Zero-dimensional mathematics and the associated timespace *Xemdir* field geodesic in deriving Fermat's principle, the stationary-action principle, and the principle of inertia

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Abstract: Physics employs a variety of models constrained by how mathematical objects are used to label physical phenomena, primarily momentum being the mathematical object of choice. These models range from Newtonian mechanics to special and general relativity, to quantum mechanics, and then to the standard model of particles. A clear issue that has arisen between these models is the dimensional mismatch between Einstein's theory of gravitation and quantum mechanics (and thence the standard model) despite the idea of momentum being employed as a common mathematical object of choice for each of the models. Identified also with each of the models are three distinct and overlooked principles which remain as principles for each of the models without any further definition or derivation thereof, namely Fermat's principle, the stationary-action principle, and the principle of inertia. In noting that these three principles are understood as assumptions for each of the models by the application of momentum as a mathematical descriptor base alone, the dimensional lack of cohesion between general relativity and quantum mechanics (and thence the standard model of particles) is brought to question with such. To rectify the dimensional mismatch, these three principles shall be derived from a zero-dimensional mathematical approach for the dimensions of time and space, specifically space as a point and time as a moment. By this derivation, the mathematical object approach of momentum shall be discussed and compared to the zero-dimensional mathematical approach.

Keywords: zero-dimensionality; temporal mechanics; timespace; Xemdir; geodesic; stationary-action principle; Fermat's principle; principle of inertia

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1. Introduction

In following on from the work of Temporal Mechanics [1-46], in paper 46 it was demonstrated that the current physics process of theoretic development is determined if not limited by its current use of mathematics[2]. A solution was formed with the utility of zero-dimensional mathematics annexed to the non-physical objects of time and space deriving 1d, 2d, and 3d *timespace* and thence a mathematical formalism to describe physical phenomena in a manner that is self-checking ([46]: p9-11)[3].

Given the findings of paper 46 ([46]: p6-11), Temporal Mechanics has thus been considered as a useful basis to discuss the dimensional mismatch between quantum mechanics and general relativity, namely the idea of curved spacetime breaking down on quantum levels [47].

This dimensional mismatch is approached by first establishing the mathematical objects common to the key streams of physics theory[4], namely the mathematical object of momentum and how such is applied to three key principles common to each of the streams of physics theory, namely Fermat's principle[5], the stationary-object principle[6], and the principle of inertia[7]. These three principles more commonly represent the basic ideas of line of sight, data-capture location, and force as action-reaction respectively.

The question here in this paper is why these three principles are so pervasive in physics theory execution in the context of a dimensional mismatch between general relativity and quantum physics, and how indeed can they be presumed principles when in fact they as principles should ideally be derived from a certain basis of either time and space[8] or the mathematical object descriptor momentum.

The problem there with physics is revealed as the assumption of these three features of physical phenomena without then deriving why these three features of physical phenomena are all-pervasive as features of a principle of relativity (and associated conditions of symmetry) upon a consistent dimensional basis of mathematical theoretic design, especially so with Einstein's general theory of relativity where not one of these principles are derived.

The proposed solution here[9] is based on the work of Temporal Mechanics [1-46] detailing the mathematics of zero-dimensionality as a common dimensional basis that derives these three assumed principles. Specifically, the solution presented here details labelling time and space in a most fundamental manner, namely as *zero-dimensional space,* and *time as a moment*, to then develop how such would

[2] The problem of applying mathematics directly to physical phenomena resulting in errors of calculation on absolute (zero and infinite) scales.

[3] Addressing Gödel's theorem.

[4] Newtonian mechanics,, special and general relativity, quantum mechanics, and the standard model of particles.

[5] Section 4.1.

[6] Section 4.2.

[7] Section 4.3.

[8] Or should they, and if they should, why?

[9] Sections 5-6.

work as a mathematics, and what then that mathematics can derive for not just the dimensions of time and space, yet for physical phenomena, and why.

In achieving such, this paper is sectioned as follows:

1. Introduction
2. Prior art and methodology
3. The momentum common denominator
4. The three assumptions: line of sight, point-location, and action-reaction
5. Zero-dimensional mathematics
6. The EM_X^{DIR} geodesic
7. Conclusion

To achieve such, the idea of not just momentum, yet how momentum is used as a mathematical object to describe physical phenomena, needs to be examined, following which can be detailed the mathematics of zero-dimensionality to thence derive Fermat's principle, the stationary-action principle, and the principle of inertia.

2. Prior art and methodology

In identifying the dimensional scale crisis between Einstein's general relativity gravitational spacetime theory and quantum mechanics [47], this paper shall discuss the mathematical object *momentum* as the common denominator in all the streams of physics. This paper shall then ask how around that common denominator can the dimensional scales go awry in regard to general relativity and quantum mechanics.

