


# The zero-dimensional physical theory (II): causality, locality, and indeterminacy

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**Abstract:** Here the zero-dimensional physical theory addresses the ideas of causality, locality, and indeterminacy. Although such are terms synonymous with current problems and paradoxes in physics theory, especially regarding the known discrepancies between Einstein's physical theories and the known features of the same quantum mechanically described phenomena, here it will be demonstrated how those terms and associated ideas are precise zero-dimensional physical theory-based derivations for the attributes of physical phenomena. By such, the key flaw in both Einstein's physical theory formulation and that of quantum mechanics becomes apparent, namely the priority of mass and momentum as the axiom of choice. Here, the axiom of choice is once again presented as the zero-dimensional basis for time and space, resolving the current ideas of causality, locality, and indeterminacy.

**Keywords:** zero-dimensional; timespace; causality; locality; determinism; logistic map equation; chaos; perihelion precession of Mercury; gravitational waves

## 1. Introduction

In following on from the previous stream of papers of Temporal Mechanics<sup>1</sup>, specifically the zero-dimensional physical theory [50], presented here shall be an overarching description of the ideas

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<sup>1</sup>[1][2][3][4][5][6][7][8][9][10][11][12][13][14][15][16][17][18][19][20][21][22][23][24][25][26][27][28][29][30][31][32][33][34][35][36][37][38][39][40][41][42][43][44][45][46][47][48][49][50].

of causality, locality, and indeterminacy as derived and thence determined by the Temporal Mechanics zero-dimensional physical theory. Here, the ideas of causality, locality, and indeterminacy will be derived from the zero-dimensional physical theory. Those ideas will not be discussed in either an Einsteinian physical theory context or quantum mechanical physical theory context, as those understandings and associated concepts are considered as commonly understood albeit disputed and unresolved features of Einsteinian physical theory regarding quantum mechanics and vice versa. Presented here shall be a new zero-dimensional physical theory basis for the ideas of causality, locality, and indeterminacy, what type of phenomena these ideas feature with, and why.

As such, this paper is sectioned as follows:

1. Introduction
2. The zero-dimensional physical theory
3. Causality, locality, and indeterminacy
4. Gravity, and planetary perihelion/aphelion and precession
5. Determinism, and the logistic map equation
6. Conclusion

Specifically, this paper shall describe the ideas of causality regarding time, together with providing a description for both locality and indeterminacy for mass and gravity. To achieve this, the zero-dimensional physical theory needs a brief introduction and review.

## 2. The zero-dimensional physical theory

Mathematics in its most basic form is the idea of counting physical objects, principally of relating objects numerically. One should then readily assume physical phenomena should be just as easily calculated using advanced counting processes. Of course, reality cannot be counted *entire* given its scale and our relative size, and so mathematical equations are used to formulate and predict the behaviour of a variety of physical phenomena. Those formulae and equations are then matched with one another across the physical phenomena spectrum to then explain physical phenomena on a grand scale. Not only on the grand scale, yet those things in physical phenomena that cannot be directly seen, like the field forces and the dimensions of time and space and their relationship to the field forces, such in bearing reference to physical phenomena as *mass* and the *motion of mass*.

Fundamentally, mathematics *in physics* is central to the utility of *mathematical objects* as *virtual constructs* usually modelled from axioms in their abstract application to physical phenomena.

The problem there is automatically thinking numbers are a part of a physical and measurable reality. How is such a problem?

In its most basic sense, a number is a mathematical object used to count, measure, and label. In mathematics, a real number is a value of a continuous quantity that can represent a distance along a line, and/or a quantity that can be represented as an infinite decimal expansion. René Descartes

[51] introduced the notion of a *real* number with his proposed dimensional analysis of physical phenomena, such in considering the dimensions as *real* in being represented by *real* numbers, which thence implied a type of preordination for numbers being integral to physical reality.

Subsequently, real numbers have been used to measure as best as possible (as approximations) physical observables such as time, space, mass, and energy. Yet, although real numbers can be represented along a line (to then map physical objects with physical features such as mass, velocity, and thence momentum), any of those numbers labelling physical traits are still abstractions, namely *placements/applications* of numerical values.

In short, numbers can be described in any manner of ways, yet when being applied to reality, to what are proposed to be the *real dimensions*, those numbers are still abstractions, namely that a real number does not automatically *confer* reality, even if that line is proposed to be a spatial or temporal *real dimension* localizing a real property of physical reality.

