} law of thermodynamics ensures conservationism. From this conceptualization process, the model's applicability to physics in general at the microscale and the classical level is able to integrate many of their features into proper perspectives consistent with existing knowledge in physics. This assumes a multiverse at a hierarchy of scales with Newtonian gravity localized to a body into space, while special relativity, $E = mc^2$ for mass-energy equivalence is sustained. These descriptions altogether offer an alternative path for the unification of quantum mechanics and general relativity. If considered, the MP model presents a dynamic intuitive tool that can be applied to explore physics in general from alternative perspectives perhaps in increments using conventional methods.

2.0 Conceptualization process of an MP model

The conceptualization path of the MP model is attempted from a classical gedanken experiment of electron-wave diffraction of a single slit. First, the process is devised using pictorial demonstrations. Second, the model is validated by applying a generalized renormalization process based on common knowledge in physics. Third, its notable limitations are examined with suggestions offered on how these can be improvised from an intuitive perspective due to the constraints faced by conventional methods to explore physics in 4D space-time. The final outcome offers a dynamic intuitive tool, and this is applied to explore physics in general from the microscale to the cosmic level wherever applicable.

2.1 A pictorial demonstration

An observer at a slit sees ripples of spherical waves receding into forward time for an emitting electron source (Fig. 1a). The electron possesses both isospin, I_z and energy-momentum, Φ. On expansion, the former is projected as an arrow of time, $\vec{I}$ in asymmetry of unidirectional and this is dissected perpendicularly by the latter along inertia frames of **B**. The condensed boundary of **E** evolves into a UMF of multiple MP fields that encloses $\vec{I}$ at a minimal energy level equivalent to the Planck's constant, h (i.e., 6.626 x 10^{-34} joules per second) with conservation sustained. The emergence of orbital structures within a MP field somewhat mimes a UMF background in thermal equilibrium. The orbitals are quantized linearly along inertia frames of BOs defined by



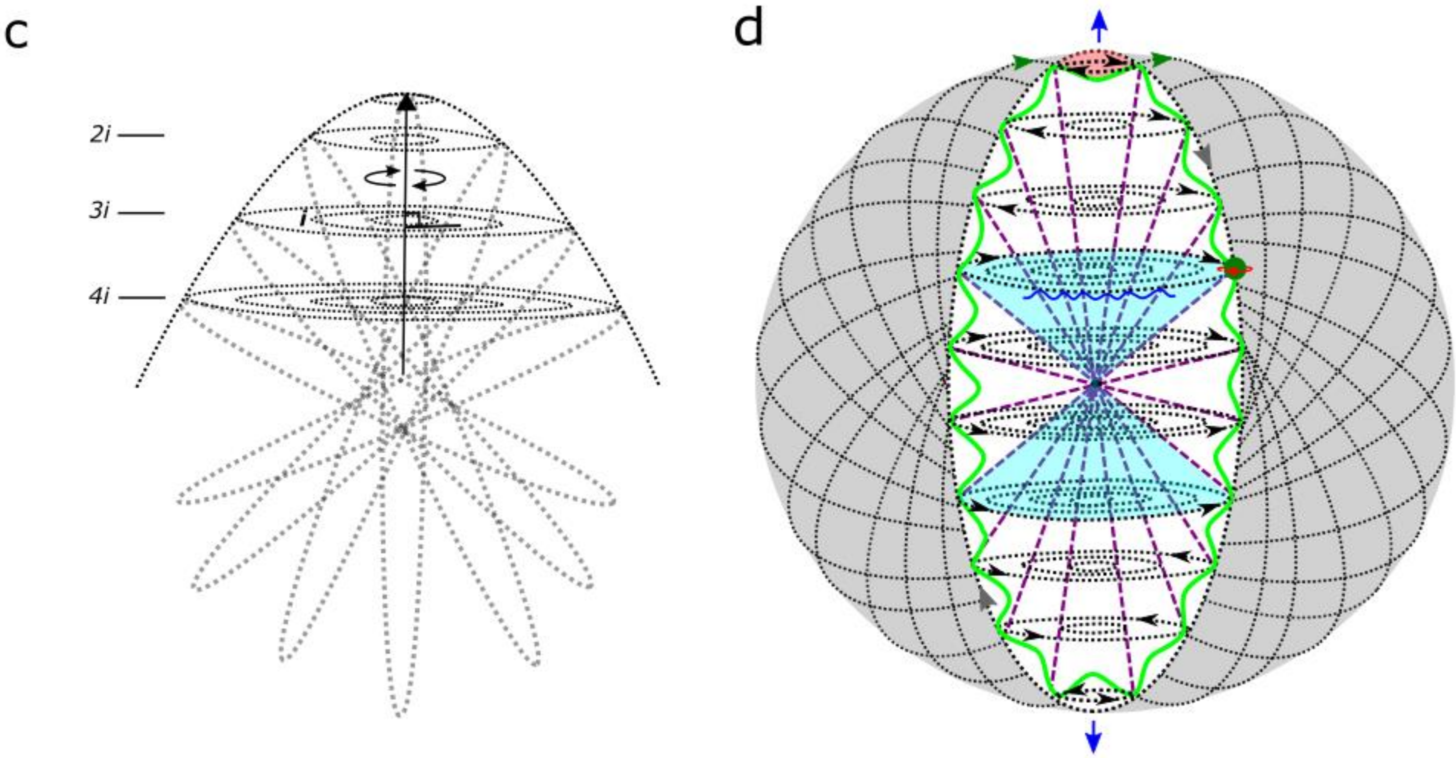


Figure 1. A step-by-step conceptualization path of the MP model. (a) Expansion of electron-wave diffraction from an electron source in a single slit setup towards detectors A and B. (b) Unidirectional symmetry-breaking of Higgs mechanism type (yellow curve) insinuates the emergence of a MP field (gray area) in 2D space. Multiple MP fields generates UMF (green loop) and this encloses an octet shape of inertia frames within a circular **E**. Coherence is epitomized by the wavelength, λ for conservationism. (c) Emergence of orbital structures within the MP mimes the UMF background in thermal equilibrium. These are quantized along BOs of **B** in degeneracy into extra dimensions, n_i. (d) The MP field of 2D space is transformed into 4D space-time of a hologram type where time is defined by precession (green arrows) into forward motion. The orbital paths are of degenerate states (pink dotted lines) for a particle such as an electron (green circle) in orbit. The wave function, Ψ (blue wavy curve) into extra dimensions resemble neutrino types. The electron transition between two orbitals from point $x \rightarrow \hat{x}$ (pink area) due to precession equates to ±*h* for the MP field (white area). This is bounded by continuous Ψ (green wavy loop) in equilibrium to $\vec{I}$ (blue arrows) in asymmetry. Expulsion of *h* during observation unveils superposition of $\pm\frac{1}{2}$ magnetic spin (m_s) (navy colored cones). Such a scenario is attributed to the effects

of gravitational time dilation where external light paths along BOs spiral inwards towards singularity at the center possibly in time reversal mode to precession into forward time. All these descriptions allude to the dynamics of a MP model of a spherical electron cloud model (gray area) into 4D space-time in flat space.

Φ. These are of degenerate states into extra dimensions in time dilation, $I_{z\|}$ to $\vec{I}$ of unidirectional along orbital paths in precession into forward time. Any outgoing radiation from precession is defined by Planck's law, $E = nhv$ at the Planck's scale of approximately 10^{-34} cm. The n-level is attributed to BO into extra dimensions where the equivalence principle is sustained and v is frequency. The radiative process breaks time reversal symmetry imposed by gravity in accordance with the application of 2nd law of thermodynamics. Additional details including space-time dynamics are provided in the captions of Fig. 1a, b, c and d in a step-by-step process towards the conceptualization of the MP model. The final product mimics an electron cloud model into 4D space-time. This can be applied to one-electron atom such as hydrogen for a MP field or multielectron atoms for multiple MP fields where electrons are distributed in accordance with Pauli exclusion principle. In the following subsections, the model's compatibility to a renormalization process and limitations are explored.

2.2 A generalized renormalization process

In mathematical terms, the conceptualization path of the MP model can be conceived in accordance with common knowledge in physics. Commencing from the electron source towards the generation of space-time, the process conceives a triple integral in the following manner

$$\int_{-\infty}^{\infty} dI_z d\phi \rightarrow \int_{-\infty}^{\infty}\int_{0}^{\pi} nI_{z\parallel} d\phi d\Omega \rightarrow \int_{-\infty}^{\infty}\int_{0}^{\pi}\int_{0}^{2\pi} nI_{z\parallel} d\phi d\Omega d\theta \qquad . \tag{1}$$

The boundary of the UMF is normalized to 2π for the spherical electron cloud model encompassing UMF in precession mode defined by h (Fig. 1d). $I_{z\parallel}$ is attained along inertia frames of BOs in degeneracy at *n*-levels in reference to $\vec{I}$ or principal axis of the MP field in asymmetry (Fig. 1d). The position of a particle in orbit into 3D space is defined by the spherical polar coordinates (Ω, Φ, θ). In here, the symbol Ω equates to the circular motion of the precession stages, Φ is energy momentum of BO and θ is azimuthal angle between $I_{z\parallel}$ and $\vec{I}$ with respect to the electron source. These intuitions somewhat translate a 3D space model into 4D space-time.

Any increase in applied external energy is expected to produce light cones along BOs at an *n*-level by expulsion of the minimal energy, h and leveling of the degenerate states (Fig. 1d). In this case, normalization of Equation 1 takes the form

$$nI_{z\parallel} \int_{-\infty}^{\infty} d\Omega d\phi d\theta = 1 \tag{2}$$

where the integral incorporates the path covered by the particle in orbit, which is of time invariance for the MP field. From the first principle of the quantum Ψ, a particle's position in orbit is also defined by the Hamilton-Jacobi relationship in the form

$$nI_{z\parallel} = abc\Omega sin\theta \qquad . \tag{3}$$

The parameters *abc* represent lengths of semiprincipal axes of a BO (Fig. 2). Renormalization then takes the standard form

$$\frac{a^2}{x^2} + \frac{b^2}{y^2} + \frac{c^2}{z^2} \leq 1 \tag{4}$$

where volume of the ellipsoid is given by $v = \frac{4\pi abc}{3}$. Projection of BO into extra dimensions along the x-axis or alternatively $\vec{I}$ generates quantized energy states at n-levels (Fig. 2).

