Unconventional reconciliation path for quantum mechanics and general relativity

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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 by assuming a multiverse at a hierarchy of scales. 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. 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 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 coined by Niels Bohr and Werner Heisenberg. Other alternative interpretations of quantum mechanics such as Everett’s many-worlds interpretations also 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 his relativity theory that includes both special relativity and general relativity. The latter somewhat came to revolutionize physics for the macroscale by successful integration of Newton’s theories of motion and gravitation among others. Over time, experimental findings and 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.

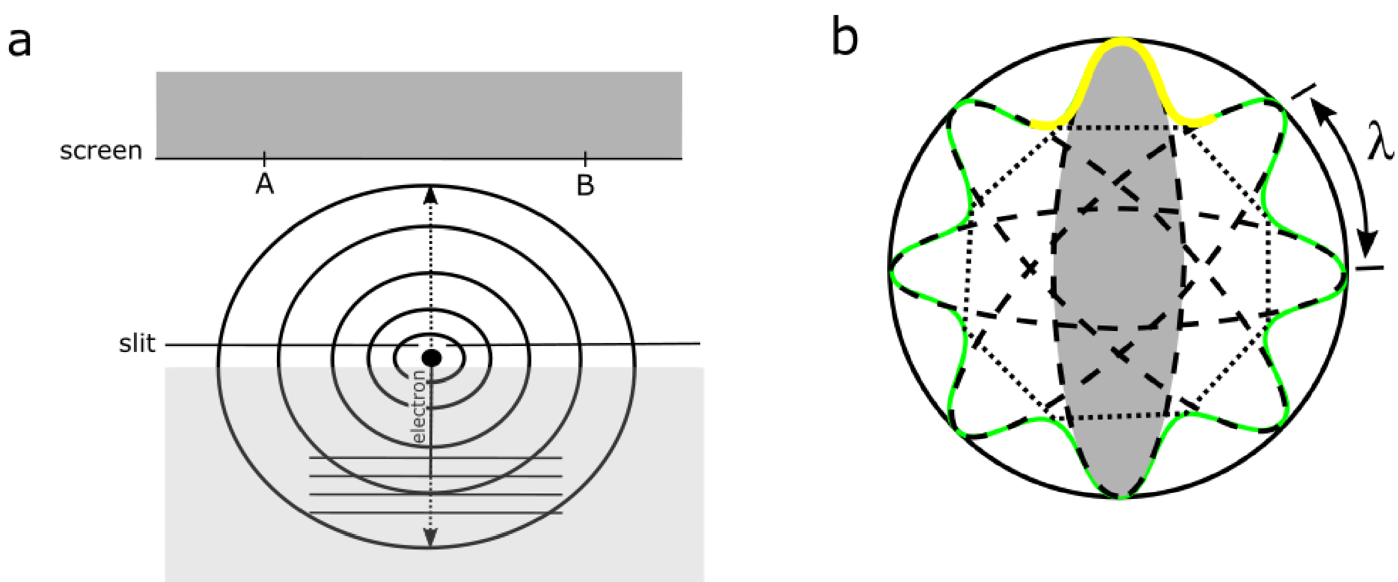
A classical Einstein’s gedanken experiment of electron-wave diffraction of a single slit [2] is pictorially examined for its quantized states. Condensed electric field, **E** of the wave diffraction generates a unidirectional monopole field (UMF) as its quanta [3] and this is dissected linearly along inertia frames of magnetic field, **B**. For the microscale, each frame is converted to Bohr orbit (BO) in perpendicular to **E**. A particle in orbit within the UMF background is naturally quantized which insinuates the emergence of a monopole pair (MP) of an elliptic shape that is equivalent to an orbital. Its application to quantum mechanics and relativity is able to integrate many of their features into proper perspectives consistent with existing knowledge in physics. This considers a multiverse at a hierarchy of scales where interaction with light travelling along a straight path is sustained. These descriptions pave an alternative path for the reconciliation process of quantum mechanics and general relativity. If considered, the proposed MP model offers a dynamic intuitive tool that can be applied to explore physics in general from alternative perspectives using conventional methods.

2. 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 intuitively improvised from general knowledge of physics applications. 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, *Iz* and energy-momentum, *Φ*. Upon expansion, the former is projected as an arrow of time, $\vec{I}$ in asymmetry of unidirectional and the latter as corresponding inertia frames of **B** along straight lines. The condensed boundary of **E** evolves into a UMF which is defined by Planck's constant, *h* perpendicular to the frames. The frames are converted to BOs in time dilation, $I_{z\|}$ to $\vec{I}$ so that the minimal difference towards the point-boundary is given by reduced Planck's constant, *ħ* (Fig. 1d). Within an MP, the emergence of orbital structures somewhat appears in thermal equilibrium to the UMF background. With conservation assumed, any outgoing radiation for the microscale is governed by Planck's law, $E = nhv$ with *n* attained along BO and *v* is frequency so that time reversal symmetry is broken. Detailed descriptions that include space-time dynamics and principles of