Albert Einstein in his lecture “Geometry and Experience” at the Prussian Academy of Science in Berlin on 27 January 1921 [52] described this problem of numbers applied to physical reality in the following manner:

*One reason why mathematics enjoys special esteem, above all other sciences, is that its laws are absolutely certain and indisputable, while those of all other sciences are to some extent debatable and in constant danger of being overthrown by newly discovered facts.*

*In spite of this, the investigator in another department of science would not need to envy the mathematician if the laws of mathematics referred to objects of our mere imagination, and not to objects of reality. For it cannot occasion surprise that different persons should arrive at the same logical conclusions when they have already agreed upon the fundamental laws (axioms), as well as the methods by which other laws are to be deduced therefrom. But there is another reason for the high repute of mathematics, in that it is mathematics which affords the exact natural sciences a certain measure of security, to which without mathematics they could not attain.*

*At this point an enigma presents itself which in all ages has agitated inquiring minds. How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality? Is human reason, then, without experience, merely by taking thought, able to fathom the properties of real things.*

*In my opinion the answer to this question is, briefly, this: - As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.*

Albert Einstein

Address to Prussian Academy of Sciences (1921)

Clearly there exists a puzzle in applying numbers to physical phenomena, which then Einstein related to his explanation [52] for indeterminacy [53]. The proposed solution to this puzzle is to not focus on the real dimensions of physical reality in using numbers, to not describe indeterminacy in such a manner, namely by criticizing how numbers are used to explain physical phenomena, yet to instead focus on the zero-dimensional aspects of physical reality [50] and then then give a precise mathematical description for the ideas of causality, locality, and indeterminacy.

The initial complicated task of the zero-dimensional number theory is how indeed should one scale the size of a point, of zero-dimensional space, which was thence termed the zero-infinity ( $\mathcal{O}_0^\infty$ ) paradox ([50]: p6). In papers 43 [43] and 48 [48] the zero-infinity scaling paradox laid a foundation for how to approach the idea of spatial infinity, and how that can be coupled with relating one zero-dimensional point with another zero-dimensional point using the idea of time.

There, the zero-dimensional number theory describes how the numbers 1 and 0 tagged to zero-dimensional time and space respectively result in two equations, the Fibonacci equation for the *temporal* feature of *timespace* as  $t_B + 1 = t_A$  (where  $t_B^2 = t_A$ ), and Euler's equation for the *spatial* feature of *timespace* as  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$ . These equations were considered as the axioms for the subsequent number theory of time relating with space [49] resulting in 1d, 2d, and 3d *timespace*. There, one axiom as the time-equation prescribes a spiral (Fibonacci) and the other as Euler's equation for space prescribes a circle. The challenge there is understanding how both equations can find parity as *time=space* outside the time-domain of *time-now*, thence requiring the use of *time-before* and *time-after*.

There, it was found that the task of joining those two unique equations, one for time and the other for space, is always incomplete thence resulting in an endless process of time relating with space with those equations. Nonetheless, in having sufficiently accommodated for the zero-infinity paradox ( $\mathcal{O}_0^\infty$ ), the limitation of the *time=space-equation* process was found to be the calculation of the equations for minimum mass and maximum mass, *namely the "maximum mass" equation which limits the scaling system in the zero→infinity zone, and of course "minimum mass" equation which limits the scaling in the 0 zone.*

When this number theory process is tagged with the charge of the electron  $e_c$  and the speed of light  $c$ , it was found that the number theory ecosystem of equations matches the known equations for physical phenomena, except for the equations for light which it proposes as a temporal wave function, and the equations for gravitational constant which it proposes to be most fundamentally and logically based on the mass of the neutrino  $m_{ex}$  ([50]: p9-10).

Fundamentally, the Temporal Mechanics zero-dimensional philosophy, number theory, and associated physical theory is **not about** applying numbers to what is "real" (such as the real dimensions, mass, and so on) in thence being an abstraction of numbers, yet about applying numbers to what is *zero-dimensional* and thus being a pure number theory. Then, that number theory and associated virtual reality of equations is applied to physical phenomena using the charge of the electron  $e_c$  and speed of light  $c$  as scales for that number theory. This was explained throughout paper 50 [50] as the zero-dimensional physical theory.