The proposal here is that momentum as the common denominator in all streams of physics[10] is the mathematical object descriptor leading to the dimensional mismatch crisis. The question asked there obviously is why all the streams of physics are unable to link with each other upon the momentum common denominator basis.

The proposal here is that the issue between quantum mechanics (electromagnetism) and Einstein's spacetime theory (gravitation) is how dimensionality is described for momentum differently between general relativity and quantum mechanics thence leading to the idea of spacetime breaking down on quantum levels. In short, quantum mechanics is based on the atomic and subatomic scales with that associated data-matching precision. General relativity as its spacetime field theory[11] though focuses on a much larger scale of fields owing to its different spacetime geometry (curved as opposed to flat). The questions to ask therefore are how this dimensional mismatch happened, and why momentum

[10] Section 3.

[11] Noting that special relativity takes a secondary yet still progenitor role.

was considered as the mathematical object of choice for physical phenomena in Einstein's equations in voiding inertia for his description of gravitational freefall.

The mismatch of Einstein's spacetime with quantum mechanics as to be demonstrated here is simply understood as the way Einstein changed how the idea of not just momentum is used as a mathematical object, yet how momentum is used in regard to the three key principles as postulates, namely:

(i) Fermat's principle[12].

(ii) The stationary-action principle[13].

(iii) The principle of inertia[14].

For instance, in regard to special and general relativity, time can only be measured as a process of how far an object has moved, namely motion relative to another object, another object whether real or imaginary (as a reference). According to Einstein, a passage of time is due to relative motion, namely that two objects must be measured relative to each other as frames of movement reference. All of such works well, except that Einstein tried to network the three principles (i)-(iii) to thence derive spacetime in accommodating for Galileo's gravitational mass findings, namely the idea of gravitational freefall, the problem there being gravitational freefall and thence the problem of replacing inertial points with a spacetime *field.*

The reason for Einstein doing such was that otherwise Newtonian mechanics as per its equations of force, momentum, and thence inertia, suggested different masses would fall at different speeds in a gravitational field[15].

In short, the classical flat spacetime[16] inertia-momentum points were put by Einstein's general relativity into a field geodesic as gravity as curved spacetime to describe how different masses fall at the same rate in the context of a common curved spacetime gravitational field geodesic separate to yet connected with the flat spacetime geodesic previously prescribed to flat spacetime inertial points of reference. Thus, when flat spacetime quantum mechanics describes gravity, the spacetime scales head toward a scale of infinity, such because that's exactly what Einstein did with pinpoint precision on the atomic and subatomic level with his spacetime account of gravity, namely turn such into a field effect through infinite functions of infinitesimal scales. The specific *infinity* problem there is how he achieved such, namely through an infinite series of infinitesimal inertia-momentum references as straight Lagrangian lines to thence *curve* flat spacetime. As is expected therefore, this mathematical field

[12] Section 4.1.

[13] Section 4.2.

[14] Section 4.3.

[15] Such being the problem with the design of general relativity if inertia is a fundamental property of all mass and thence gravity.

[16] Minkowski spacetime [48].

description of spacetime does not fit with the *quantization*[17] process of physical phenomena, simply because the common principle basis (i)-(iii) is being altered[18], primarily line of sight being altered to a curve via Lagrangian infinitesimal straight line functions in an overall infinite function, and thus the stationary-action principle being averaged yet at the same time factored to large scales via these Lagrangian functions[19].

The proposal here though despite Einstein's mathematical error is that the fundamental issue at play is having mathematics as an a priori mathematical object rely on momentum as that fundamental mathematical object description and not the more fundamental[20] dimensions of time and space as an *a priori* definition.

How therefore is this *a priori* dimensional proposal identified as a solution from the basis of momentum? As light has no mass and that momentum is key to both gravity and light as a mathematical object of description, then it is the velocity component of gravity and light in question, namely that:

(iv) The frames of both distance and time intrinsic to momentum (namely, intrinsic to velocity v) are being applied to two paradigms:
   i. EM (as per quantum mechanics).
   ii. Gravity (as per Einstein's curved spacetime).

(v) If these two paradigms have been demonstrated to be unable to be joined by the mathematical object utility of momentum, then a division exists with the mathematical object of momentum intrinsic to its mathematical object nature as that which can only be due to one (or both) of two things:
   i. Not recognizing the component of *time* for a common mathematical object for both spacetime-gravity[21] and EM, resolved ideally as a component of time for both spacetime-gravity and EM as one.
   ii. Not recognizing the component of *distance* for a common mathematical object for both spacetime-gravity and EM, resolved ideally as a component of distance for both spacetime-gravity and EM as one.

In other words, the problem is one of defining a common basis for time and space for both spacetime-gravity and EM. Whether this needs to be a dimensional common basis or a direct derivative of a dimensional common basis such as points (i)-(iii), or ideally both, is the subject in question.