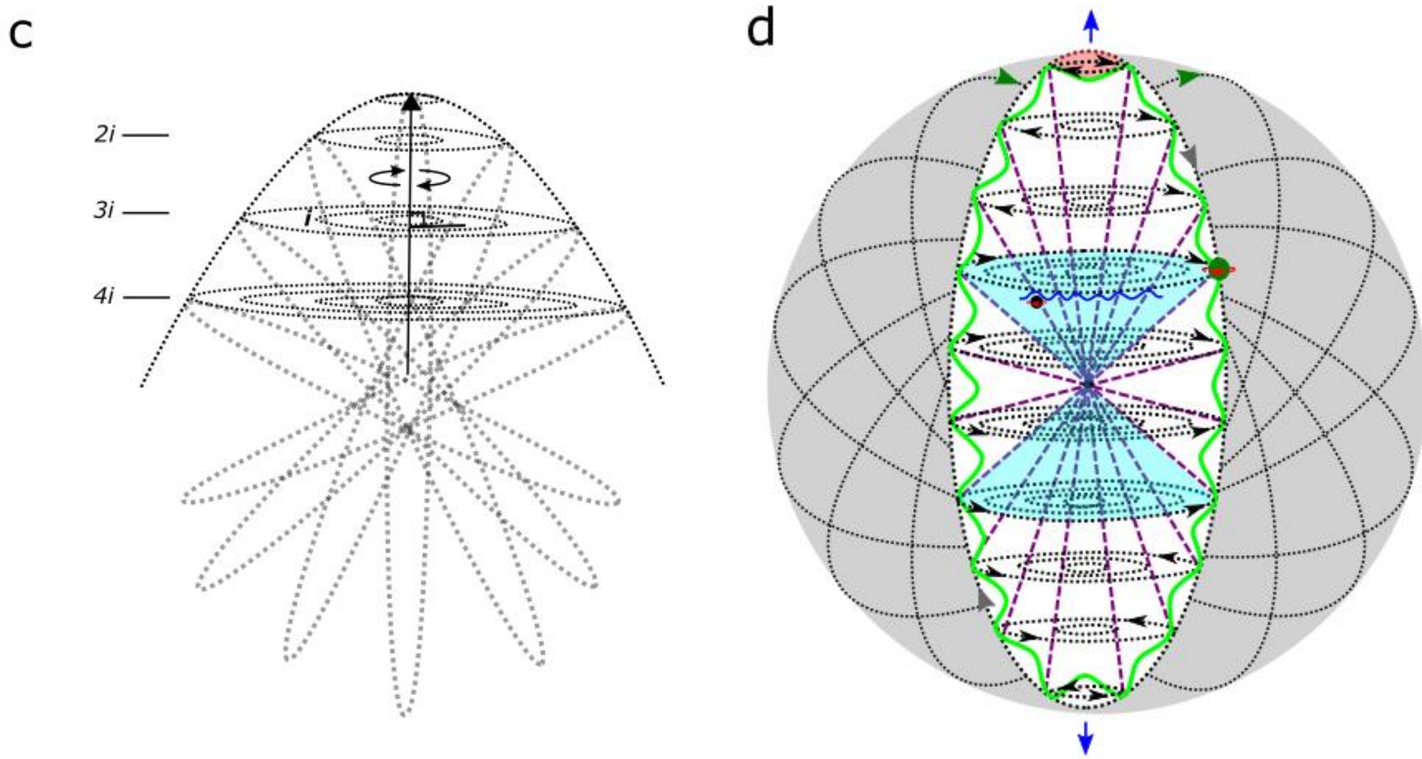


Figure 1. A step-by-step conceptualization path of the MP model. (a) Expansion of electron-wave diffraction from an electron source in a single slit setup towards detectors A and B. (b) In two-dimensional (2D) space, condensed wave diffraction offers symmetry-breaking of a Higgs mechanism type (yellow curve) that generates UMF (green loop) that is quantized along straight paths of an octet shape in time dilation, $I_{z\parallel}$ mode to lightspeed. Conservation is epitomized by the wave function, λ. Excitation of the UMF background insinuates an MP model of an elliptic shape (gray colored). (c) Manifestation of orbitals within the MP mimes the UMF background in thermal equilibrium. These are coupled to quantized states or inertia frames of **B** into 3D space with the principal axis equal to $\vec{I}$ in asymmetry in reference to the electron source. The inertia frames are of BO types in degeneracy, n_i towards extra dimensions. (d) Space-time dynamics of the MP model. In 2D space-time, a classical particle with spin (green circle) is in orbit of an elliptic plane of an MP into forward time (grey arrows). In 3D space-time, the orbitals (pink dotted lines) are normalized (blue wavy curve) in accordance with relativistic theory, $E = mc^2$ so that a subatomic particle (black dot) in acceleration cannot be distinguished from lightspeed. This sustains the equivalence principle along an inertia frame of BO defined by $I_{z\parallel}$ where gravitation mass of the particle is

equal to its inertia mass. Light interaction with shift in perihelion precession or rotation of an orbital at the source is expected to generate minimal energy of an electroweak force. The energy is expelled outward at the boundary of the MP in comparison to *h* value from a cavity system of a black body. The minimal inertia level of BO is now defined by $\hbar$ (pink area) with reference to $\vec{I}$ in asymmetry while this is given by $n_i\hbar$ in reversal direction towards the source. Somehow this intuitively implies that quantum critical point at the source cannot be physically attained for it will also require time reversal and in turn violate the MP precession (green arrows) into forward time. Perhaps, the point can only be observed from a distance where any in situ measurements eliminate *h* or minimal energy stage towards an *n*-level where the corresponding BO forms a light cone shape of length contraction towards singularity at the source. The cones indicate superposition states of $\pm\frac{1}{2}$ magnetic spins in accordance with the direction of the MP (blue arrows). Thus, the classical path (white area) is uniform in flat space but is quantized (green loop) due to outward projection of *h* described above. Such descriptions offer a dynamic spherical electron cloud model (gray area) into 4D space-time in flat space.

relativity, are provided in the captions of Fig. 1a, b, c and d in a step-by-step process towards the conceptualization of an MP model. The final product mimics an electron cloud model in 4D space-time, where its compatibility to a renormalization process and limitations are examined.