In many aspects, the zero-dimensional physical theory is a mathematical description of zero-dimensional time and zero-dimensional space that together can construct a virtual reality in a way:

- (i) According to a specific axiom protocol for zero-dimensional time and space without wavering from such.
- (ii) Replacing how physics uses abstraction with numbers to describe actual physical phenomena.
- (iii) Mimicking what is observed of physical phenomena.

In many ways, the zero-dimensional philosophy, number theory, and thence physical theory process can register physical reality according to a description consistent with our own sentient awareness. Along this train of thought therefore, perhaps one of the most fundamental concepts in philosophy is the idea of causality and determinism. What therefore does the zero-dimensional philosophy, number theory, and physical theory say about the idea of causality, of cause and effect, and ultimately determinism, and how are such proposed to manifest with the workings of physical phenomena? Further to such, what does this zero-dimensional physical theory derive for the ideas of *locality* and *indeterminacy*?

### 3. Causality, locality, and indeterminacy

Causality [54] as an idea (cause and effect) is perhaps one of the greatest mysteries in physics, namely the reason for physical phenomena and how such plays out as the effect itself of the behaviour of physical phenomena and that variety of traits.

On a most basic level *causality* prescribes the following ideas and processes:

- (iv) The relationship between causes and effects.
- (v) A process of time whereby the cause and effect are each best conceived of as temporally transient.
- (vi) Cause is partly responsible for the effect.
- (vii) Effect is partly dependent on the cause.
- (viii) An effect cannot occur *before* its cause.
- (ix) A cause cannot have an effect outside its future.
- (x) The cause and effect must be mediated across space and time (in upholding the idea of contiguity).
- (xi) Effects follow causes in a predictable, linear manner.
- (xii) The causes of an event must ultimately be reducible to fundamental interactions.

In greater detail, causality describes how one event, process, state, or object (*a cause*) contributes to the production of another event, process, state, or object (*an effect*) where:

- (xiii) The cause for something to happen is embedded in the effect to some extent on a fundamental time and space level.
- (xiv) A process can have many causes as *causal factors*, and all lie in its past.
- (xv) An effect can in turn be a cause of, or causal factor for, many other effects, which all lie in its future.

Here with the zero-dimensional logic, causality requires:

- (xvi) The basis of zero-dimensional space as a point and time as a moment as the fundamental interaction basis.
- (xvii) The accompanying feature of a past-event (*time-before*) leading to a future event (*time-after*) via the known local temporal paradigm of *time-now*.

By its basis and ensuing description, Temporal Mechanics and associated zero-dimensional theory makes the description of causality a formality; paper 50 ([50]: p6-20) summarizes what was achieved in zero-dimensional number theory in that regard, primarily the two equations for time space, namely  $t_B + 1 = t_A$  for the primary temporal component and  $e^{i\pi} + 1_{t_N} = 0_{t_A}$  for the primary spatial component.

By the proposed association of those two equations there results an ecosystem of equations as presented in paper 50 ([50]: p6-20). Each of those two equations therefore must describe features of the derived ecosystem of equations for each of those equations in that ecosystem of equations.

On a basic level, it was found that the  $t_B + 1 = t_A$  equation forms the basis for *EM*, and the  $e^{i\pi} + 1_{t_N} = 0_{t_A}$  equation forms the basis for a zero-point gravitational field. Gravity as is understood in physics is thence an emergence from the relationship between  $t_B + 1 = t_A$  and  $e^{i\pi} + 1_{t_N} = 0_{t_A}$ . Simply, in between these two equations is the derived concept of mass, and thence the known concept of gravity. This was described throughout paper 42 [42], and thence papers 43-50 [43-50].