Although the utility of momentum as a mathematical object is not disputed in aiming to describe the phenomena of gravity and EM separately, how momentum is used to describe spacetime-gravity and

[17] Labelling physical phenomena with a mathematical object descriptor as a quantum.

[18] Section 4.

[19] Section 3.

[20] As would be mathematically logical and self-evident

[21] Einstein's (curved) spacetime

EM shall be discussed and a common flaw identified as points (v)-a and (v)-b. By such, this paper thence proposes a solution by addressing a common basis of time and space in the following manner:

(vi) Labelling a zero-dimensional space construct as a *time-now=1* (t_N1) realm where t_N1 is a moment of time and not a passage of time.

(vii) Proposing for that t_N1 realm is an infinite set of zero-dimensional t_N1 time-points for zero-dimensional space.

By such, it is then possible to derive as a measurement template the following:

(viii) The arrow of time (*time-before* to *time-after* via *time-now*) as a golden ratio time-equation:
   i. ([44]: p8-12).

(ix) 1d, 2d, and 3d *timespace*:
   i. ([44]: p12-19).

(x) The derivation of the prime numbers from 0→∞ as the interlinking numerical entities of 1d, 2d, and 3d *timespace*:
   i. ([44]: p12-19).

(xi) A *timespace* temporal wave function as an EM analogue:
   i. ([2]: p2-15).

(xii) Mass, and thence a gravity field effect associated to mass as derived from both a partial (EM^{DIR}) and complete (EM_X^{DIR}) destructive interference resonance (DIR) of EM:
   i. ([42]: p3-16).

(xiii) A temporal equation for gravity revealing the nature of absolute zero-point energy (EM_X^{DIR}):
   i. ([42]: p2-29).

(xiv) A fundamental basis for inertia as that baseline zero-point energy field effect as the EM_X^{DIR} field[22]:
   i. ([42]: p29-56).

The purpose of such is to create a common reference for time and distance for inertial bodies in relative motion with such pinpoint zero-dimensional space and associated temporal t_N1 scaling precision.

3. The <u>momentum</u> *common denominator*

The discipline of physics relies on three key concepts, namely physical phenomena, the measurement of physical phenomena, and thence the theory for physical phenomena.

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[22] Section 6.

Physical phenomena are generally assumed as the question of objective study, namely what is being objectively examined, whereas measurement and theory depend on defining particular scales for dimensional measurement, scales that relate directly to a mathematics as mathematical objects that can thence describe the physical phenomena and thus presumably the dimensions of time and space physical phenomena is a part/process of.

Much of the aim of physics is to create a mathematical theory to explain the mathematical reason[23] of physical phenomena, to then predict the behaviour of physical phenomena in establishing the basic laws of nature, the reliable events prescribing the behaviour of physical phenomena.

In this whole process the aim of physics is to construct a theory that is self-consistent and is able to demonstrate its postulates and axioms as the theoretic basis for its mathematical modelling of physical phenomena as its theories. Ultimately the aim of any theory[24] in physics is to fundamentally explain its postulates and axioms from a common underlying basis that can thence derive those postulates and axioms.

A key common basis of physics theory, together with physical phenomena and the process of measuring physical phenomena, is the undeniable idea of momentum.

In Newtonian mechanics, momentum (p) is the product of the mass (kg) and velocity (ms^{-1}) of an object, as a vector quantity having magnitude and direction[25] .

Newton's second law of motion holds the rate of change of an objects momentum equals the net force acting on it, a net force which is dependent on the precise frame of reference of the object[26] where in any inertial frame momentum is a conserved quantity[27]. It is an expression of one of the fundamental symmetries of space and time, namely translational symmetry[28].

Simply, momentum is a mathematical object describing the mass and velocity of a phenomenal object, and thus involves three basic ideas, namely:

(xv) its mass at a precise location,
(xvi) the distance it moves,
(xvii) and over what time period.

Assumed here are the ideas of:

(xviii) vector of magnitude and direction as per (i),
(xix) pin-point location as per (ii),

[23] Mathematical logic, the reason for which as presented throughout paper 46 [46].

[24] Newtonian mechanics, special relativity, general relativity, quantum mechanics, the standard model.

[25] Point (i).

[26] Point (ii).

[27] Point (iii).

[28] Neatly as a combination of (i)-(iii).

(xx) and mass having a type of force effect as this momentum as per (iii).

Upon these entirely reasonable Newtonian mechanics assumptions are the more advanced Lagrangian [49] and Hamiltonian mechanics [50] systems which allow a choice of coordinate systems. These coordinate systems given their mathematical upbringings are used in the study of quantum mechanics as operators for quantum mechanical wave functions where the momentum and position operators are described by the Heisenberg uncertainty principle [51]. To describe continuous systems[29] the idea of *momentum density* is employed leading to a *continuum version* of the conservation of momentum principle, thence leading to the Navier-Stokes equations [52] for fluids or the Cauchy momentum equation [53] for deformable solids or fluids.