2.2. A generalized renormalization process

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

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

The boundary of UMF is normalized to 2π for a spherical electron cloud model and this is defined by $\hbar$ to accommodate minimal precession stage (Fig. 1d). $I_{z\|}$ refers to the time dilation attained along inertia frames of BOs at *n*-levels in reference to $\vec{I}$ or principal axis of the MP in asymmetry (Fig. 1d). A particle's position in orbit into 3D space is defined by spherical polar coordinates (Ω, Φ, θ) with Ω equal to precession stages, Φ is the energy momentum of BO and θ is the azimuthal angle between $I_{z\|}$ and $\vec{I}$ with respect to singularity at the electron source. This sustains relativistic theory where the particle's motion in orbit is indistinguishable to lightspeed. An increase in the applied energy at more than $\hbar$ produces 4D space-time of light cone along BOs with reference towards singularity at the source (Fig. 1d). Alternatively, the particle's position is defined by $i\hbar$ with i equal to a complex number that represents acceleration along an orbital path. Normalization of Equation 1 then takes the form

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

where the integral incorporates the path covered by the particle in orbit, which is of time invariance for the MP. From the first principle of the quantum wave function, a particle's position at the intersection of a BO and MP (Fig. 1d) is 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).

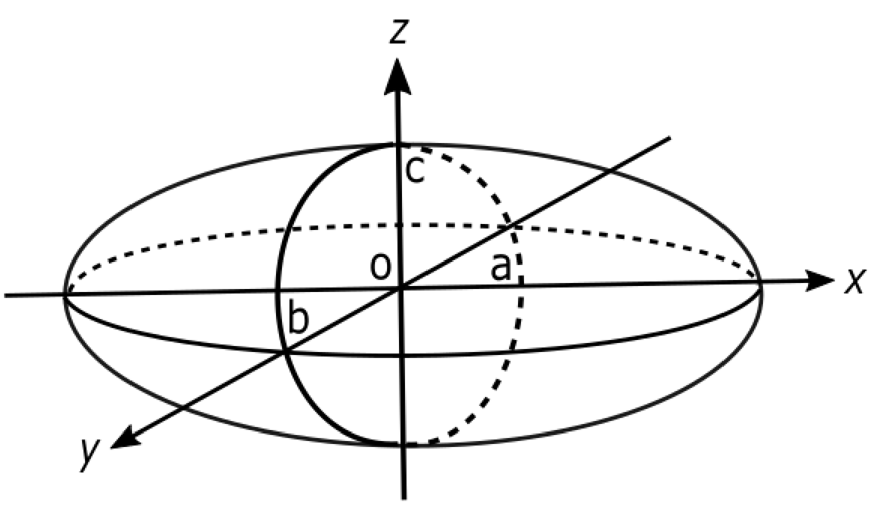


Figure 2. An MP of elliptic shape in 4D space-time. The sphere along the *z*-axis/$I_{z\parallel}$ is comparable to a BO, while the *x*-axis identifies $\vec{I}$ in asymmetry.

Alternatively, Equation 3 can also be expanded in the form

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

where Ω^2 represents either the precession stages of the MP for the classical level or an orbital for the subatomic level. This further supposes that the particle would exhibit superposition states, $\pm\frac{1}{2}$ spins (Fig. 1d). Defining its position at the intersection of the MP and an orbital structure sustains the Heisenberg uncertainty principle, $\Delta x.\Delta p \geq \hbar/2$. De Broglie's wave function, $\lambda = h/p$ is also physically applicable to a precession stage with h demonstrated in Fig. 1d. Momentum is defined by $p = mv$ possibly in relation to a BO with v being velocity of the particle's motion in orbit and m is its mass. The magnitude of the wave function, Ψ, is dependent on the mass of the object interacting with light travelling along a straight path. This is given by Born's rule in the generalized form

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

where $d\tau = dxdydz$ along a BO defined by $nI_{z\|}$. Equation 6 holds true from the first principle where Ψ is applicable to all constants related to observations of the microscale and this forms the basis for the physical derivation of Schrödinger equations. Because Ψ is physical, external light application and its interaction with BOs along the x-axis (Fig. 2) or in parallel lines may produce standing waves in 3D space in a continuum mode of the type

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

where A and B are constants that define origin of magnitude along the *z*-axis. These descriptions allude to conservation of the electromagnetic field for a spherical electron cloud model in 4D space-time for the MP model at the microscale.

2.3. Limitations

The constraints posed by the proposed MP model unfortunately cannot be readily assessed with studies related to conventional methods due to the unconventional path adapted in this study. However, this does not automatically disqualify the process for a number of reasons. Many aspects of quantum mechanics, such as entanglement and probabilities during measurements, remain somewhat counterintuitive and these cannot be easily resolved into proper perspective despite the advancement of instrumentation and theories made in recent times [4]. Likewise, the standard model theory of particle physics has been quite successful in integrating electroweak forces, weak and strong nuclear forces, with the discovery of the Higgs boson being its pinnacle. However, beyond that, the model appears inadequate to accommodate quantum gravity, dark matter, dark energy among others [5], towards the possibility of reconciling quantum mechanics and general relativity. In the meantime, physicists have somewhat adapted to ‘shut up and calculate’ ethos. While other options are still being considered, such as string theories and loop quantum gravity, the approach undertaken here though it is mostly unorthodox, is pursued in accordance with existing knowledge in physics and general perceptions of the physical world to avoid it being metaphysical. In this case, two of its major limitations are listed below.