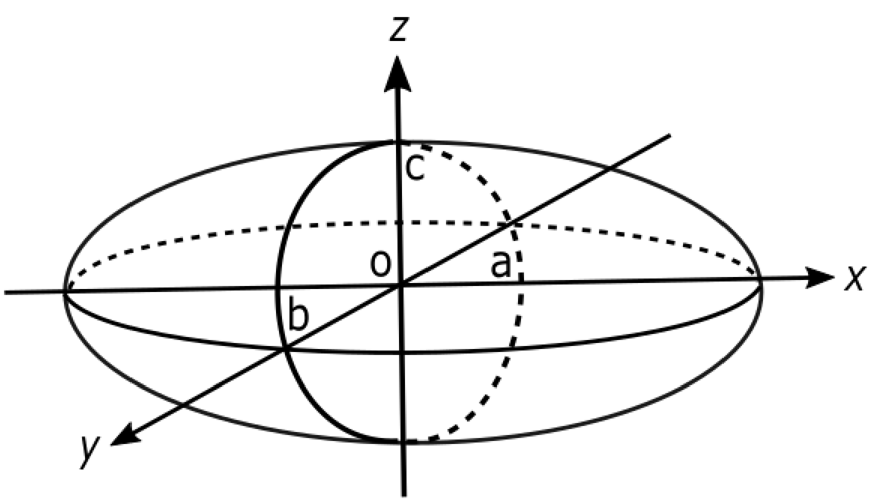


Figure 2. An MP field of elliptic shape. The sphere along the *z*-axis/$I_{z\|}$ is comparable to a BO, while the *x*-axis identifies $\vec{I}$ in asymmetry. If *z*-axis mimes **B**, *y*-axis equates to **E**.

Alternatively, Equation 3 can be expanded into the form

$$dxdydz = abc\Omega^2 sin\theta d\Omega d\Phi d\theta \tag{5}$$

where Ω^2 encompasses the precession stages of both the MP and its internal orbital structures. To an external observer, a particle in orbit is always in a superposition state of $\pm\frac{1}{2}m_s$ due to continuous precession of a circular motion and gravity effects exerted on the quantized states of the orbital paths (i.e., BOs) towards singularity (Fig. 1d). The magnitude of the Ψ is depended on the size of the object interacting with light along a straight path. For the particle transition between two orbitals from point $x \rightarrow \hat{x}$ (Fig. 1d), this follows Born's rule in the generalized form

$$nI_{z\parallel}\int_{-\infty}^{\infty}\Psi^*\Psi d\tau = 1 \tag{6}$$

where $d\tau = dxdydz$ along BO is defined by $nI_{z\parallel}$. Equation 6 holds true from the first principle where Ψ is applicable to all constants such as an electron in orbit at the microscale and this forms the basis for the physical derivation of Schrödinger equation. External light application at a point-boundary of the MP model is expected to generate standing waves in 2D space-time of a continuum mode (i.e., Euler's formula). This is defined by the relationships

$$\Psi = Asin\frac{2\pi x}{\lambda} \quad \text{or} \quad Bcos\frac{2\pi x}{\lambda} \tag{7}$$

where A and B are constants with λ projected along the *x*-axis. All these descriptions offered in this section allude to the dynamics of the MP model into 4D space-time.

2.3 Limitations

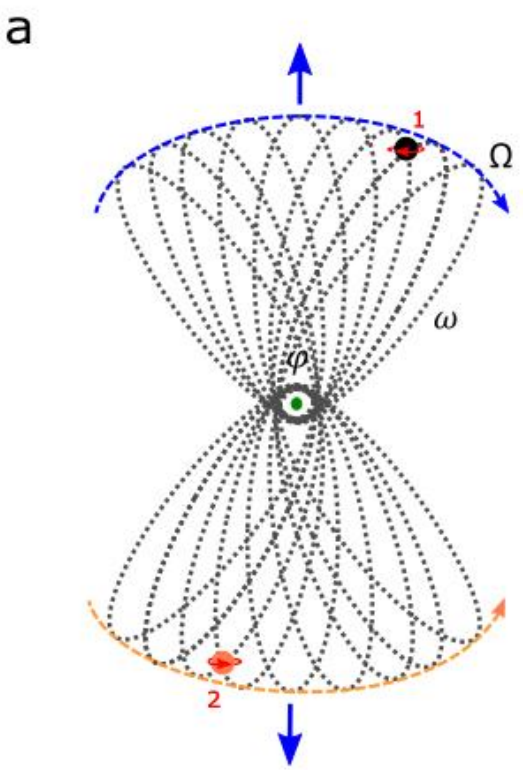
The most obvious question arises from what powers the precession mode of the MP model into forward time in a perpetual motion and in turn violate the laws of thermodynamics? By linking precession to $\pm h$ for the MP field of time invariance along $\vec{I}$ at Planck's scale, time reversal symmetry is broken in accordance with 2nd law of thermodynamics and conservation sustained. Perpetual rotation in one direction then offers a miniature clock in correspond to a possible large time clock since the Big Bang. Further details are provided in the final section of this paper.

The coupling of external light paths and inertia frames of BOs are expected to spiral inwards towards singularity at the center and this mimes gravitational time dilation such as for one-electron atom like hydrogen (Fig. 1d). If this insinuates time reversal against precession into forward time, then superposition state of $\pm\frac{1}{2}\,m_s$ is attained along BOs into extra dimensions. In this case, observation of the actual orbital paths into 4D space-time violates lightspeed of time dilation. Such intuitions are highly speculative but somehow these cannot be effectively addressed by the principle of Occam's razor. For example, the principle underlies conventional methods and this requires simplicity or empirical data, such as from point A to point B in either 1D to 2D space-times or 3D space. In the process, any intricate details, intuitions or complexities between the two points are overlooked. Hence, current models of the orbital structures are limited to the Ψ of hydrogen atom into 3D space. So in order to ascertain the dynamics of the orbitals structures or the rigor of the MP model into 4D space-time (Fig. 1d), this is weighted against existing knowledge in physics. However, to do so defies the norm, for there are currently no existing studies in physics that have pursued such an unconventional path prior to this study to the best of the author's knowledge.

Hence, in this novel undertaking, a more conceptualization path is adapted and this is also expected to shed some perspectives into the unification process of quantum mechanics and general relativity, a predicament that continues to defy conventional methods to this day. For such a quest, the model's applicability to symmetry is first conceived before examining its compatibility to existing knowledge in physics for both the microscale and the cosmic level wherever applicable.

3.0 MP model versus symmetry

Symmetry at the fundamental level is governed by the Noether theorem and this assumes energy conservation. Its applicability requires the existence of both matter and antimatter as first proposed by Dirac [3] in the process, $e^+ e^- \longrightarrow 2\gamma$. Evidences of antimatter are provided by the discovery of positron [4] and stern-gerlach experiment of $\pm\frac{1}{2}\, m_s$. Beyond that, other empirical data for the existence of supersymmetric partners or microscale black holes are still lacking [5, 6]. While these are being investigated in ongoing research programs, an intuitive demonstration of symmetry for $\pm\frac{1}{2}\, m_s$ from Fig. 1d is expounded in Fig. 3a. By assuming a multiverse at a hierarchy of scales, the process is applied to the solar system (Fig. 3b). Here, the effects of gravitational time dilation only allows for the observation of a ± monopole field for the MP field irrespective of the scale. In these demonstrations, conservation of energy, magnetic momentum, angular momentum and center-of-mass are sustained with respect to the singularity at the center. Perhaps the major differences between the two scales are that the area of the applied light during observation is either greater or less than the object. For example, for the microscale, superposition of $\pm\frac{1}{2}\,m_s$ is attained in probabilistic distribution at lightspeed due to time dilation (Fig. 3a). At the macroscale, the reflected light rays are less than the area of the planet and only a monopole field becomes observable, while the anti-field remains hidden or vice versa (Fig. 3b). Such differences can also be viewed from another perspective in the following manner.



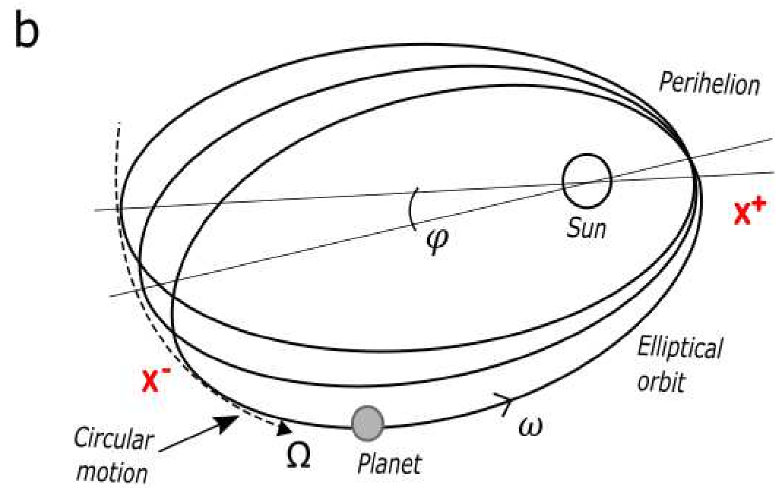


Figure 3. Observation of actual orbital paths during precession violates lightspeed due to localization of gravity. (a) A particle extracted in an upward direction at position 1 offers $+\frac{1}{2}$ spin (blue dotted curve and arrow) and vice versa in a downward direction at position 2 (brown dotted curve and arrow). The former is attributed to precession into forward time and the later due to gravitational time dilation of spiraling form in reversal mode towards the center. In this way, the quantized states of BOs sustain superposition of $\pm\frac{1}{2}\,m_s$ into extra dimensions. (b) Similar process is perhaps applicable towards a higher hierarchy of scale for Mercury's orbit [7]. Shifts in the perihelion precessions are more accessible to an external observer on Earth, while the anti-field remains hidden or vice versa due to gravity. X^+ represent matter (e.g., Mercury) into forward time and X^- is the apparent position for the antimatter field due to gravitational time dilation. The former is not drawn according to spatial distance. Ω = circular motion of the precession stages, ω = perturbation of angular

velocity and φ = is the measure of magnetic flux or BOs into extra dimensions between two precession stages.

The precession of the orbitals at the microscale is defined by h (Fig. 1d). By contrasts, Mercury's perihelion precession of its elliptic orbit advances by 5,601 seconds of arc per century [2] for a body of a mass equal to 3.285 x 10^{23} kg. Suppose the formation of the arc equates to the approximate time it takes for the emergence of a Ψ, this is attained at a rate of 56 seconds per year. Thus, the transition of the geodesic motion towards the formation of a planetary Ψ at a higher hierarchy of scales in a multiverse is considerably delayed or is of gravitational time dilation. Such a scenario considers Newtonian gravity to be localized to a body into space (e.g., Fig. 3a and b). Its sphere of influence is comparable to a MP model and this sustains symmetry into 4D space-time as described above. Whether these explanations can possibly account for a discrepancy of 43 seconds predicted by general relativity [2] for Mercury's perihelion precession offers interesting prospect for further investigations.