The question now though is how well the 3 postulates (i)-(iii) are being executed by the various disciplines of physics.

4. The 3 postulates: line of sight, point-location, and action-reaction

As based on proposals (i)-(iii) and (xviii)-(xx), a new postulate is proposed:

> *To assume a principle that is used as a standard of measuring to then not derive that standard of measuring basis is to only end up with a theory that relies on those assumptions as the "missing piece" of that theory.*

In other words, it is proposed that by the process of assuming any number of principles there will result a *measuring standard* anomaly in that physics anthology of theories between the theories, or more simply, a dimensional scaling crisis between the theories, as is the case between general relativity (Einstein's spacetime) and quantum mechanics.

To test this postulate, these assumptions (i)-(iii) shall now be examined more closely to identify what exactly is being assumed.

4.1 Line of sight: Fermat's principle

Fermat's principle is the postulate of light behaving in a way prescribed by the least time for light to travel between two points, and thus presumably in a straight line. Ultimately, in taking a path of light, the least time ultimately is a 0 passage of time, and by such for each 0 passage of time light is postulated to continue in a straight line in a vacuum, and thus from a point source of light in a vacuum thence equally

[29] Such as electromagnetic fields, fluid dynamics and deformable bodies.

in all directions as a spherical wave front, uniformly so. The question for this postulate is, "*why, why a straight line, why does light behave in the vacuum of space in such a fashion*[30]?".

Associated to Fermat's principle is the idea of a geodesic. According to Einstein's general relativity, everything including light moves in a geodesic (straight line) if not acted on by a force other than gravity. To note is that the curvature of spacetime as gravity is an infinite series of infinitesimal straight line values[31]. Thus, technically Einstein upheld Fermat's principle in creating general relativity, yet then bent what should have still remained a fundamental symmetry concept[32]. Furthermore, Einstein's general relativity *did not derive* Fermat's postulated principle.

4.2 *Point-location: stationary-action principle*

As proposed, the stationary-action principle tries to encapsulate the idea of a moment in time and thence presumably a point location. In one regard therefore, the stationary-action principle is a principle of least action, namely in a timeframe where nothing happens, a freeze frame, yet when applied to the action principle[33] of a dynamic system such results in the equations of motion for that system. There, both Newtonian and Lagrangian [49] equations of motions can be calculated for their associated processes, so too Hamiltonian [50] equations of motion.

The stationary-action principle is applied throughout all the streams of physics theory.

In alliance with Fermat's principle, Einstein utilized the stationary-action principle as an infinite-series of additions of infinitesimal locations resulting in curved spacetime. Interestingly there, the resourcefulness[34] of Einstein as a historian is evident in noting that the action principle is preceded by not just Fermat's principle, yet far earlier ideas in optics where in ancient Greece *Euclid*[35] noted that the angle of incidence equals the angle of reflection for the path of light reflecting from a mirror. Heron of Alexandria later showed that this path was the shortest length and least time[36], precluding Fermat's principle. As with Fermat's principle though, Einstein's general relativity *did not derive* the stationary-action principle.

4.3 Action-reaction: inertia

Inertia comes from the Latin word, $iners$, meaning idle, sluggish.

[30] Such, despite the known irregularities of the intrinsic features of the wave function leading to spreading paths.

[31] Section 4.3.

[32] Section 3.

[33] Such as a Lagrangian function.

[34] Whether instinctive or by tuition.

[35] In his *Catoptrica* [53].

[36] See [55].

Inertia is proposed to be one of the primary manifestations of mass as a quantitative property of all physical systems. There, as proposed most notably by Sir Isaac Newton's Principia[37], inertia is the resistance of any physical object to a change in its velocity[38]. Subsequently, there is proposed to be a tendency of an object to keep moving in a straight line at a constant speed when no forces act upon that object.

Thus, without inertia, standing normally as we do on the surface of a spinning planet would be hazardous. Simply, the physics of reality has it that our reference as humans is relatively fixed as gravitational masses as per the effect of inertia. Thus, the postulate of the principle of inertia carries weight[39].

The importance of inertia therefore is paramount for flat spacetime theories, as documented by Einstein's special relativity and thence subsequently quantum mechanics. The problem though with Einstein's special relativity and its use of inertia was that such an application could not account for the gravitational freefall of objects, namely that despite inertial mass and gravitational mass being the same value[40], the mechanism of gravity cannot be explained by inertial mass if masses of different values fall at the same rate in the same gravitational field leading to the notion that there must be a new gravitational principle at play not explained by inertia, specifically not explained by inertial[41] mass, and as Einstein considered not explained by flat spacetime.