First, is the apparent question of what powers the precession mode of the model into forward time in a perpetual motion and in turn violates the laws of thermodynamics? With *h* being projected outward at the boundary of the MP, this reconciles well with black body radiation while the electromagnetic field is conserved (Fig. 1d). Regression of $\vec{I}$ in asymmetry of unidirectional towards singularity is progressively slowed due to precession of both MP and orbitals into forward time while gravitation force is assumed negligible for the microscale.

The second question arises from why is the precession mode not readily observed during measurements? Suppose the boundary of the MP is posed by *h* at the microscale, light interactions with BOs into extra dimensions along straight paths of unidirectional sustain relativistic theory (Fig. 1b and d). An increase in applied energy eliminates *h* and exposes quantized states or inertia frames of BOs, such as those observed in the emission spectrum of hydrogen. In this case, in situ observation of the structural form of the MP model in 3D space, is expected to produce either light cones or wave functions of one-electron atoms like hydrogen by substituting it for the electron source. In a mulitelectron atom, the number of MPs is expected to increase to accommodate electron probability distributions and this might relate to complex orbital structures at ≥ *d*-orbital.

Although other limitations might be overlooked here, the above descriptions alone offer a dynamic intuitive tool of an MP model that somewhat resembles an electron cloud model in 4D space-time (Fig. 1d). By employing this model, phyiscs in general are explored from alternative perspectives. The process is attempted for both the microscale and the cosmic level wherever applicable. Such an endeavor is expected to pave an alternative path towards a reconciliation process of quantum mechanics and general relativity, where this can be further explored using conventional methods perhaps in incremental steps.

3. MP model versus symmetry

Symmetry at the fundamental level is governed by the Noether theorem, which assumes energy conservation. So far, without any evidence of supersymmetric partners or microscale black holes being generated at CERN's Large Hadron Collider [5, 6], symmetry is not well defined in terms of linking them to our intuition of the physical world. While its investigation is an ongoing process, an intuitive demonstration of symmetry of $\pm\frac{1}{2}$ spins 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). Perhaps, the major differences between the two scales are that the area of the applied

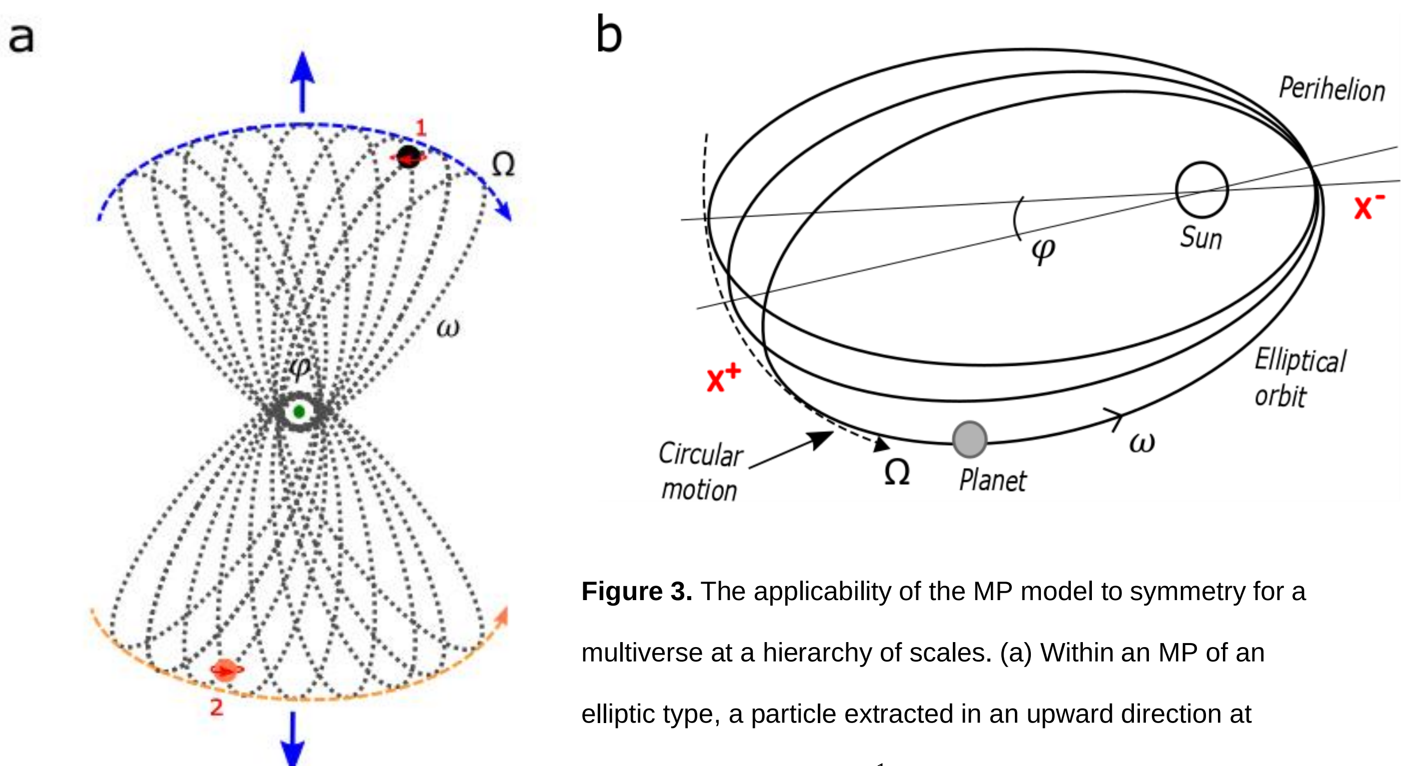


Figure 3. The applicability of the MP model to symmetry for a multiverse at a hierarchy of scales. (a) Within an MP of an elliptic type, a particle extracted in an upward direction at position 1 generates a $+\frac{1}{2}$ spin and vice versa in a downward direction at position 2 for the $-\frac{1}{2}$ spin. Precession stages into forward time for matter is normalized (blue