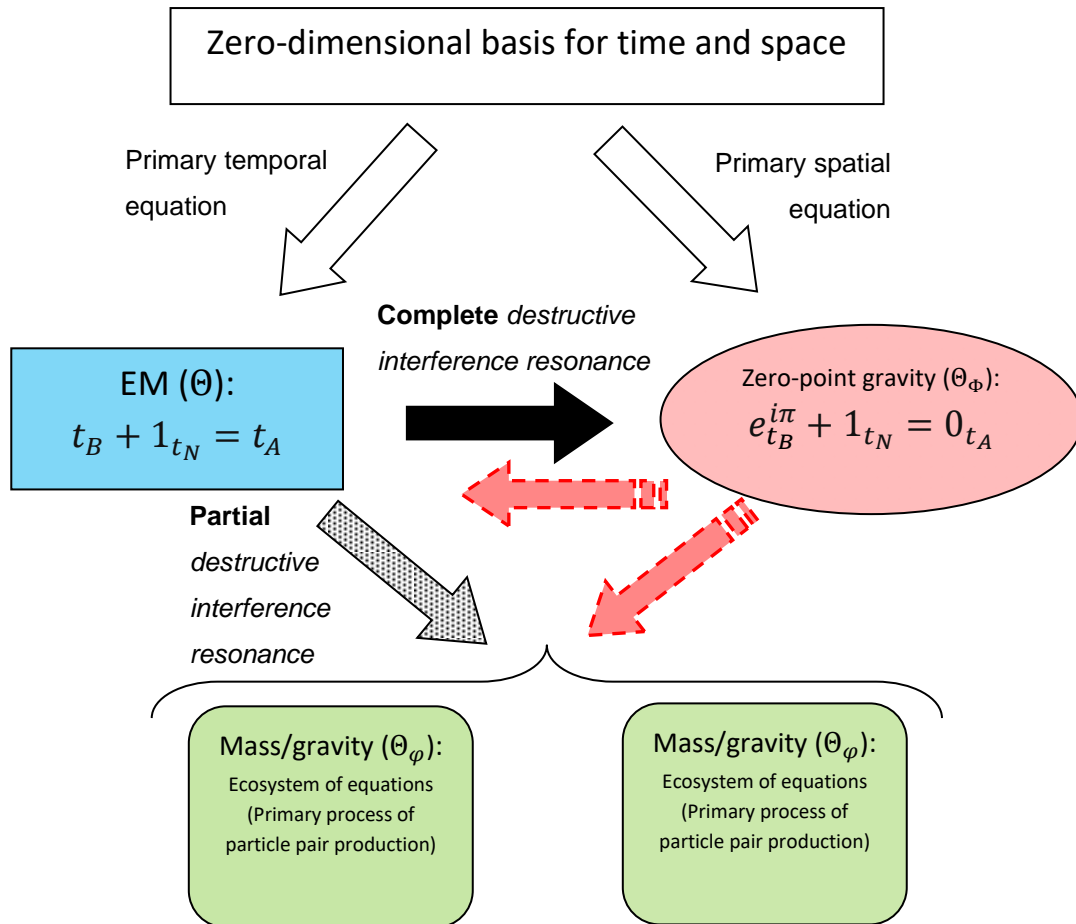
The process of derivation of the equations and associated descriptors for *EM*, the zero-point gravitational field, and mass (gravity), revolve primarily around the basic *EM* temporal wave function equation and how that equation adapts to the space-equation of  $e^{i\pi} + 1_{t_N} = 0_{t_A}$ . There, it was found that when the  $t_B + 1 = t_A$  equation undergoes complete destructive interference resonance ( $EM_X^{DIR}$ ) it equates to a 0  $t_A$  result, and thus complies completely with the  $e^{i\pi} + 1_{t_N} = 0_{t_A}$  equation, thence becoming a zero-point gravitational field effect<sup>2</sup>. A partial destructive interference resonance ( $EM^{DIR}$ ) effect though was derived to result in mass, specifically particle pair production [38]. These processes were presented throughout paper 42 [42].

For simplicity, consider the *EM* field as the  $\theta$  field, the  $EM^{DIR}$  field as the  $\theta_\phi$  field, and the  $EM_X^{DIR}$  field as the  $\theta_\Phi$  field.

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<sup>2</sup> ([35]: p29, eq3), ([39]: p44, eq19-20), ([40]: p20, eq4-10), ([42]: p14, eq14, eq21) ([42]: p7-16).

The real issue therefore is how mass as  $EM^{DIR}$  gravity field ( $\theta_\phi$ ) and all its associated derived equations are affected by  $EM$  ( $\theta$ ) and the  $EM_X^{DIR}$  zero-point gravitational field ( $\theta_\phi$ ). Consider figure 1 describing the three timespace field effects, namely  $EM$  ( $\theta$ ), mass/gravity ( $\theta_\phi$ ), and zero-point gravity ( $\theta_\phi$ ) as derived from the two equations for *timespace*.