The above descriptions somewhat appear contrary to the prediction offered by quantum mechanics such as De Broglie relationship for classical objects, where the Ψ is considered to be negligibly small. As a consequence, the reconciliation path for quantum mechanics and general relativity using conventional methods has become fairly constrained with infinite mathematical terms particularly into either 2D space-time or 3D space. The same can be said for the pursuit of quantum gravity at the Planck's scale. But for this study, an alternative perspective is considered into 4D space-time where Planck's scale is projected outward towards the boundary of the MP model (Fig. 1d). Such a prospect offers an opportunity to examine physics in general from an alternative perspective and this is offered next.

4.0 MP model versus various aspects of physics

In this section, the model's relevance to both classical and quantum physics is presented. Such a process is expected to integrate a number of physics themes into proper perspective. At the moment, this is lacking from current observations and theories without any forthcoming new insights despite the advancement of instrumentation made in recent times [8]. Similarly, the Standard Model theory of particle physics has quite successfully integrated the electroweak forces, weak and strong nuclear forces. The discovery of the Higgs boson formed the pinnacle of its final prediction. However, beyond that, the model appears somewhat inadequate to accommodate quantum gravity, dark matter and dark energy among others [5]. Hence, for these undertakings, a purely conceptualized path is pursued based on the adapted method.

In Fig. 4, the treatment of the MP model to various physics themes is offered. Some of these include Planck's radiation, wave function collapse, Euler's formulation, Schrödinger equation, Bohr's model, electromagnetism and so forth. These are briefly expounded below in bullet points.

- *Wave function collapse:* A light beam travelling on a straight path and its interaction with a precessing MP model into forward time registers standing waves of Euler's formulation into 2D space-time (e.g., Equation 7). The presence of matter (an electron in orbit) smoothens out the precession stages of the MP field to insinuate a physical Ψ into 4D space-time. During observation, this adds a spike to the standing waves in the quantized form, $E = nhv$ for the wave function collapse into 2D space-time (Fig. 4). The output signal, λ equates to $\hat{x}$ or the expectant value and this diminishes with continual precession

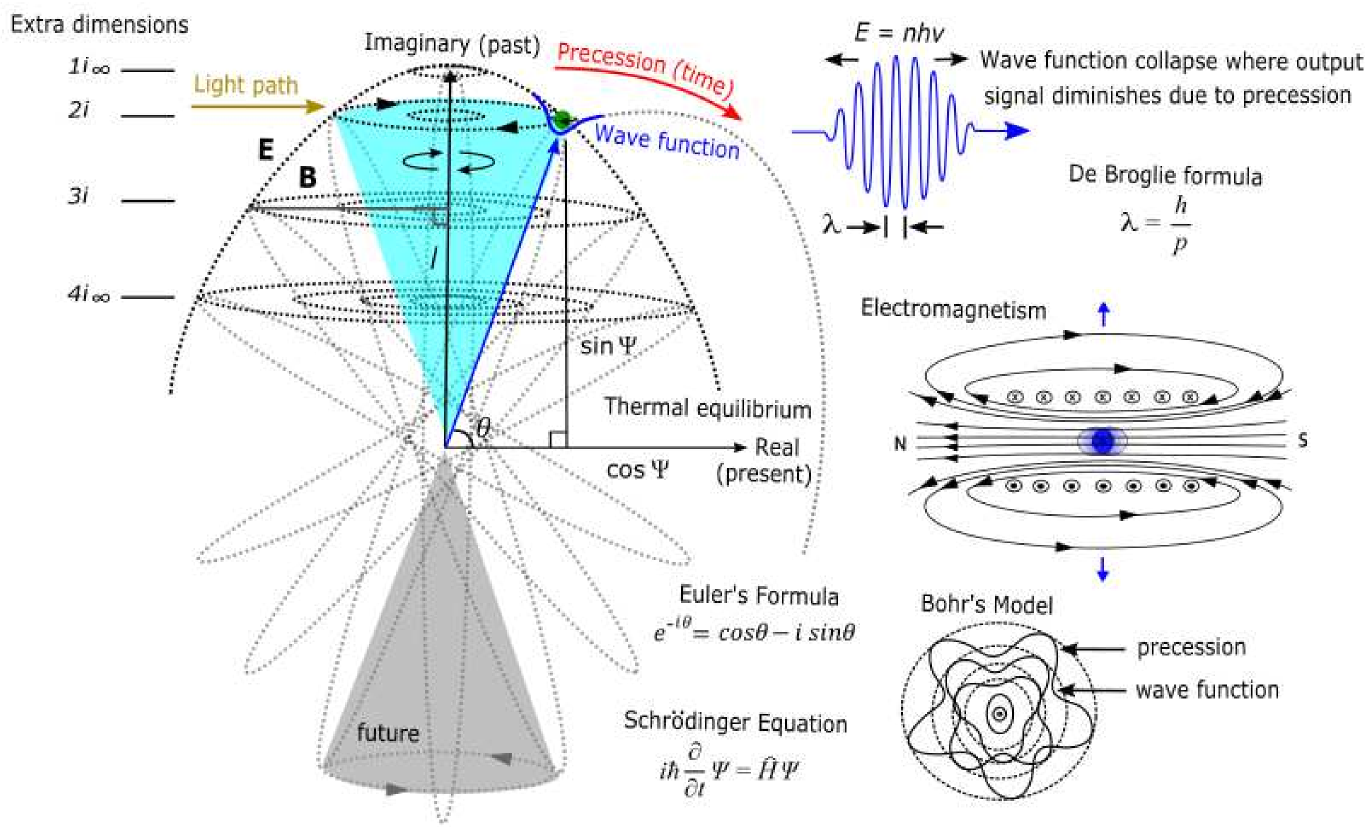


Figure 4. The presence of matter within the MP model insinuates a wave function, Ψ into 4D space-time. This is reduced to 2D space-time at observation (i.e., a wave function collapse scenario). How some of the major physics themes fits into this conceptualized process are incorporated and expounded further in the text.

of the object in orbit into extra dimensions. For the electron, De Broglie relationship, $\lambda = h/p$ defines its wave-particle duality. Its momentum, $p = mv$ is attained along BO with m equal to mass and v is velocity along the orbital path. The shift in the position of the electron between two orbitals into space, i.e., $x \rightarrow \hat{x}$ resembles $\Psi \rightarrow \Psi$ transition in accordance with Born's rule for complex probability amplitudes. A level of complexity is sustained for the electron into 4D space-time (e.g., Fig. 3a). The Heisenberg uncertainty principle, $\Delta x \,.\, \Delta p \geq \hbar/2$ defines the electron's position, where $\hbar/2$ incorporates the orbital pair within the MP field into 2D space at observation (Fig. 4). Normalization of precession at the point-boundary of the MP field (between two orbital paths) for the electron's position is defined by Euler's formulation (Fig. 4) and this offers a level of indeterminacy, i.e., $i\hbar$ (Fig. 1d). Any information transfer between the electron and the photon incorporates the quantum parameters, n, l, m and m_s values. Their applicability to one-electron atom like hydrogen is demonstrated in Fig. 4. For example, the n-level is related to the extra dimensions, l is defined by the orbital paths, m is attributed to BOs in degeneracy and m_s corresponds to the light cones for both the past and future scenarios. Note that gravity due to time dilation offers the present stage. Because of either decoherence or Planck's radiation with respect to time dilation, the past is not always equivalent to the future or vice versa. Such intuitions further imply that an electron orbiting into 4D space-time at the lightspeed can pass through both slits in a double slit experimentation when observations of its position are limited to either 2D or 3D space (e.g., Fig. 1a). Such intuition poses interesting prospect for further investigations.

- *Bohr's model:* Quantization of the orbital paths or MP field into 2D space along inertia frames is assumed by BOs into extra dimensions (Fig. 4). Because quantization epitomizes particle presence, the outgoing radiation translates to discrete forms, $E = nh\nu$ for the wave function collapse. Thus, the electron is not expected to spiral inwards towards the nucleus with continual radiation at Planck's scale. Instead, this is attributed to gravitational time dilation of light paths into 3D space with respect to the nucleus while the electron is conserved. Because the orbital paths in 4D space-time are assumed to violate lightspeed (e.g., Fig. 1d and 3a), their modelling into 3D space is assumed to mimic the Ψ of hydrogen for complex orbital structures. Applying such intuitions, degenerate BOs would relate to Zeeman effect and perhaps other odd spin types for observation into 3D space and this warrants further investigations.

- *Schrödinger Equation:* According to Fig. 4, the position of the electron anywhere along the orbital paths into extra dimensions is defined by the Ψ or $i\hbar$ as mentioned above. Thus, shifts in its position are accommodated by the generalized equation, $i\hbar\, \partial/\partial t\, \Psi = \hat{H}\, \Psi$ where $\hat{H}$ is the Hamiltonian operator for both the kinetic and potential energies. The square root of -1 is given by *i* and this is incorporated into Euler's formulation. Change in time due to precession insinuates shifts in the position of the electron and hence Ψ along BO (Fig. 4). Such intuitions can be further explored for Schrödinger's equations of both time independent (2D to 3D space) and time dependence (2D space-time) including the m_s for its cat narrative with respect to the MP model.
- *Electromagnetism:* Based on the conceptualization process (subsection 2.1), the spherical boundary of the MP model is defined by **E**, while its quantization along BOs in degeneracy is of **B**. This sustains conservation where a particle such as an electron in orbit into space-time becomes of a classical Maxwell point. Shifts in its position due to precession are incorporated into the relationship, $\nabla \times \mathbf{E} = -\partial\mathbf{B}/\partial t$ with ∇ defined by the spacing of BOs into extra dimensions. Precession dictates time and this in turn influences the rotational of **B** along BOs. Any interaction with external light on a straight path at point, $i\hbar$ generates electromagnetic field of standing waves (e.g., Equation 7). Similarly, external application of magnetic fields during compression of the MP model is expected

to insinuate Casmir effect due to the presence of the electromagnetic field (Fig. 4). Whether this can also shed some insights into the Meissner effect observed in superconductors at non-zero temperatures requires further investigations.

- *A probable entanglement scenario:* Continual precession and gravitational time dilation effects induces violation of lightspeed along the orbital paths during observations (Fig. 1d). This is perhaps attributed to the translation of 4D space-time into 3D space at observation. In this case, superposition state of $\pm\frac{1}{2}\, m_s$ is sustained along quantized states of BOs (Fig. 3a). Any linear coupling of a complementary pair of MP models or $\pm\frac{1}{2}\, m_s$ is expected to produce qubits, 1, 0, –1. Whether the coupling process between a split pair of MP model or photon can be attained in the absence of light as a transport medium into space poses an interesting prospect for quantum entanglement. In addition, the information gained by the photon from its interaction with the electron is either conserved or destroyed through decoherence also offers an interesting dilemma worth further considerations.
- *Statistical mechanics:* The precession stages of the orbitals are normalized to a circular motion defined by Ω in thermal equilibrium (Fig. 3a and b). Quantization of the orbitals along BOs provides the microcanonical ensemble for the entropy, S in the form, $S = k\ In\ \Omega$. The Boltzmann constant, k offers an approximate value to the distributions of both fermions and bosons along degenerate states of BOs into extra dimensions. This is attained in N-dimensions of Hilbert space where both matrix and algebraic relationships for both Dirac-Fermion and Bose-Einstein can be pursued. Extension of the baryon octet shape of the orbitals (Fig. 1b) may also accommodate decuplet diagrams for quark distribution towards the nucleus in a multiverse at a hierarchy of scales. Such

explanations can be explored for the Standard Model where coupling of multiple MP fields during hadron collisions is expected to produce a plethora of particle types from the quantized states of BOs into Hilbert space.