dotted curve and arrow) so as time reversal for antimatter (brown dotted curve and arrow), which possibly produces wave functions of probabilistic distributions (e.g., Equation 6). Because $\vec{I}$ for the MP is asymmetry (blue arrows), a particle exits as its own antimatter, while there is a level of uncertainty towards determining its position into space. (b) A similar scenario is perhaps applicable to solar systems such as Mercury's orbit [7] in 3D space-time. Due to the scale, complete observation of shift for both aphelion and perihelion precession (the former away from the sun and the latter vice versa) cannot be attained during a single observational event while other monopole field of the MP remains hidden. For the planet at position, X^+, its antimatter X^- assumes an apparent position for the hidden part, and this is not shown according to spatial distance. Ω = precession stages, ω = perturbation of angular velocity and φ = is the measure of magnetic flux from BOs into extra dimensions that crosses the area in straight paths between two precession stages with reference to singularity.

light during observation is greater than the object of interest, while classical time is of no essence for the quantum state. This sustains relativity where a particle gravitation force cannot be easily differentiated from lightspeed (e.g., Fig. 1d). At the macroscale, it is envisioned that reflected light rays are less than the area of the planet, so classical time allows for observation of a monopole field with the other part of the MP hidden (Fig. 3b). These intuitions are perhaps, supported by existing experimental results in the following manner.

With h assigned to advances of MP or orbital precession at the microscale (Fig. 1d), this is equivalent to 6.626×10^{-34} Joule-second for the atomic state. By contrasts, Mercury's perihelion precession of its elliptic orbit advances by 5,601 seconds of arc per century [2]. This is at a rate of 56 seconds per year to an observer stationed on Earth, which is equivalent to 3.711×10^{-32} J.s (i.e., by assuming 6.626×10^{-34} J in a second into forward time for Mercury miming black body radiation). Thus, there is merely a difference of 3.645×10^{-32} J.s despite the immense size differences for the atomic state and a planetary body of a mass equal to 3.285 x 10^{23} kg. Such explanations possibly imply that Newtonian gravity is of a terrestrial scale and localized to a large body into space. If this is considered, it might perhaps explain a discrepancy of 43 seconds predicted by general relativity for Mercury's perihelion precession which cannot be accounted by Newtonian gravity [2]. How geodesic motion may apply to generate a cosmic wave function is examined later when dealing with general relativity. In the next section, the model's applicability to various other themes of physics for the microscale is briefly plotted.

4. MP model versus various aspects of physics

There are a number of themes in physics that can be intuitively assessed from alternative perspectives by applying the MP model as an intuitive guide. Such a process can complement conventional methods to integrate subthemes into a proper perspective. Some of them are listed below in bullet points.

- *Hydrogen atom:* If the electron source is substituted for a hydrogen atom, the minimal energy at Planck's scale (Fig. 1d) would relate to the zero-point energy of a vibration spectrum. Then, the vibrational modes into extra dimensions at *n*-levels would mime degenerate BOs (Fig. 1c) with their link to the orbitals (Fig. 1d), providing rotational modes. Due to precession of the MP into the forward time of an electron cloud model, complex orbital structures for the wave function of hydrogen can be explored as mentioned earlier in subsection 2.3. For a multelectron atom, the number of MPs is expected to increase in order to accommodate electron probability distributions.

- *Fermions:* Particle and antiparticle positions of probabilistic distributions within the MP for the subatomic level (Fig. 3a) can somehow relate to fermion types. Suppose Weyl fermions are accorded to the cone shapes (Fig. 1d); then Dirac fermions become applicable at degenerate states of BOs along a straight path, while the orbitals link Majorana types where a particle exists as its own antiparticle (e.g., Fig. 3a).
- *Statistical mechanics:* Fermions and bosons are described by Dirac-Fermion and Bose-Einstein relationships, respectively. These are related to matrix and algebraic mathematical formulations, and they can be applied to the octet shape (Fig. 1b) of inertia frames of BOs and degeneracy states into extra dimensions. Maxwell-Boltzmann distribution is then accorded to precession stages of the MP into forward time (Fig. 3a), while **E** along $\vec{I}$ is perpendicular to BOs of **B** of unidirectional so a light path sustain electromagnetic waves. If the electron source mimes one-electron atoms such as hydrogen, the above can perhaps be explored for either hydrogen molecules or helium atoms.
- *Zeeman effect and conductance band:* External application of a pair of strong magnetic fields linearly in contraction form on a UMF can induce Zeeman effects. For example, along the *z*-axis/$I_{z\parallel}$ (Fig. 2), a semisphere of BO is induced, which can produce superposition states of $\pm\frac{1}{2}$ spins from degenerate states due to its connections to the orbital paths (Fig. 1d). Perhaps, valence electrons freed from the annihilated outermost orbital structures may induce current flow, while a Meissner effect is envisioned towards the source (e.g., Fig. 3a).
- *Classical electromagnetism:* Divergence of the monopole pair due to electromagnetic radiation from the source sustains conservationism while any outgoing radiation is

limited to Planck's scale. A particle in orbit within UMF (Fig. 1d) also identifies with a classical Maxwell point into space where its position is defined by, $\nabla \times \mathbf{E} = -\partial\mathbf{B}/\partial t$ with ∇ equal to the dipole moment of the MP of partial charges. In this way, electromagnetism is applicable along inertia frames of the BOs in straight lines of unidirectional.