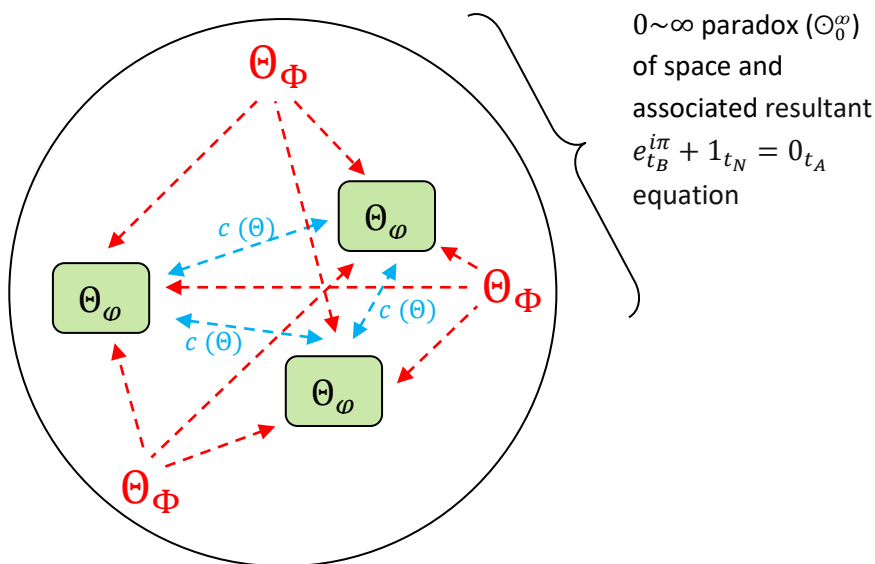
**Figure 1:** Schematic of the zero-dimensional number theory and two basic equations, and their physical phenomenal *relationships* as  $EM$  (blue arrow), mass (green), and gravity (red arrow).

The very nature of the two fundamental equations for time and space thence describe how mass/gravity ( $EM^{DIR}$ ,  $\theta_\phi$ ) can be regarded from two aspects, from the  $EM$  ( $\theta$ ) aspect as the  $t_B + 1 = t_A$  aspect, and from the zero-point gravity ( $EM_X^{DIR}$ ,  $\theta_\phi$ ) aspect as the  $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$  aspect. In other words, mass/gravity ( $EM^{DIR}$ ,  $\theta_\phi$ ) is proposed to have two field effects associated to it, an intrinsic  $EM$  ( $\theta$ ) field effect as  $t_B + 1 = t_A$ , and an all-pervading zero-point gravitational effect as  $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$  ( $EM_X^{DIR}$ ,  $\theta_\phi$ ).

Therefore, the primary locality (immediate surrounding) influence on mass/gravity ( $EM^{DIR}$ ,  $\theta_\phi$ ) has two components,  $EM$  ( $t_B + 1 = t_A$ ) and  $EM_X^{DIR}$  as zero-point gravity ( $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ ).

On the surface, the standard time-equation of  $t_B + 1 = t_A$  appears compatible with the idea of causality, namely having a cause  $t_B$  that leads to an effect as  $t_A$ . Yet it must be noted that  $t_A$  was defined as an unknown and thence required the idea of  $t_B^2 = t_A$  to accommodate for such<sup>34</sup>. There, one could say there is a certain lack of certainty in the future, an unknowability, already wired into the time-equation. To also note there is that the time-equation operates according to a value of  $c$ , as a rate of expression<sup>5</sup>.

The standard space-equation of  $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ , written as such as a temporal analogue to form the basis of the resulting *timespace-equations*, is to have its  $t_B$  component represent  $e^{i\pi}_{t_B}$ , and its  $t_A$  component represent the value of 0. By such, one could say by a null future result there is presumably an “immediate” (zero *time-after* effect) field effect in play for zero-point gravity, namely no streaming of time per se. One could therefore also say that the idea of zero-point gravity is one of being an immediate field force effect not constrained by  $c$ , and that by such zero-point gravity as a field effect goes beyond the normal local field constraints of  $c$  as faster than light field travel. Consider the schematic of figure 2.



**Figure 2:** A more detailed schematic of the relationship between EM ( $\theta$ , blue arrows), mass/gravity ( $\theta_\phi$ , green), and zero-point gravity ( $\theta_\Phi$ , red arrows), noting that here only three schematic locations for a zero-point gravitational field reference are used with three schematic locations for mass/gravity.