- *Further experimental pursuits:* In summary, it is envisioned that the MP model exemplified in Fig. 4 can be designed and tested experimentally. By building a gyroscope that mimics the model into 4D space-time, its interaction with a light beam travelling along a straight path should be observed for a number of scenarios. 1) Lightspeed at less than the speed of the rotating gyroscope. 2) Lightspeed at almost equal to the speed of the gyroscope. 3) Lightspeed at faster than the gyroscope's speed. In this case, the orbital paths should traverse into reversal mode to mime gravitational effects. The successful outcomes of such undertakings can perhaps ascertain some of the quantum features described above and this warrants further investigations.

5.0 MP model versus General Relativity

Relativistic theories in physics form the cornerstone for cosmic observations. Einstein's name is synonymous with their development and this involves more complex mathematical paths that are construed to generally comply with experimental findings. However, conventional methods in both theoretical and experimental undertakings are attained in accordance with the principle of Occam's razor. The empirical data garnered are largely construed into either 1D to 2D space-times or 3D space. In this section, how general relativity becomes applicable into 4D space-time is explored by first examining a black hole scenario followed by the solar system. Other notable themes such as the Big Bang and cosmic inflation are briefly outlined at the end of this presentation in order to pave a new research path for their future pursuits.

5.1 A black hole scenario

For a multiverse at a hierarchy of scales, a black hole could exist as a quantum state of a galactic scale. In such a scenario, the applicability of the MP model to a black hole is demonstrated in Fig. 5. Rotation into forward time is defined by Kerr matrix whereas the extra dimensions along

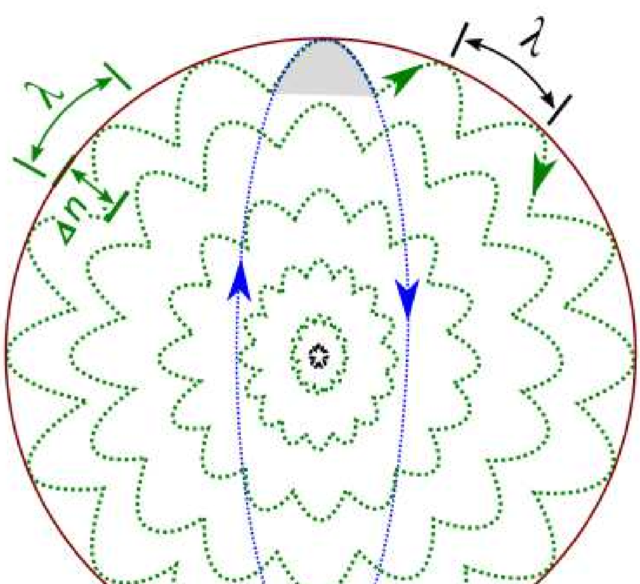


Figure 5. Application of the MP model to a black hole into 4D space-time. Interaction with light travelling in a straight path is expected to vanish along orbital paths. Light absorption is progressively slowed into extra dimensions (green dotted loops). Any decoherence (green wavelength) of minimal energy (gray area) beneath the event horizon (maroon circle) must first overcome coherent flow (black wavelength) by external application of high energy waves. The outline of the MP field is given by the blue dotted shape

for the simplest scenario (i.e., a hydrogen atom), while its multiples are comparable to a multielectron atom. Blue arrows = forward time and green arrows = shift in precession.

inertia frames are related to Schwarzschild property. Both are expected to have evolved in response to a Big Bang scenario and these are explored later in the text. Any interaction with external light travelling in a straight path is intercepted by the orbital paths. In the absence of matter, the emergence of the Ψ would take time infinite to evolve (see Fig. 4), while coherence is sustained beneath the event horizon. In this case, perhaps the initiation of Ψ from point $x \rightarrow \hat{x}$ between two orbital paths becomes of gravitational time dilation in light years. Whether such a scenario of outgoing radiation into 2D space-time could account for gravitational wave types noted [9] for a binary black hole merger offers interesting prospect for further considerations.

Comparably, a person falling into the black hole may never get the chance to reach singularity if one's body becomes elongated or 'spaghettized' along orbital paths into extra dimensions of forward time infinite. Any outgoing information is limited to external application of high energy waves such as gamma rays to overcome the gravitational effect compared to the microscale (e.g., Fig. 4). Similarly, the entanglement scenario described in section 4.0 is extremely enlarged for a higher hierarchy of scale in a multiverse and this is unavailable for measurement to an external observer stationed on Earth. Such a case rules out any existence of firewall paradox. Similarly, if Hawking radiation mimes $\pm h$ for the macroscale, its observation is limited to the emergence of the Ψ described above. In the subsequent subsections, the model's applicability to the solar system is examined followed by its relevance towards a probable Big Bang scenario.

5.2 The solar system in a multiverse

Based on the Nebular hypothesis, the solar system evolved from a cloud of dust and gases immediately after the Big Bang. Suppose the planetary bodies were formed within a UMF of the sun, a likely scenario is offered in Fig. 6. In this case, whether the stability of the solar system

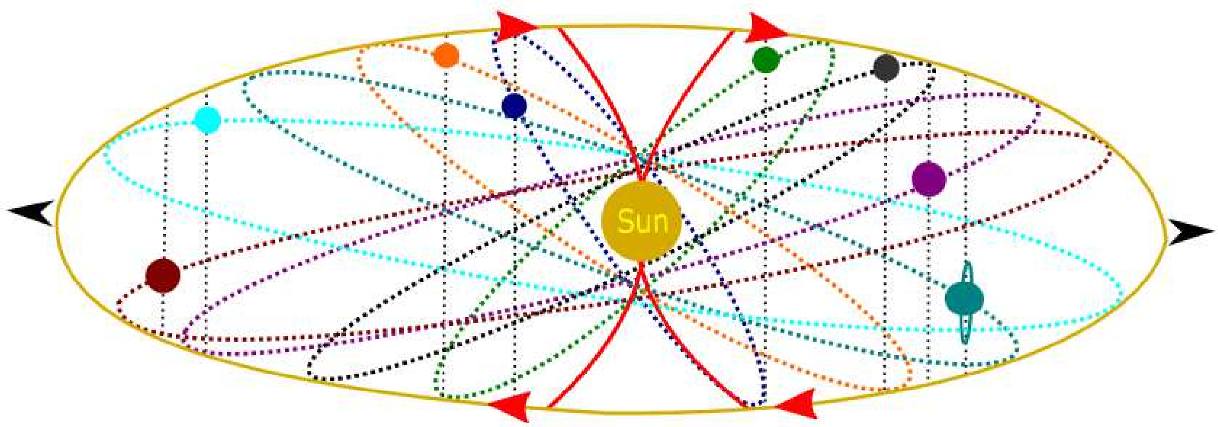


Figure 6. The application of the MP model to the solar system is comparable to a Rutherford planetary model. The orbitals are quantized along straight paths of BOs (dotted lines). Divergence of the electromagnetic radiation from the sun (red curves and arrows) sustains $\vec{I}$ in asymmetry for the MP field (black arrows). The boundary (pale orange circle) indicates conservation. Note, the planets are not plotted according to size or type.

into space is sustained from interactions with others of similar type remains an open question not pursued here. Perhaps the solar system in thermal equilibrium could be orbiting a galactic system and this is explored later in the text. But due to gravity, this may not be obvious to an internal observer.

Based on Kepler's 2nd law, the area covered by apsidal precession of a planet's orbital is equivalent to its perihelion precession within the vicinity of the sun. In 2D space-time, the orbit is of an elliptic plane (Fig. 6), while precession insinuates a 4D space-time in flat space as shown in Fig. 7. Here, Einstein's field equation of geometry for the geodesic motion [10] is intuitively

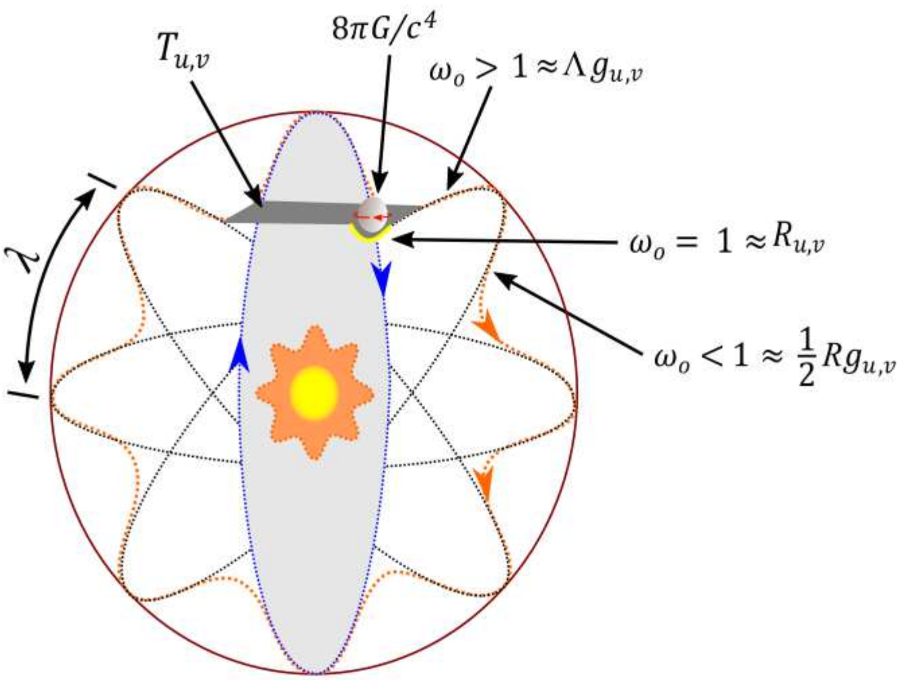


Figure 7. The application of Einstein's field equation for the geodesic motion of a planet into 4D space-time. The initiation of the planetary Ψ (yellow curve) is naturally incorporated into the geodesic motion but is of gravitational time dilation (i.e., readily unavailable to observations at lightspeed). The process normalizes the precession stages (orange dotted loop) of a MP field (blue dotted outline) and this sustains conservation. Manifolds of the stress-energy tensor ($T_{u,v}$) framework is assumed into extra dimensions comparable to BOs at the microscale (see Fig. 4). The actual precession of the planet (e.g., Mercury) due to gravitational effect is provided in Fig. 3b. G = Newtonian gravity, R = scalar curvature and $Rg_{u,v}$ = Ricci curvature tensor with definitions of other terms provided in the text.