- *Entanglement:* Here, it is envisioned that splitting of the MP is expected to regenerate the process demonstrated in Fig. 1 so superposition states of $\pm\frac{1}{2}$ spins is sustained. In this case, linear coupling of MPs would produce qubits, 1, 0, -1 at a certain frequency of the electromagnetic radiation. Whether this can be processed in the absence of light as a transport medium poses interesting prospects for entanglement.
- *Standard Model:* Quantum field theory is based on fields and their excitations as quantized states or particles while sustaining special relativity and classical field theory. The framework of the MP model itself is dynamic and this can perhaps accommodate quantum field theory by assuming conservation. For example, the Higgs mechanism is attained in a constriction form towards the source, while baryon octet (Fig. 1b) and decuplet diagrams (Fig. 1d) are accommodated into extra dimensions. The former in relation to descriptions provided for symmetry and this includes gravitation force related to Meissner effect implied above. The latter is comparable to a pair of cones with reference to singularity (Fig. 1d), whereas classical electromagnetism is described above. Coupling of multiple MPs during the collision process is expected to generate a plethora of particle types from degenerate states of BOs into extra dimensions (i.e., equivalent of leptons) akin to a Feynman diagram integral path. Applying these intuitions, gauge symmetry, $SU(3) \times SU(2) \times U(1)$ [8] and other related themes can be further explored.

5. 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 agree with experimental findings. A similar approach is perhaps pursued here where relativity is intuitively applied to the conceptualized model (Fig. 1). In this section, general relativity is explored starting with a black hole followed by the solar system. Other notable cosmic themes, such as Big Bang, and redshifts are briefly outlined in the final subsection. Such undertakings are expected to shed new perspectives into these areas and these can be pursued using conventional methods perhaps in incremental steps.

5.1. A black hole

For a multiverse at a hierarchy of scales, a black hole may possibly 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. 4. Interaction with external light travelling in a straight path is attained along orbital paths where any outgoing radiation must first satisfy coherence at a minimal energy level at the event horizon before any decoherence can take place. The former is comparable to a Planck energy level for the atomic state while the latter may apply to high–energy light waves such as gamma rays interacting with the black hole at the event horizon. Thus, any outgoing radiation could generate either fireworks or Hawking radiation types at reduced magnitude. Gravitation waves would possibly relate to outgoing radiations at Planck's scale due to light interaction with precession of a particle and its antiparticle into forward time (Fig. 3a) comparable to a binary black hole merger [9].

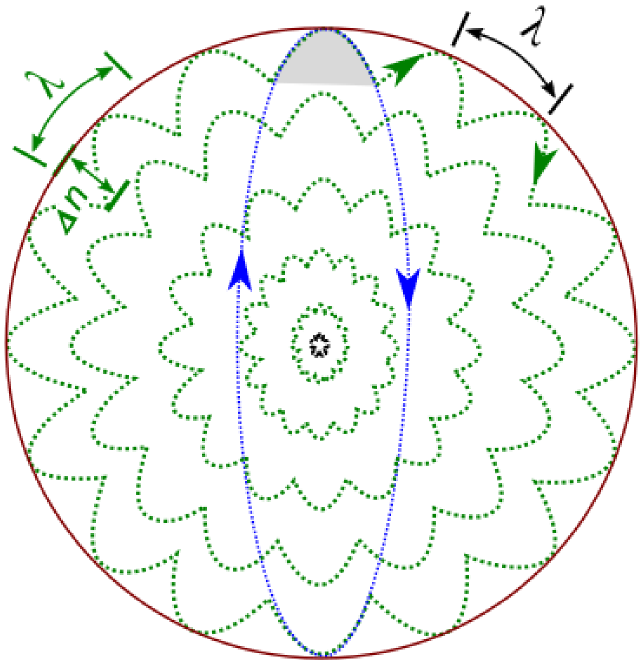


Figure 4. Application of the MP model to a black hole. Interaction with light traveling in a straight path is expected to vanish along orbital paths where the reversible time for $\vec{I}$ in asymmetry towards singularity is progressively slowed down into extra dimensions (green dotted loops). Decoherence (green wave function) of outgoing radiation must first satisfy coherence (black wave function) to smoothen out shifts in precession stages in order to overcome minimal energy state at Planck's scale (grey area) just beneath the event horizon (maroon circle). The outline of the MP is given by the blue dotted shape for the simplest scenario (i.e., hydrogen atom), while its multiples are comparable to a multielectron atom. Blue arrows = forward time and green arrows = shift in precession.

A person falling into the black hole may never get the chance to reach singularity if one's body becomes elongated or 'spaghettized' in precession stages at extra dimensional matter into forward time. Perhaps the same applies for light absorption, where $\vec{I}$ in asymmetry of reversal direction is progressively slowed down towards singularity. Based on such descriptions, the applicability of the MP model to generality relativity for the solar system is examined next.