As a solution to this problem, Einstein took an object's mathematical Lagrangian location basis of inertia-momentum, conditions (ii) and (iii), to a *field* description, namely as a conversion of the Lagrangian Euclidean coordinates for the mathematical flat spacetime objects of inertia-momentum into a curved spacetime field (proxy coordinate) system, as from point locations to a field location. Specifically, Einstein regarded gravity not as a force yet a *consequence* of his curved spacetime geometry. To be noted there is that Einstein proposed the source of the curvature of spacetime to be a stress-energy tensor *caused* by inertial mass[42], as per his process of mathematics. Subsequently as a description, the path of a planet orbiting a star was proposed to owe itself to the geodesic of the curved four-dimensional spacetime geometry *as caused* by the inertial mass of a star as projected onto three-dimensional space, noting the time component as projected onto 3d space as essential for the motion of the planet.

Such may seem harmless, yet the manner in which Einstein performed such, namely in changing the geometry of flat spacetime, has been demonstrated to be the problem [47]. As it has been shown[43], if Einstein created his fields consistent with the quantum process of measurement (flat spacetime) there would have been no impact on quantum mechanics. Yet owing to the need to accommodate for

[37] Philosophiæ Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy) [56].

[38] This includes changes to the object's speed, or direction of motion.

[39] No pun intended (as shall be highlighted in section 5).

[40] As must be the case, namely mass being the same mass for inertial and gravitational effects.

[41] As Einstein considered.

[42] And thus caused by flat spacetime.

[43] See [47].

gravitational freefall (gravitational mass) Einstein changed the geometry of flat spacetime. To achieve this, a series of infinitesimal references in flat spacetime were joined to form curved spacetime, namely in an infinite sequence; therein lies the problem and associated impact of quantum spacetime, namely the infinite sequencing of the infinitesimal references. By such, there eventuated a mismatch between the dimensional calculus used for flat spacetime quantum mechanics as compared the curved spacetime of general relativity.

In short, the effect this process has on the flat spacetime equations for quantum mechanics results is in an infinite series of infinitesimal straight-line values. There, the Einsteinian curved spacetime values in being calculated *into* quantum mechanical flat spacetime highlight how general relativity went awry with its mathematical approach to altering conditions (i)-(iii) as that process of calculating into quantum mechanical flat spacetime leads to extraordinarily large (infinitely sized) values (especially for the quantum energy value of space), well above the known value[44]. Of course by such and by the results there this indicates Einstein's approach is incorrect, yet the flaw here is proposed by general relativity theorists to be rectified by invisible energy and associated invisible matter as dark energy and dark matter respectively. The question is why?[45]

In short, Einstein approached the idea of the gravitational field line of force geometrically as his geodesic, namely by changing the geometry of flat spacetime to accommodate for the idea of gravitational freefall as curved spacetime. Yet dimensionally this had a severe impact on known quantum mechanical data for flat Minkowski spacetime. Here once again, as with (i) and (ii), Einstein's general relativity *did not derive* the principle of inertia.

The proposal here is that these three assumed measuring standards (i)-(iii) can only be derived from a more fundamental basis, namely the mathematics of zero-dimensionality as a mandate of analysis for physical phenomena.

5. Zero-dimensional mathematics

In many ways, the principle of inertia is a combination of Fermat's principle (i) and the stationary-action principle (ii), despite how Einstein attempted to accommodate for gravitational free fall subsequently leading to infinite values on the quantum mechanical scale. Indeed, the principle of inertia is a postulate, and it is interesting to note that Einstein's general relativity did not explain inertia, namely general relativity did not derive the idea of inertia from a first principle basis of his spacetime mathematical construction, nor derive Fermat's principle, nor derive the stationary-action principle. Physics though still considers general relativity should form the basis of a pan-cosmology theory[46] despite such.

[44] As demonstrated by that magnitude of error of 10^{120} above the known energy value for space @$10^{-9} Jm^{-3}$, Einstein's cosmological constant problem, Λ.

[45] A difficult one to fathom on purely scientific terms.

[46] As the ΛCDM model [57].

The proposal here therefore is that Galileo's gravity[47] needs to be derived without using an infinite sequence of infinitesimal points of inertia-momentum mathematical objects as straight line segments bent to form a curve as gravity to account for gravitational freefall.

Simply, the proposed solution is to not use an infinite sequence of infinitesimal points as per the Lagrangian approach of the action principle, namely by not averaging and approximating time-frames as infinitesimal sequences to arrive at a best estimate for a position of an object in time and space as curved spacetime. The proposed solution is to derive the idea of zero-dimensionality for time and space cleanly as an *a priori*, and to then take that theoretic mathematical object scheme and apply such to all the known data of physics theory across all the streams of physics discipline. Such is the work of Temporal Mechanics as the mathematics of zero-dimensionality [1-46].