applied to a planet in orbit of the sun. Such demonstration is in general agreement with the core principle of general relativity, where matter curves space and space tells matter how to move. For example, shifts in precession of the MP field into extra dimensions determine how matter should move into space. In turn, the gravitation force of the planet bends a ray of light traveling along a straight path to induce a geodesic motion. At the localized scale, gravity induces time reversal to counter precession at lightspeed (e.g., Fig. 1d). Thus, the initiation of the planetary Ψ into forward time is considerably delayed or becomes of gravitational time dilation (Fig. 7). In this case, Λ equates to both the cosmological constant and Einstein's original interpretation [2] of it representing the repulsion force for a static universe to balance out gravitational pull. The term, $T_{u,v}$, corresponds to inertia frame of BO in degeneracy for the macroscale (see Fig. 1c). The light paths traversing BOs into extra dimensions of unidirectional provide the metric tensor, $g_{u,v}$ into space-time. These explanations relate extra dimensions of the MP model to the existence of dark energy and dark matter within a hierarchy of scales for a multiverse. Special relativity of mass-energy equivalence along the inertia frames into extra dimensions is sustained. The process is perhaps replicated for Earth miming a MP model at the lower hierarchy of scale with satellites in orbit. Applying these intuitions, the possible link between the microscale and the cosmic level is plotted next.

5.3 A probable reconciliation path

Pictorially, the MP model offers a tangible path towards the reconciliation process of quantum mechanics and general relativity based on the Ψ into 4D space-time (e.g., Fig. 4 and 7). Such a path is extremely difficult to plot using conventional method because of the restriction posed by the Occam's razor based on the instrumentation capabilities and theoretical approaches from abstract mathematical paths. For a crude mathematical representation, Equation 2 is expanded into the form

$$i\int_{-\infty}^{\infty}(dRdTd\Lambda)_{u,v} \equiv \ i\int_{-\infty}^{\infty}(d\Omega d\phi d\theta)_{u,v} \tag{8}$$

where *i* refers to an accelerating object in orbit at an undefinable scale (∞) of a multiverse in accordance to Euler's formulation (Fig. 4). The momentum of the object in both forward and reversible directions is of equal magnitude along the quantized states of BOs. From geometry relationship of the MP model, Equation 8 provides the link between the microscale and the cosmic level. By expanding Equation 6, the Ψ for the multiverse at a hierarchy of scales is given by the expression

$$T_{u,v}\int_{-\infty}^{\infty}\left(R_{u,v}+\Lambda g_{u,v}+\frac{1}{2}Rg_{u,v}\right)^{\frac{8\pi G}{C^4}}dR_{u,v} \equiv \ nI_{z\|(u,v)}\int_{-\infty}^{\infty}\Psi^{*}\Psi d\tau_{u,v} \quad . \tag{9}$$

The left side of Equation 9 considers that the geodesic motion somewhat intuitively incorporates the planetary Ψ (Fig. 7). This is of gravitational time dilation with its magnitude defined by, $\frac{8\pi G}{C^4}$ for the localization of gravity (i.e., matter curves space-time). Thus, a person on Earth may not be subject to collateral damage from large λ or alternatively, Λ that is transiting from outer space unlike the microscale (e.g., Fig. 4). The uncertainty in the position of a planet into space is given by the relationship

$$(G\mathcal{H} - mc)_{u,v} \cong (i\hbar - mc)_{u,v} \tag{10}$$

where $\mathcal{H}$ equates to a minimal energy of precession akin to $\hbar$ for the microscale. Any outgoing radiation towards outer space is attained in accordance with the 2nd law of thermodynamics at lightspeed for mass-energy equivalence, i.e., – *mc* (Equation 10). With gravity localized, Equation 10 can be further reduced into the form

$$G\mathcal{H}_{u,v} \equiv \; i\hbar_{u,v} \qquad . \tag{11}$$

Equation 11 accommodates shifts in the position of matter between orbital paths, i.e., $x \to \hat{x}$ at a minimal precession stage (see also Fig. 1d). For a multiverse within a visible universe, its outermost limit is perhaps defined by the cosmic microwave background (CMB) of a MP field type. How these all fit into a probable Big Bang scenario is plotted next.

5.4 Other related cosmic themes

Based on the alternative version of general relativity offered above, dark matter and dark energy are somewhat intuitively incorporated within the extra dimensions of a multiverse at a hierarchy of scales, while special relativity is sustained as mentioned above. How the Big Bang and the accelerated cosmic inflation fit into such a perspective is briefly outlined here in bullet points.

- *A probable Big Bang scenario*: The conceptualized UMF (Fig. 1b) is figurative of the *M*-theory type and this somewhat incorporates *SO*(10) of multidimensional structures (Fig.

8a and b). Its resemblance to Higgs mechanism of unidirectional is applicable to time reversal symmetry breaking due Planck's radiative type in order to counter the effect of gravity associated with time reversal. Suppose the Big Bang evolved from a primordial soup in uniformity or singularity (Fig. 8a), its progression towards the lower hierarchy of scales would transits in the following manner: $SO(10) \rightarrow SU(5) \rightarrow SU(3) \times SU(2) \times U(1)$.

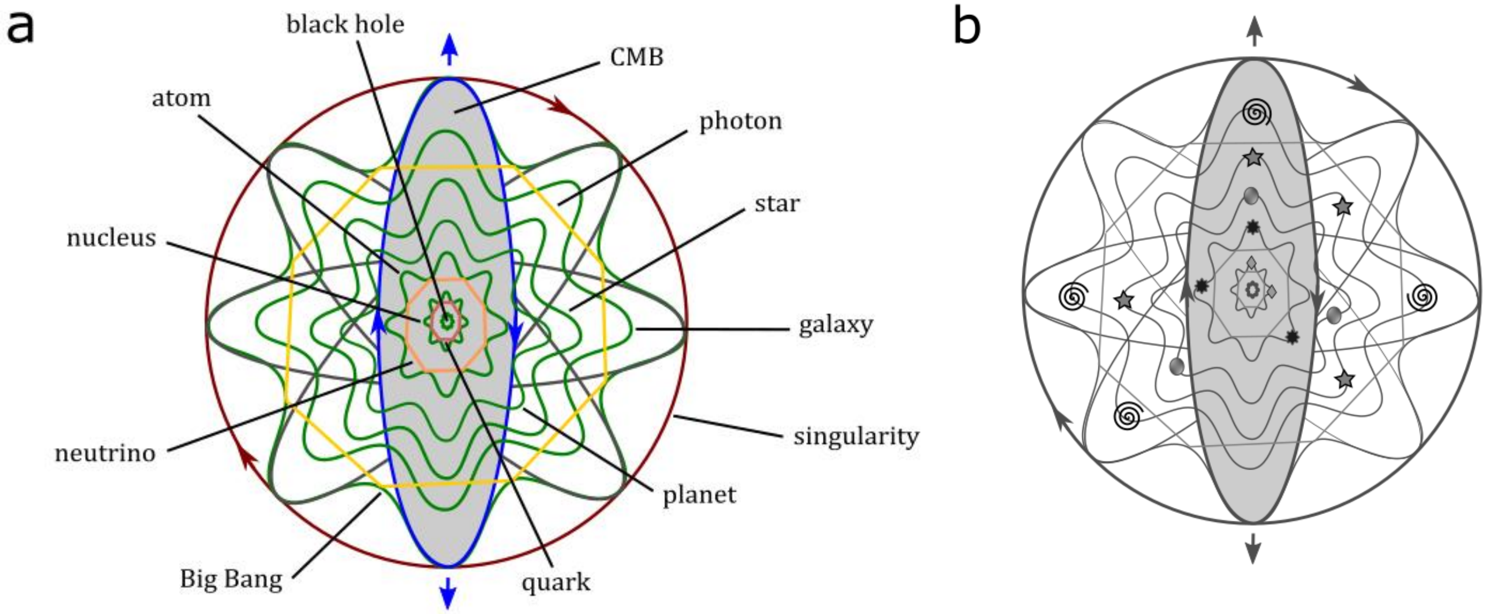


Figure 8. An idealized scenario of the Big Bang into 4D space-time. (a) Time reversal symmetry due to gravity effect is broken during the Big Bang from an initial state of uniformity or singularity. Cooling and regression towards the center insinuates the emergence of multidimensional structures in thermal equilibrium to the initial state. Each subsequent dimension sets the stage for the evolution of bodies such as galaxy, star, planet, atom and its constituents. (b) The MP model of each body emerges in thermal equilibrium to the CMB when matter collides and amalgamates along orbital paths into extra dimensions at a hierarchy of scales. The emergence of localized model at any of the dimensions and devoid of matter insinuates the existence of black holes (e.g., Fig. 5) perhaps inclusive of the subatomic level.

The final stage is of the gauge symmetry for the atomic scale and other intermediate steps can be incorporated between these three stages. For the visible universe defined by the CMB of a MP field type (Fig. 8a and b), a literal Wheeler-Feynman one-electron-universe [11] becomes applicable. In such illustration, how matter and time originated including whether there exists other multiverses beyond the one defined by the CMB appear to be philosophical questions not explored in here.

In the initial stage of 4D space-time, the photons assumed the inertia frames (Fig. 8a) and this is sustained towards a lower hierarchy of scales. At the microscale, the photons are replaced by neutrinos (e.g., Fig. 1d) and subsequently quarks for the subatomic level. Such intuitions if considered could perhaps account for why ordinary matter constitutes only 5% of the visible universe compared to 25% of dark matter and 70% of dark energy. For example, suppose dark matter relates to quantized states of BOs along the orbital paths of the MP model (i.e., photons, neutrinos to quarks), then dark energy is attained by the precession of the orbital paths into 4D space-time. In this case, external observation of BOs into 3D space would indicate the light paths to spiral inwards towards the nucleus (e.g., galaxy), while time remains dilated by gravity. How these all fits into the cosmic inflation scenario is presented next.