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 Big Bang. Suppose the planetary bodies were developed within a UMF of the sun; a likely scenario is presented in Fig. 5. In this case, whether the stability of the solar system

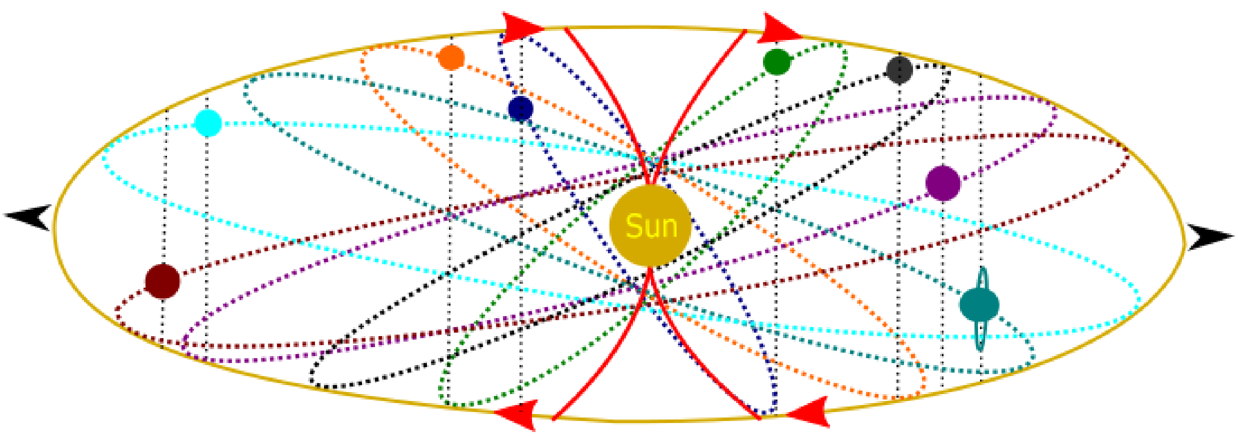


Figure 5. The application of the MP model to the solar system is comparable to a Rutherford planetary model. Apsidal precession determines the extent of the quantized states (dotted lines) along a straight path away from the sun. The divergence of electromagnetic radiation from the sun (red curves and arrows) sustains $\vec{I}$ in asymmetry for the MP (black arrows). The boundary (pale orange circle) depicts conservation where it might take a while to reduce the sun to a black hole scenario (Fig. 4) with any outgoing radiation attained in accordance with the 2nd law of thermodynamics. Note that 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 that is not pursued here. Perhaps equal forces exerted by an MP in opposing directions and the planetary orbitals in thermal equilibrium (see also Fig. 1) might sustain a solar universe that is accelerating in uniformity into space in accordance with the Newton's first law of motion.

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. 5), with its precession demonstrated in Fig. 3b. In Fig. 6, Einstein's field equation of geometry [10] is intuitively applied to the MP model for a planet in orbit about the sun. Such demonstration is in general agreement with the core principle of general relativity,

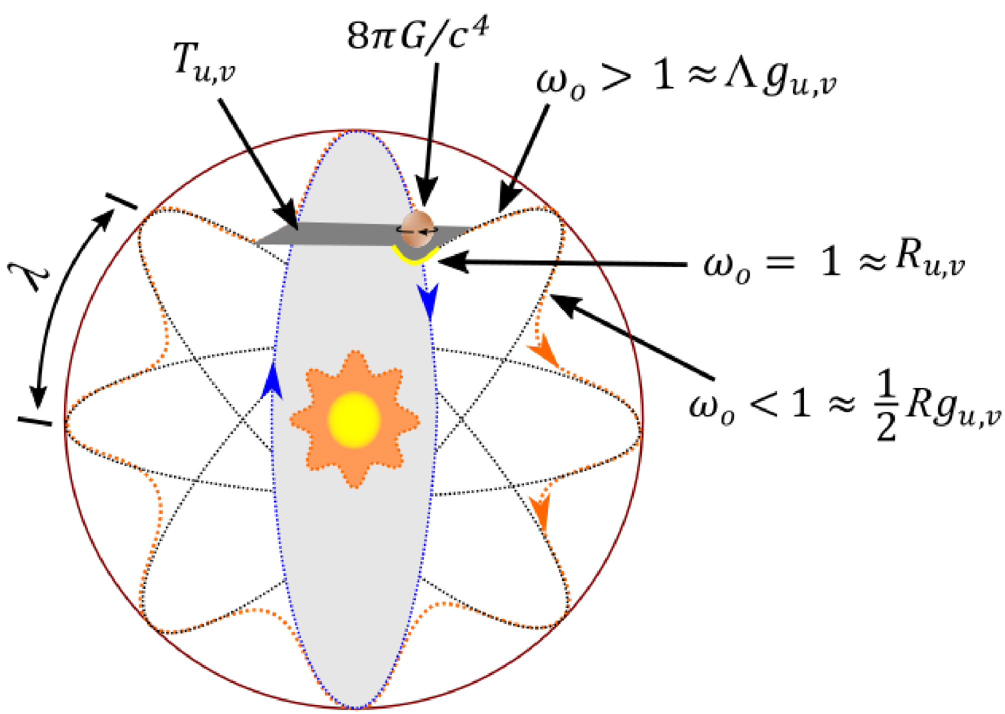


Figure 6. An intuitive demonstration of how Einstein's field equation is incorporated into the MP model for a planet in orbit within the solar system. Geodesic motion (yellow curve) normalizes the precession stages (orange dotted loop) of an orbital (blue dotted line and arrows) to produce a cosmic wave function. Manifolds of the tensor framework can be envisioned between the boundary (maroon circle) and

subsequent quantized states of BOs into extra dimensions towards the sun. Other features of relativity are offered in Fig. 1d. G = Newtonian gravity, $Rg_{u,v}$ = Ricci curvature tensor with definitions of other symbols provided in the text.