Although the mathematics of zero-dimensionality takes a new start-point for the analysis of physical phenomena, essentially by-passing the idea of momentum (and inertia) as a fundamental mathematical object basis for describing physical phenomena, the purpose here is to describe how the following can be derived from a zero-dimensional mathematical approach:

(xxi) Light (the EM wave function and Coulomb's constant k_e).
(xxii) Gravitational mass (and the gravitational constant G).
(xxiii) Gravitational freefall.
(xxiv) Fermat's principle.
(xxv) The stationary-action principle.
(xxvi) The principle of inertia.

By achieving such, the mathematics of zero-dimensionality will have been demonstrated to execute a more fundamental mathematical object description for the ideas of time and space in deriving what Einstein failed to derive while abiding by known physical data across the disciplines of physics.

The proposed solution is to ask physics to consider zero-dimensionality for space and time[48], namely as the following mathematical objects:

(xxvii) Zero-dimensional space as a *point*.
(xxviii) Zero-dimensional time and a *moment of time*.

How these two features for *space* (xxvii) and *time* (xxviii) are mathematically developed is the essence of Temporal Mechanics [1-46], first derived in the zero-dimensional manner in paper 43 [43] and thence in deriving the prime numbers in paper 44 ([44]: p4-12).

[47] Namely accommodating for the known phenomenon of gravitational freefall.

[48] Given Temporal Mechanics represents an entirely new charter (basis and heading) and thus *Journal* context.

The initial proposal in paper 1 ([1]: p1-5) of Temporal Mechanics was to examine how anyone, anyone who is willing to count physical phenomena into a mathematical theory[49], is naturally conscious of time and space on a most fundamental level *as a basis* for counting objects in time and space. This lead to the derivation of the time-equation. Such then through a series of papers [2-42][50] lead to the fundamental mathematics of zero-dimensionality[51], specifically papers 43-46 [43-46].

To be noted here is that Temporal Mechanics is a proposed new stream of physics[52], and thus much of the work of Temporal Mechanics requires referencing the work of Temporal Mechanics as compared to known data references, one paper to the next. Given the large amount of data available to physics theory, Temporal Mechanics in its adaptation process to that data has itself become a just as large body of work, as follows:

(xxix) Volume 1: *(papers 1-7)*
   i. *Hypothesis*: the time-equation proposal and associated process of equation data matching.

(xxx) Volume 2: *(papers 8-14)*
   i. *Adaptation*: a new mathematical time-equation formulation and associated process of equation data matching.

(xxxi) Volume 3: *(papers 15-21)*
   i. *Development*: the development of a dual time approach for EM and G as the Hybrid time-theory by deriving time to have different subsidiary equations for EM and G.

(xxxii) Volume 4: *(papers 22-28)*
   i. *Derivation*: the interlinking mathematics of the hybrid time theory with associated atomic and subatomic data and equations.

(xxxiii) Volume 5: *(papers 29-35)*
   i. *Restraint*: determining what the microscopic and macroscopic limits are and why for the time-equation theory, presenting a basic scheme for time-equation cosmology.

(xxxiv) Volume 6: *(papers 36-42)*
   i. *Refinement*: a process of deriving the known and more refined subatomic and elementary particle values and associated field force equations and data.

(xxxv) Volume 7: *(papers 43-47)*

[49] See general content and theme of paper 46 [46].

[50] The primary compass of theoretic design being the time equation and its associated derived golden ratio (Fibonacci) feature.

[51] As initially presented in paper 43 [43].

[52] See section 6.

i. *Zero-dimensionality*: establishing the common underlying mathematics of physical phenomena and associated field force effects, particularly the basis for inertia and gravitational freefall.

To then efficiently acquaint oneself with Temporal Mechanics, volume 7 has been designed with the benefit of hindsight of volumes 1-6, particularly paper 42 of volume 6 where the $Xemdir$ (EM_X^{DIR}) field was derived ([42]: p29-56), which then inspired volume 7 as a new overall approach to revising Temporal Mechanics with the idea of zero-point energy and thus presumably the mathematics of zero-dimensionality. The key issue found with paper 42 though was the need to thence derive the *timespace* zero-dimensional *timespace* grid, hence papers 43-46 [43-46]:

(xxxvi) Paper 43 [43]:

i. Describing *zero-dimensional space* and *a moment of time* ([43]: p1-5).
ii. Thence deriving 1d, 2d, and 3d *timespace* ([43]: p6-8).

(xxxvii) Paper 44 [44]:

i. Using zero-dimensional mathematics to derive the natural number system from $0 \rightarrow \infty$ via deriving the prime numbers ([44]: p5-12).
ii. Resolving Goldbach's conjecture ([44]: p12-13).
iii. Resolving the Riemann hypothesis ([44]: p14-19)[53] in mapping the primes using Euler's equations for the zero-dimensional derived number values of $0 \rightarrow \infty$.