- *Cosmic inflation*: Suppose an observer on Earth is aligned within the area defined by the CMB, away from it, the stars and galaxies would appear to undergo accelerated expansion at more than lightspeed into either 1D or 2D space-times. Such a scenario can be assumed if Earth and possibly the solar system are accelerating along orbital paths into 4D space-time (e.g., Fig. 8a and b). Because of gravitational time dilation, the emergence of the Ψ is impeded so that constant light paths are expected to be considerably redshifted during observations. Depending on the scale, the time frames can be of light years for continual precession into forward time. Thus, in 2D space-time, the redshift is defined by the generalized form, $z = \frac{\lambda - \lambda_0}{\lambda_0} \propto d$ with λ as the measured wavelength shift, λ_0 is the reference wavelength and d is the measured distance. In this case, blueshifts are fairly constrained in accordance with the Hubble constant. All these explanations offer interesting prospects for cosmology and astrophysics.

- *Further experimental pursuits:* The explanations offered above though are highly speculative, they somehow provide an alternative version to the development of galaxies, stars, planets and atoms within the visible universe defined by the CMB particularly into 4D space-time since the Big Bang (Fig. 8a and b). Thus, comparable to the propositions offered for the microscale for further pursuits in the preceding section, similar approach should be considered for the macroscale. In this case, the light beam should be applied at less than the area of the object embedded within a gyroscope for a number of scenarios. a) Lightspeed at less than the gyroscope speed, b) lightspeed equal to the gyroscope speed and c) lightspeed at more than the gyroscope speed. Precession of the orbital paths within a MP field is assumed to provide reversal time. Such undertakings should also incorporate the black hole scenario (Fig. 5) and the geodesic motion of a planet in orbit of the sun (Fig. 7). This is to further ascertain the model's applicability to existing knowledge in physics as expounded in this section.

6.0 Concluding remarks

The proposed MP model into 4D space-time and its application to physics in general provides one tangible path towards the reconciliation process of quantum mechanics and general relativity. Such a path is difficult to demonstrate using conventional method for the Occam's razor is confined to either 1D to 2D space-times or 3D space and this generally underlines the limitations faced by conventional methods in both experimental and theoretical undertakings. For this undertaking, a multiverse is assumed at a hierarchy of scales within the limits of the visible universe defined by the CMB, while special relativity is sustained. Newtonian gravity is then considered localized to a body into space. These intuitions somewhat appear highly speculative, but the MP model is developed and applied in accordance with existing knowledge in physics and our general perceptions of the physical world. If considered, it provides a valuable intuitive tool that can complement conventional methods, especially when attempting to integrate and consolidate many aspects of foundation physics into proper perspective of 4D space-time for both the microscale and the cosmic level. This may provide the needed incentives to explore physics further into the unknown realms using conventional methods.

Competing financial interests

The author declares no competing financial interests.

References

1. N. Griffin. Einstein's unified field theory. *Sci. Progress* **56** (222), 273-276 (1968).
2. J. T. Cushing. *Philosophical concepts in Physics: The historical relation between philosophy and scientific theories*. (Cambridge University Press, United Kingdom, 1998) pp. 153-154, 252-315.
3. P. A. M. Dirac. Quantized singularities in the electromagnetic field. *Proc. Roy. Soc. (London) A* **133**, 60 (1931).
4. C. D. Anderson. The positive electron. *Phys. Rev.* **43**, 491 (1939).
5. J. Ellis. Outstanding questions: physics beyond the Standard Model. *Phil. Trans. R. Soc. A* **370**, 818-830 (2012).
6. H. Baer, V. Barger, M. Savoy and X. Tata. Multichannel assault on natural supersymmetry at the high luminosity LHC. *Phys. Rev. D* **94** (3), 035025 (2016).
7. A. G. Cornejo. A lagrangian solution for the precession of Mercury's perihelion. *Int. J. Astron* **3.2**, 31-34 (2014).
8. S. Weinberg. The trouble with quantum mechanics. *New York Rev. Books* **64** (1), 51-53 (2017).
9. B. P. Abbott *et al*. Observation of gravitational waves from a binary black hole merger. *Phys. Rev. Lett.* **116** (6), 061102 (2016).
10. R. Penrose. *The road to reality: A complete guide to the laws of the universe.* (Random House, Great Britain, 2004). pp. 458-62.
11. G. N. Ord and J. A. Gualtieri. The Feynman propagator from a single path. *Phys. Rev. Lett.* **89** (25), 250403 (2002).

Figures

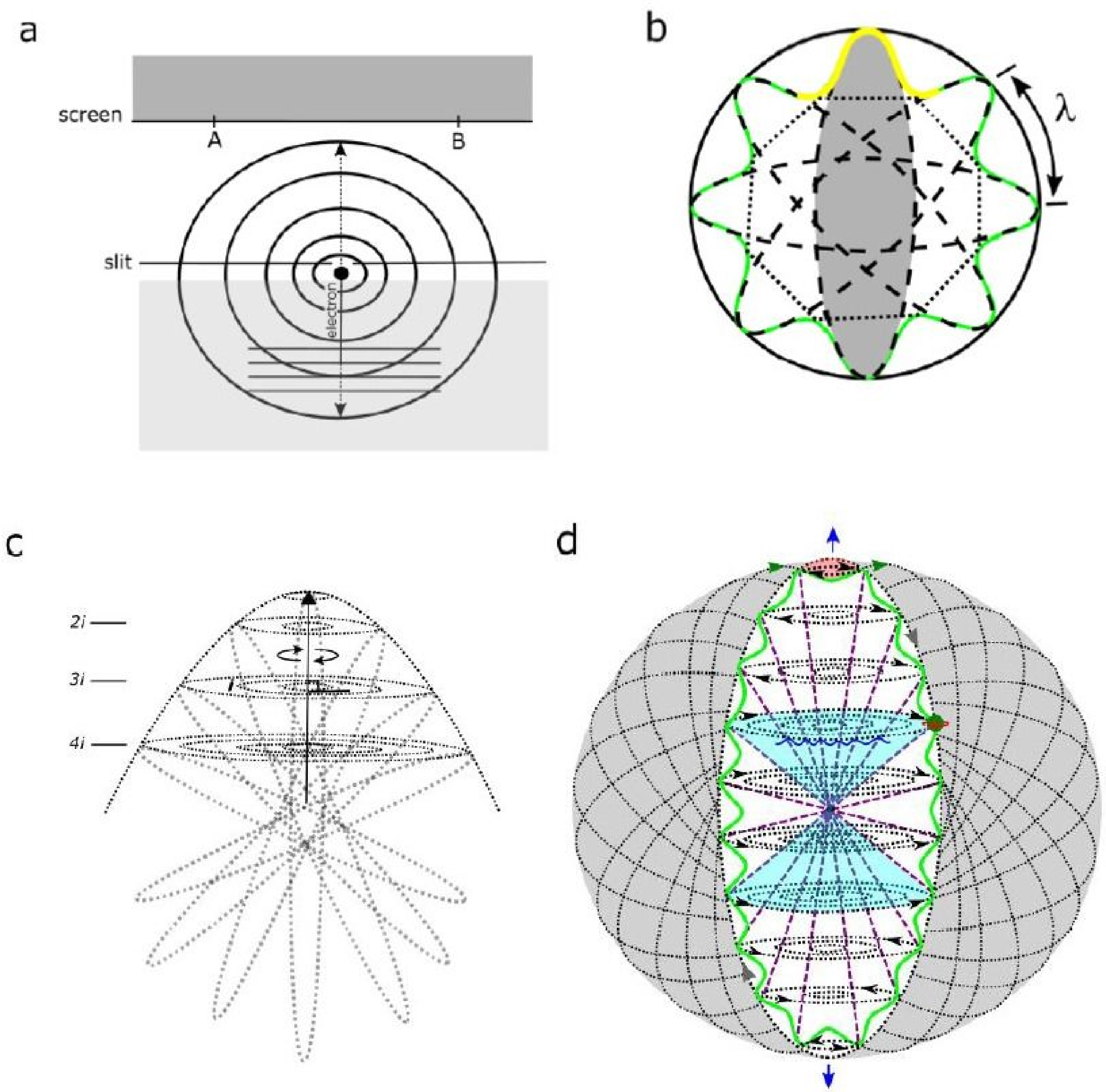


Figure 1

A step-by-step conceptualization path of the MP model. (a) Expansion of electron-wave diffraction from an electron source in a single slit setup towards detectors A and B. (b) Unidirectional symmetry-breaking of Higgs mechanism type (yellow curve) insinuates the emergence of a MP field (gray area) in 2D space.

Multiple MP fields generates UMF (green loop) and this encloses an octet shape of inertia frames within a circular E. Coherence is epitomized by the wavelength, λ for conservationism. (c) Emergence of orbital structures within the MP mimes the UMF background in thermal equilibrium. These are quantized along BOs of B in degeneracy into extra dimensions, ni. (d) The MP field of 2D space is transformed into 4D space-time of a hologram type where time is defined by precession (green arrows) into forward motion. The orbital paths are of degenerate states (pink dotted lines) for a particle such as an electron (green circle) in orbit. The wave function, □ (blue wavy curve) into extra dimensions resemble neutrino types. The electron transition between two orbitals from point □□□□ (pink area) due to precession equates to ±h for the MP field (white area). This is bounded by continuous □ (green wavy loop) in equilibrium to □□ (blue arrows) in asymmetry. Expulsion of h during observation unveils superposition of ±1/2 magnetic spin (ms) (navy colored cones). Such a scenario is attributed to the effects of gravitational time dilation where external light paths along BOs spiral inwards towards singularity at the center possibly in time reversal mode to precession into forward time. All these descriptions allude to the dynamics of a MP model of a spherical electron cloud model (gray area) into 4D space-time in flat space.

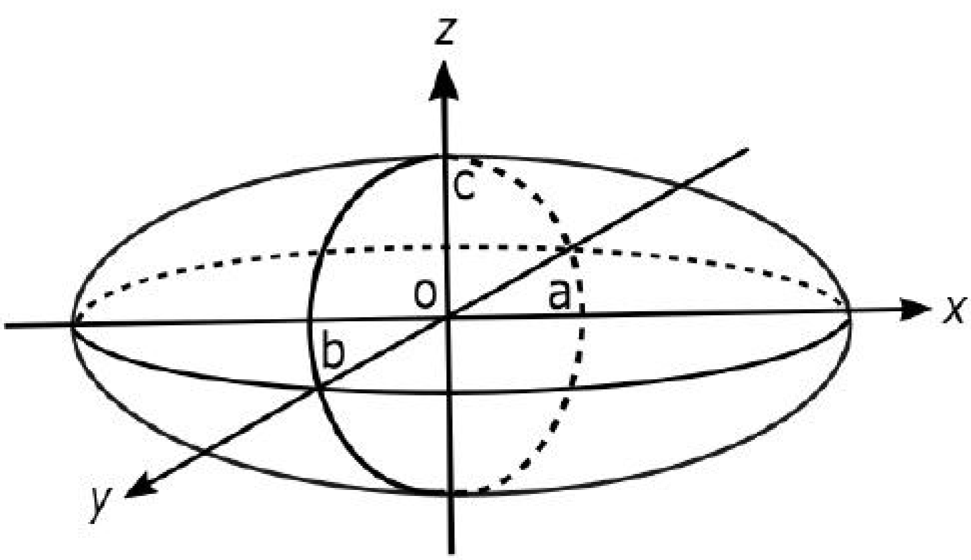


Figure 2

An MP field of elliptic shape. The sphere along the z-axis/□□□ is comparable to a BO, while the x-axis identifies □□ in asymmetry. If z-axis mimes B, y-axis equates to E.