where matter curves space and space tells matter how to move. For example, shift in precession of the model 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 generate geodesic motion. In the latter, a cosmic wave function is produced (Fig. 6), where 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 stress-energy tensor in flat space-time, $T_{u,v}$, is comparable to the inertia frame of BO for the microscale. The metric tensor, $g_{u,v}$ of space-time applies to the frames of a spherical electron cloud model in 4D space-time (Fig. 1d) for the solar system. In this case, Poincaré conjecture is also applicable between the spherical boundary and BOs of octet shape (e.g., Fig. 1b). For a multiverse at a hierarchy of scales, the magnitude of Ψ for both the classical level and the microscale is defined by the mass of the object interacting with light into space (e.g., Equation 6). Applying such intuitions, the wave function provides a possible link between the microscale and the cosmic level, and this is explored 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. To illustrate such a path using complex mathematical formulations appears unattainable for two main reasons. First, diverse themes of physics are covered in both the conceptualization process of the proposed model and its applications to physics in general. These cannot be easily combined into a single article using the conventional method. Second, some aspects of physics, such as space-time dynamics, superposition states, the uncertainty principle, and entanglement, among others, are counterintuitive and more difficult to represent with abstract mathematical tools to suit our general perceptions of the physical world. For such reasons, the MP model appears to be an ideal intuitive tool to pave the reconciliation path consistent with existing knowledge in physics. Thus, here, only a crude mathematical path is demonstrated.

By incorporating Equation 2, the link between general relativity and quantum mechanics in 4D space-time becomes of the form

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

where *i* represents an accelerating object in an orbital with both forward and reversible directions of equal magnitude along an inertia fame of BO. Equation 8 is purely geometrical in relation to the MP model applications as demonstrated in Fig. 1 and 6. A similar correlation is made for a quantized energy level by incorporating Equation 6, which is given in the expression

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

Equation 9 assumes that geodesic motion is part of a cosmic wave function (Fig. 6) comparable to Ψ for the classical scale as mentioned above. For light interaction with an orbiting object into space-time, this is defined by the relationship

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

where $\mathcal{H}$ is the minimal energy of precession akin to $\hbar$ for the quantum state (e.g., Fig. 1d). The latter at the atomic state has a value of 1.055 x 10^{-34} J.s for minimal energy related to BO of orbital's precession into forward time (e.g., Fig. 1d). The former for Mercury is equal to 5.910 x 10^{-33} J.s (i.e., 3.711 x 10^{-32} J.s / 2π) towards an observer on Earth (see related notes offered in section 3.0). Between the microscale and the macro level, uniformity is attained for the classical scale, where a person is not subject to either collateral damage from gigantic cosmic waves or constant bombardment of harmful radiations at Planck's scale. Any decaying process of matter in accordance with the 2nd law of thermodynamics is assumed at lightspeed, i.e., – *mc* (Equation 10), with special relativity sustained in a multiverse at a hierarchy of scales. Conservation of matter then assumes the form

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

Equation 11 sets the classical boundary of a terrestrial scale between the atomic state and the cosmic level. Intuitively, it is consistent with the application of the MP model for a multiverse at a hierarchy of scales, while assuming the Newtonian gravity to be localized to a body into space as earlier suggested (see section 3.0). Uncertainty towards defining a planet's position is given in Fig. 3b. However, because advances of perihelion precession for a planet in orbit take longer time frame (e.g., Mercury), the uncertainty principle is negligibly small. In a similar fashion, other cosmic themes can be explored with a few of them demonstrated next.

5.4. Other related cosmic themes

Based on the alternative interpretation of general relativity offered above, it becomes a necessity to also expound on other related cosmic themes. However, these are not investigated in detail; rather, a possible path towards their pursuit is described here from alternative perspectives.

- *Big Bang theory*: The development of UMF (Fig. 1b) is figurative of the M-theory type and incorporates *SO*(10) of multidimensional structures. To an extent, it resembles symmetry breaking of a Higgs mechanism type towards higher dimensions. Thus, suppose the Big Bang evolved from a primordial soup at a higher hierarchy of scales, its progression towards the lowest level transits in the following manner: *SO*(10) → *SU*(5) → *SU*(3) x *SU*(2) x *U*(1). The latter is of gauge symmetry for the quantum state, and other immediate steps can be incorporated in between the three stages. For a multiverse, a literal Wheeler-Feynman one-electron-universe [11] becomes applicable at all scales, and this can perhaps, also mime with a cosmic microwave background radiation of an ellipsoid type as the universe limit from current observations.
- *Redshifts*: Aphelion precession of large bodies in orbits into space-time produces redshifts in the 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. Light interaction with perihelion precession of a body into forward time may allude to an expanding universe in

acceleration mode into distant space. For example, geodesic motion generated by a body in orbit is comparable to a cosmic wave function (Fig. 6), which is of continuity form into forward time, while the position is shifted from a reference frame in accordance with the Hubble constant. Precession into forward time for a localized universe would fairly constrain blueshifts towards an external observer.

6. Concluding remarks

The unconventional method adapted in this study for the conceptualization process of the MP model and its application to physics in general provides one tangible path towards the reconciliation process of quantum mechanics and general relativity. This assumes a multiverse at a hierarchy of scales with special relativity sustained at all levels while gravitation force is assumed localized to a body into space. Such intuitions somewhat appear speculative, but the model is developed and applied in accordance with existing knowledge in physics and our general perceptions of the physical world. If considered, it can provide a valuable intuitive tool to complement conventional methods, especially when attempting to integrate and consolidate many aspects of foundation physics into proper perspective both at the microscale and the macro level. This may provide the needed incentives to explore physics further into unknown realms.

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. Dirac. Quantized singularities in the electromagnetic field. *Proc. Roy. Soc. (London) A* **133**, 60 (1931).
4. S. Weinberg. The trouble with quantum mechanics. *New York Rev. Books* **64** (1), 51-53 (2017).
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. M. K. Gaillard, P. D. Grannis and F. J. Sciulli. The standard model of particle physics. *Rev. Mod. Phys.* **71** (2), S96 (1999).
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).