(xxxviii) Paper 45 [45]:

i. Using zero-dimensional mathematics to:
    1. Derive the 5 processes of time for physical phenomena ([45]: p12, (xv-xix)).
    2. Derive the constancy of the speed of light in a vacuum for all frames of reference ([45]: p15-16).
    3. Derive Einstein's cosmological constant *error* in Einstein's failing to accommodate for zero-dimensional mathematics ([45]: p27-31).

(xxxix) Paper 46 [46]:

i. A criticism of the current manner of employment of mathematics by physics, namely a criticism of considering space *as mass* and time *as motion of mass* as such assumes:
    1. The dimensions automatically confer mathematically to physical objects.

[53] Solving the Riemann hypothesis is considered as a key mathematical achievement according to the Clay Mathematics Institute [58].

2. The ideas of not only the mathematics of ***a point in space***, yet also ***a moment in time***, leading to dimensional counting anomalies.

Preceding and yet also underwriting such, the process of paper 42 [42] was to:

(xl) Account for EM as the analogue of the temporal wave function and thence how light can be modelled as a process of destructive interference resonance (DIR) in two ways:

i. A partial destructive interference resonance resulting in particle pair production as the EM^{DIR} gravitational mass effect.
ii. An absolute (X) destructive interference resonance (DIR) resulting in a baseline zero-point field as the EM_X^{DIR} field effect.

Paper 42 [42] and the papers of volume 7 [43-46] therefore are considered as required reading for the mathematics of zero-dimensionality and associated presentation here for the EM_X^{DIR} field geodesic [42] describing and more importantly deriving (i)-(iii).

6. The EM_X^{DIR} geodesic

In paper 42 [42] the following was achieved and demonstrated:

(xli) The value for G (gravitational constant) as derived from the mass[54] of the neutrino while highlighting such in association with two new phenomena reveals, namely:

i. An electron degeneracy process revealing the phenomena of the stars.
ii. The EM_X^{DIR} field effect revealing the phenomena of black holes.

(xlii) Gravity thus being a sub-quantum (elementary particle) phenomenon that ultimately approaches an *absolute (0)* zero-point value for energy and temperature as a force field effect.

(xliii) That there is a baseline field force in play as a flatline EM field (and thus 0 value) proposed as the EM_X^{DIR} field as one that brings into effect the idea of entanglement for both EM (EM entanglement) and gravitational (*gravitational mass* entanglement) processes[55].

(xliv) This EM_X^{DIR} field by its construction resists EM and *gravitational mass* *(EM^{DIR})*[56].

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[54] As the gravitational mass by such a derivation.

[55] Describing the shaping of the phenomena of galaxies.

[56] Therefore, this EM_X^{DIR} field can be demonstrated in a laboratory by repelling EM and gravitational mass (EM^{DIR}) and thus be central to zero-point inertial propulsion systems.

(xlv) In accommodating for (xli)-(xliv) a new cosmological model is formulated (cosmological principles 1-9) detailing what is required to accommodate for known astrophysical data as per this baseline EM_X^{DIR} field, namely the scale of stars at play according to the newfound electron degeneracy process and associated EM_X^{DIR} zero-point field effects.

(xlvi) The EM_X^{DIR} field not only accounting for yet mandating symmetry breaking and baryon asymmetry ([42]: p51-56)[57].

In short, the EM_X^{DIR} field was the notable result for paper 42 leading to the requirement of a zero-dimensional basis to thence more clearly highlight the 1d, 2d, and 3d *timespace* grids in play. Such was considered imperative given the EM_X^{DIR} field is proposed and nonetheless derived to represent the baseline field framework that both shapes physical phenomena and keeps physical phenomena in place in time and space. There, the baseline key feature to this EM_X^{DIR} field effect regarding EM and gravitational mass (EM^{DIR}) is of *excluding/repelling* the *quasiparticle* signature of EM and the *particle (gravitational mass)* signature of EM^{DIR} ([42]: p48, fig18).

In common terms therefore, the EM_X^{DIR} field[58] in repelling both gravitational mass (EM^{DIR}) and EM, creates:

(xlvii) A basis for a “line of sight” as a path of least resistance.

(xlviii) A *mandate* for inertial rigidity for any mass in this ground state EM_X^{DIR} field effect[59].

Simply, the EM_X^{DIR} field is derived to cause straight line effects for the EM field as a direct route between EM temporal wave function points, as a path of least resistance against this EM_X^{DIR} field effect, yet at the same time a field of absolute resistance creating the effect of inertia for gravitational mass objects (EM^{DIR}) immersed in this EM_X^{DIR} field. There is also as per paper 40 ([40]: p19-25, eq4-14) a uniform velocity baseline value mandate for any gravitational mass reference as a constant gradient of distance and time[60].