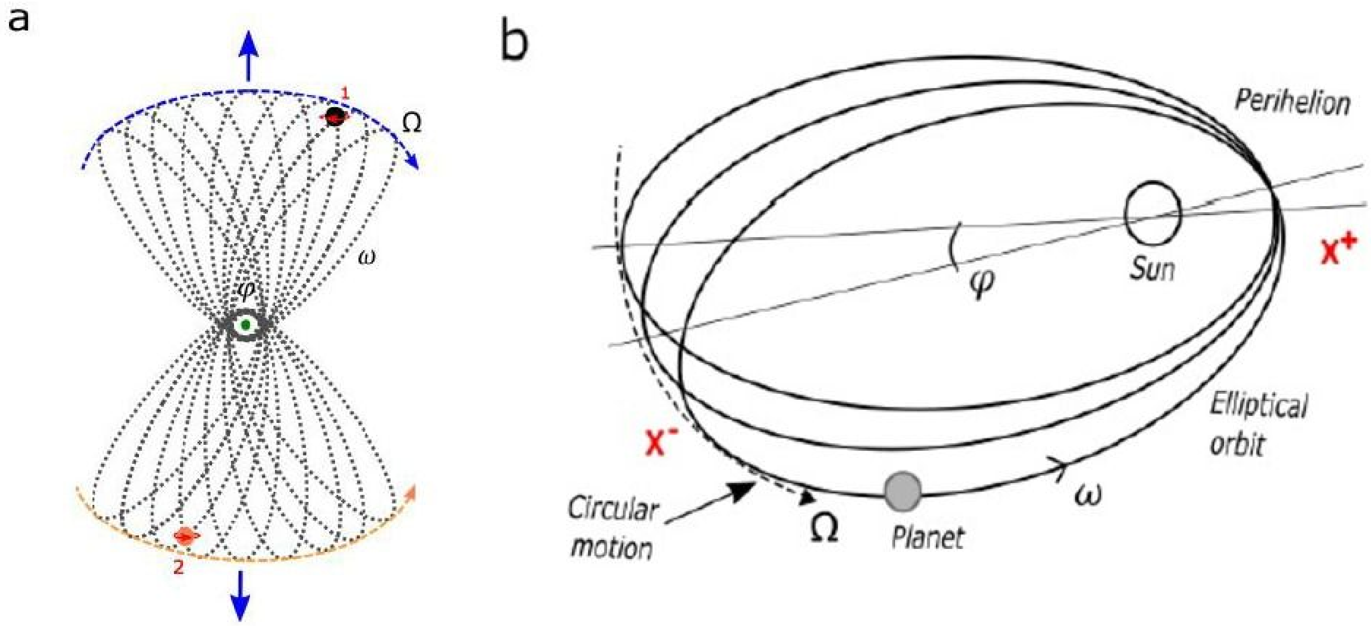


Figure 3

Observation of actual orbital paths during precession violates lightspeed due to localization of gravity. (a) A particle extracted in an upward direction at position 1 offers +1/2 spin (blue dotted curve and arrow) and vice versa in a downward direction at position 2 (brown dotted curve and arrow). The former is attributed to precession into forward time and the later due to gravitational time dilation of spiraling form in reversal mode towards the center. In this way, the quantized states of BOs sustain superposition of ±1/2 ms into extra dimensions. (b) Similar process is perhaps applicable towards a higher hierarchy of scale for Mercury's orbit [7]. Shifts in the perihelion precessions are more accessible to an external observer on Earth, while the anti-field remains hidden or vice versa due to gravity. X+ represent matter (e.g., Mercury) into forward time and X- is the apparent position for the antimatter field due to gravitational time dilation. The former is not drawn according to spatial distance. Ω = circular motion of the precession stages, ω = perturbation of angular velocity and φ = is the measure of magnetic flux or BOs into extra dimensions between two precession stages.

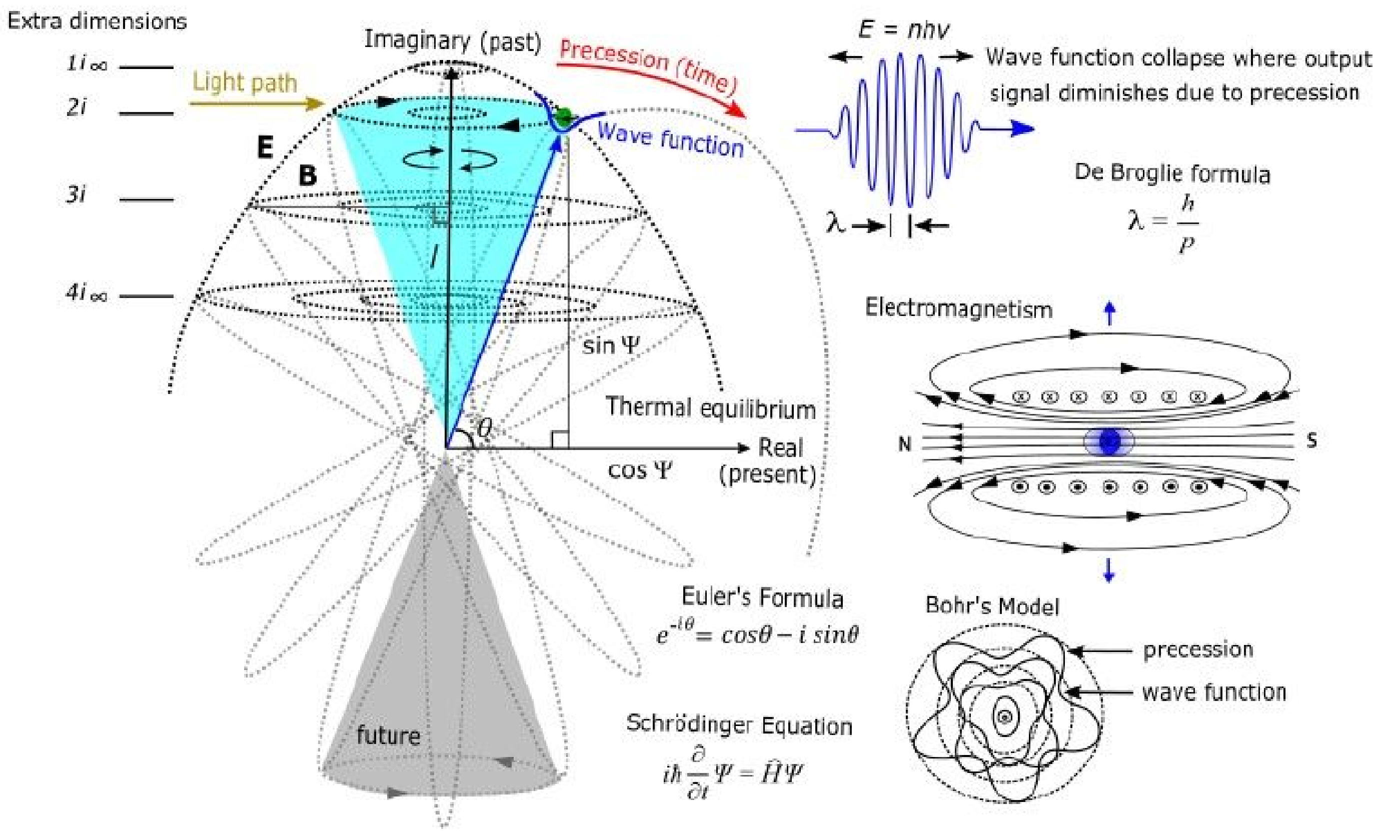


Figure 4

The presence of matter within the MP model insinuates a wave function, into 4D space-time. This is reduced to 2D space-time at observation (i.e., a wave function collapse scenario). How some of the major physics themes fits into this conceptualized process are incorporated and expounded further in the text.

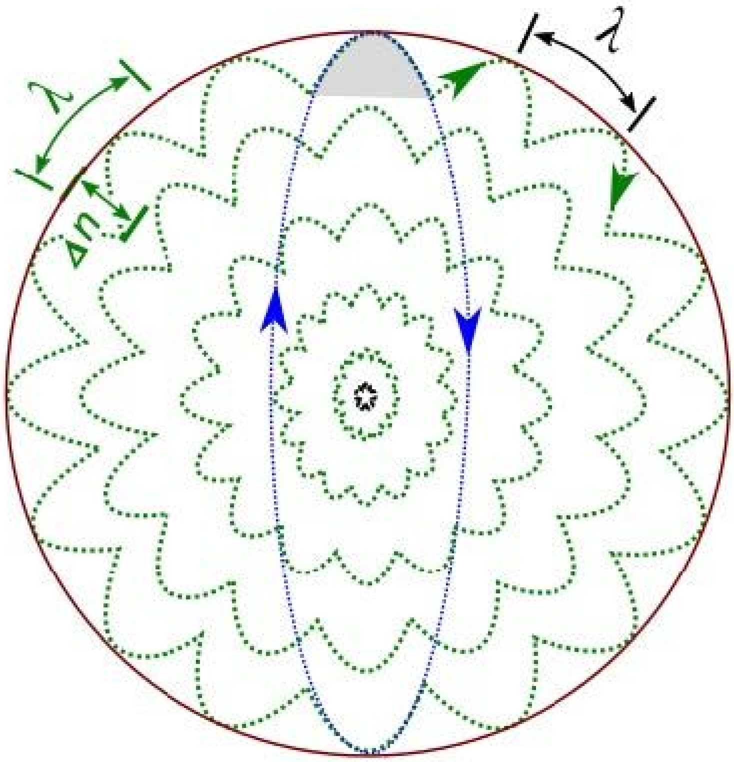


Figure 5

Application of the MP model to a black hole into 4D space-time. Interaction with light travelling in a straight path is expected to vanish along orbital paths. Light absorption is progressively slowed into extra dimensions (green dotted loops). Any decoherence (green wavelength) of minimal energy (gray area) beneath the event horizon (maroon circle) must first overcome coherent flow (black wavelength) by external application of high energy waves. The outline of the MP field is given by the blue dotted shape for the simplest scenario (i.e., a hydrogen atom), while its multiples are comparable to a multielectron atom. Blue arrows = forward time and green arrows = shift in precession.

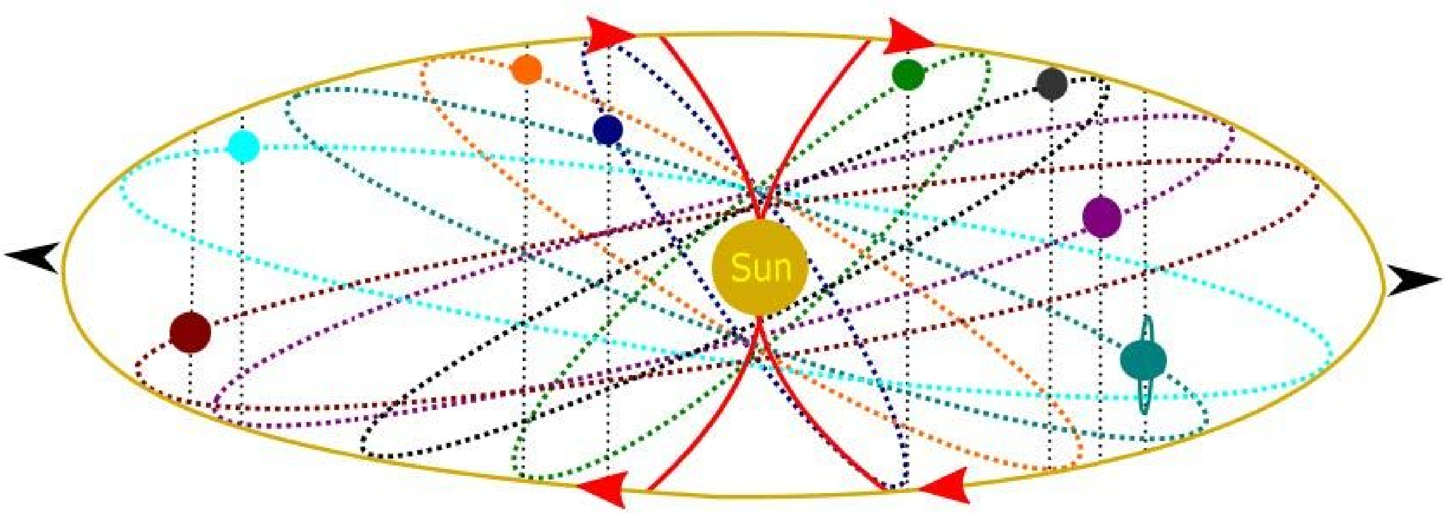


Figure 6

The application of the MP model to the solar system is comparable to a Rutherford planetary model. The orbitals are quantized along straight paths of BOs (dotted lines). Divergence of the electromagnetic radiation from the sun (red curves and arrows) sustains 𝜔𝑜 in asymmetry for the MP field (black arrows). The boundary (pale orange circle) indicates conservation. Note, the planets are not plotted according to size or type.

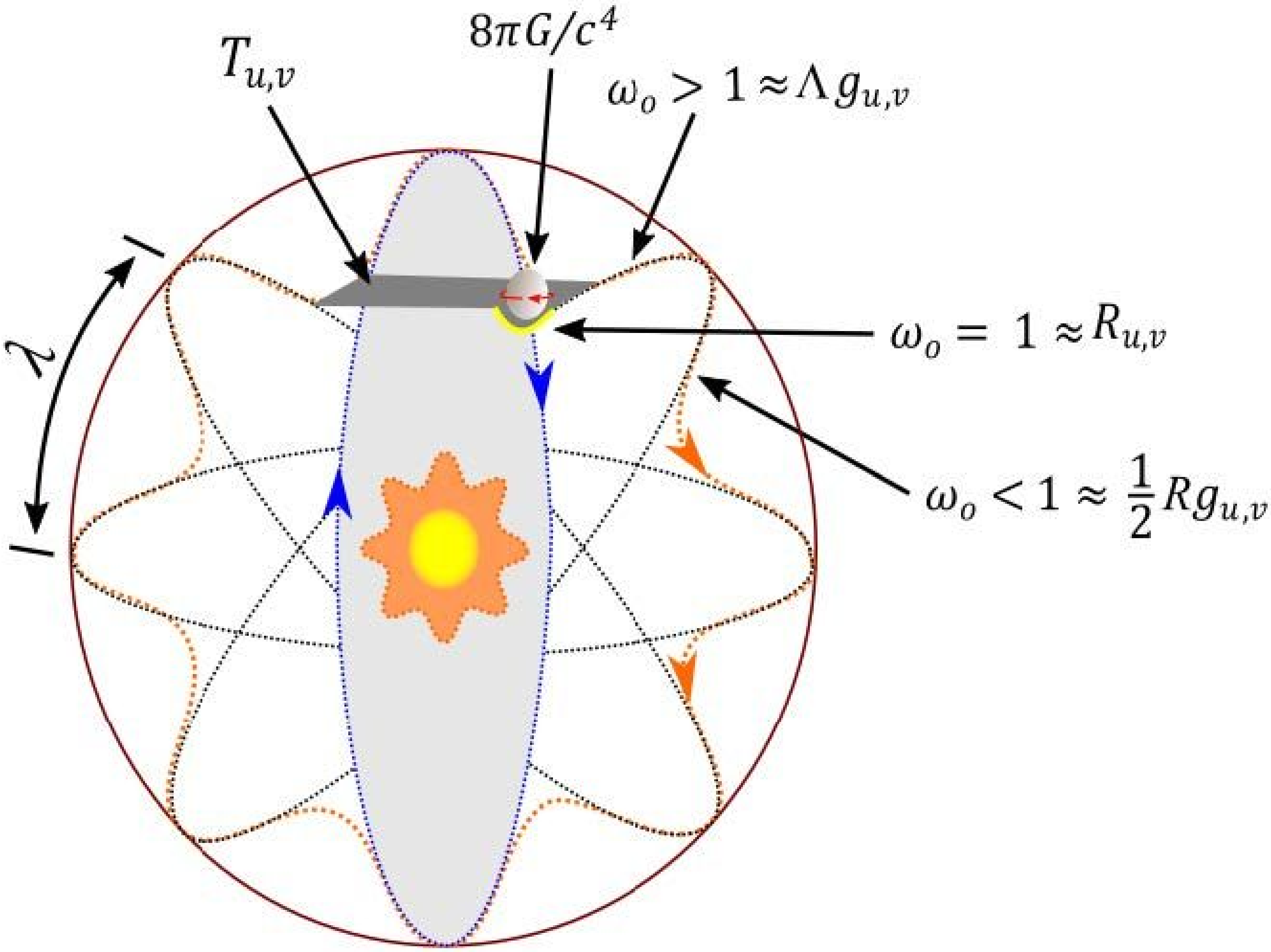


Figure 7

The application of Einstein's field equation for the geodesic motion of a planet into 4D space-time. The initiation of the planetary 𝜆 (yellow curve) is naturally incorporated into the geodesic motion but is of gravitational time dilation (i.e., readily unavailable to observations at lightspeed). The process normalizes the precession stages (orange dotted loop) of a MP field (blue dotted outline) and this sustains conservation. Manifolds of the stress-energy tensor (𝑇𝑢,𝑣) framework is assumed into extra dimensions comparable to BOs at the microscale (see Fig. 4). The actual precession of the planet (e.g., Mercury) due to gravitational effect is provided in Fig. 3b. G = Newtonian gravity, R = scalar curvature and Rgu,v = Ricci curvature tensor with definitions of other terms provided in the text.

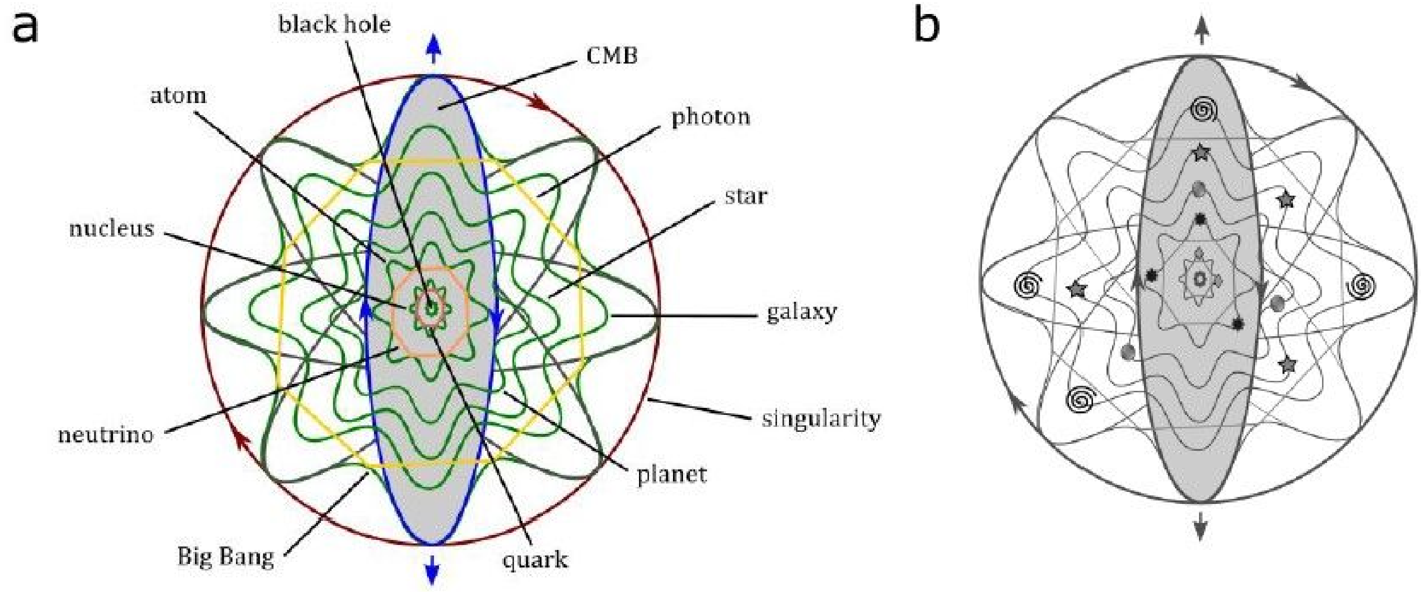


Figure 8

An idealized scenario of the Big Bang into 4D space-time. (a) Time reversal symmetry due to gravity effect is broken during the Big Bang from an initial state of uniformity or singularity. Cooling and regression towards the center insinuates the emergence of multidimensional structures in thermal equilibrium to the initial state. Each subsequent dimension sets the stage for the evolution of bodies such as galaxy, star, planet, atom and its constituents. (b) The MP model of each body emerges in thermal equilibrium to the CMB when matter collides and amalgamates along orbital paths into extra dimensions at a hierarchy of scales. The emergence of localized model at any of the dimensions and devoid of matter insinuates the existence of black holes (e.g., Fig. 5) perhaps inclusive of the subatomic level.