To be noted with this derivation process is that gravitational mass (EM^{DIR}) alone and its presence in a EM_X^{DIR} field is not the issue, as gravitational mass is a separate issue to the EM_X^{DIR} field[61]. Simply, as demonstrated in paper 42, gravitational mass is the EM^{DIR} particle effect, not the EM_X^{DIR} field, yet the EM_X^{DIR} field as a zero-point inertial field repels the EM^{DIR} particle effect from all aspects thus creating an inertial sphere of influence for mass (an EM^{DIR} particle and thus gravitational mass object).

Therefore, with the EM_X^{DIR} field the following needs to be noted regarding inertia:

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[57] A fundamental requirement of achievement for a successful pan-theory.

[58] From a ground state zero-point energy level.

[59] Proposed to be a pan-timespace field effect.

[60] Derived to be the principle behind cosmic rays.

[61] To be noted here is that Einstein would thus have appeared to have incorrectly excluded inertial mass from the phenomena of gravitational freefall.

(xlix) The EM_X^{DIR} field repels both the EM field and EM^{DIR} gravitational mass:

i. ([42]: p47-51).

(l) Conservation of energy/temperature is upheld, as the EM_X^{DIR} field is an absolute zero-point energy field:

i. ([42]: p51).

(li) Inertia as resistance is not owing to gravitational mass (EM^{DIR}) per-se, yet owing to the EM_X^{DIR} field holding the mass in place as though in an EM_X^{DIR} zero-point energy field vice.

(lii) Inertia is therefore not the property of gravitational mass yet the background zero-point EM_X^{DIR} field it exists in.

(liii) Mass is the same mass for inertial (EM_X^{DIR}, gravity-B)[62] and gravitational (EM^{DIR}, gravity-A)[63] effects:

i. ([21]: p16-17).

Thus, by paper 42 [42] and volume 7[64] it is shown that the EM_X^{DIR} field forms the basis for line of sight as Fermat's principle (i), the zero-dimensional reference as a stationary-action principle (ii), and the principle of inertia (iii).

To note is that this proposal of inertia and freefall gravity for the EM_X^{DIR} field is similar to what was proposed centuries earlier by Nicolas Fatio de Duillier [59] in 1690 and later by Georges-Louis Le Sage [60] in 1748. The commonality here is that with Le Sage's model is a force of gravity caused by tiny unseen particles (termed ultra-mundane corpuscles) impacting all material objects from all directions. Here though the mechanical and kinematic feature of the EM_X^{DIR} field is described in accounting for absolute zero-point energy, and not being an aether or a corpuscle requiring a basic mechanical description per-se despite such a *classical mechanical* description being entirely feasible to construct given this field is a progenitor inertial field.

The interesting feature of Le Sage's work is that he was (without knowing) touching on the phenomena of cosmic rays as per his account of gravity given his model prescribed the force effect of gravity being proportional to v^2, a feature derived in paper 40 ([40]: p20-24, eq4-14) per the time-equation theoretic process for the derivation of cosmic ray phenomena and the associated velocity of protons. There in paper 40 though the account of gravitational mass as gravity-A is presented in alliance with the EM_X^{DIR} field being proposed here responsible for the field effect of gravity per-se as gravity-B.

In short, the EM_X^{DIR} geodesic represents a field effect that allows for objects of different masses to be repelled by a uniform field that not only accounts for their inertia yet is also separate to their gravitational mass values and thus allows objects of different masses to be influenced equally by that baseline EM_X^{DIR} field. Further to this is the effect of the EM_X^{DIR} field on EM, namely the preponderance of

[62] As presented in paper 21 as gravity-A ([21]: p16-17).

[63] As presented in paper 21 as gravity-B ([21]: p16-17).

[64] Papers 43-46 [43-46]

quantum perturbations due to this EM_X^{DIR} field effect, and what the nature of those quantum perturbations are[65].

7. Conclusion

The art of any discipline is its efficiency and simplicity for what itself organizes as a theory, as efficient and simple mechanisms of description. Yet as this paper has highlighted, physics as per Einstein's general theory of relativity has made things vastly difficult if not convoluted for itself by trying to derive the dimensions of space and time based on a mathematics of momentum and inertia to then derive spacetime, as a spacetime that is non-inertial, in using mathematical objects as field transformations relating points to fields.

Consequently, despite the *no stone unturned* approach by Einstein's spacetime physics and the associated search for dark matter and dark energy, here in this paper that process has been shown to be fundamentally flawed. Such a process though has an upside, namely that by its *no stone unturned* approach in looking for dark energy and dark matter that entire process will nonetheless provide much data. The downside there is that no actual new and right-step-forward solutions to physical phenomena will logically be forthcoming if indeed dark energy and dark matter do not exist and the decision remains to look for such.

Conflicts of Interest

The author declares no conflicts of interest; this has been an entirely self-funded independent project.

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[65] Both effects, namely a gravitational field effect and zero-point energy quantum perturbations, shall be the subject of a subsequent paper.

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