When the idea of mass is then brought into the picture of  $t_B + 1 = t_A$  and  $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ , it must be noted that intrinsic to mass is the idea of a partial *DIR* (destructive interference resonance) EM

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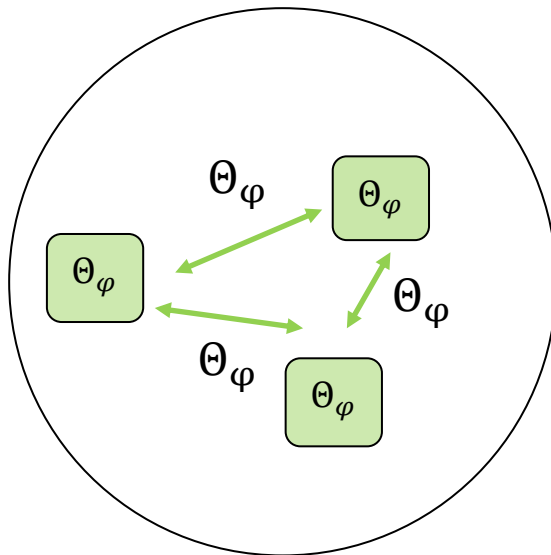
<sup>4</sup> ([43]: p6-7, eq1-7), ([44]: p8-10, eq1-6).

<sup>5</sup> paper 2 ([2]: p13-16), and paper 45 ([45]: p20-27).



( $\theta$ ) field effect ( $EM^{DIR}, \theta_\phi$ ). There also to note is that zero-point gravity as  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$  is a full destructive interference resonance ( $EM_X^{DIR}, \theta_\phi$ ) of the  $t_B + 1 = t_A$  equation. Therefore, in an overall zero-point gravitational field backdrop, as an expansive zero-point field effect, the  $EM$  feature yields to the zero-point gravitational feature, or quite simply, the idea of  $EM$  ( $\theta$ ) that is fundamental/intrinsic to mass, intrinsic to  $\theta_\phi$ , is prescribed to approach a spatial value of 0 for  $\theta_\phi$  (mass) locale relative locations.

By such, mass/gravity ( $\theta_\phi$ ) is derived to be self-attractive. Such self-attraction is derived to happen in alliance with a repulsive effect of the zero-point gravitational  $\theta_\phi$  field on  $EM$  ( $\theta$ ) and mass ( $\theta_\phi$ ), as derived and described in paper 47 ([47]: p15-19). Thus, figure 2 can be more efficiently drawn as figure 3 highlighting the self-attractive resultant nature of mass and standard gravity.



**Figure 3:** a resultant schematic for the self-attractive nature of mass/gravity ( $\theta_\phi$ ) by the overall resultant effect of zero-point gravity ( $\theta_\phi$ ).

Simply, the “attractive” feature of the mass-mass association (green arrows) owes itself to the requirement of the  $EM^{DIR}$  ( $\theta_\phi$ ) field to abide by the zero-point gravitational field  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$  equation. Although, mass would be influenced locally by  $t_B + 1 = t_A$  and thus have certain local influences constrained by the same constraints of  $t_B + 1 = t_A$ , namely  $c$ , mass would be fundamentally constrained by  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$  and thus constrained non-locally as an *attractive* force effect, and thus the outcome would be an apparent force of attraction by a  $\theta_\phi$  field effect as what is understood to be what is observed for gravity, namely mass attracting mass.

As highlighted in figure 2, a  $\theta_\phi$  (mass, green square) locale is influenced directly by its immediate  $EM$  ( $\theta$ ) surroundings (blue arrows) and via an immediate zero-point gravitational ( $\theta_\phi$ ) “action at a distance” process (red arrows). The question now is understanding how the two relate, and what that phenomenon for a mass object is derived to be, and whether they allude to the ideas of locality, causality, and indeterminacy.

If it can be granted that to measure something requires  $EM$ , thence naturally physics would consider that the process of measurement is constrained by  $c$ . Here though Temporal Mechanics and

the zero-dimensional theory presents a confounding ingredient as per the zero-point gravity equation of  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$ , namely that gravity on a most basic zero-point level operates immediately through space by its very nature with the derived fabric itself of *timespace*. The field effect this ( $\Theta_\Phi$ ) would have would be two-fold as mediated by its  $t_A$  feature of  $0_{t_A}$ , namely its effect on mass ( $\Theta_\varphi$ ) and its effect on *EM* ( $\Theta$ ), as follows:

- (xviii) The effect of the  $\Theta_\Phi$  field (gravity) on the  $\Theta_\varphi$  field (mass) would be immediate, a field force described with properties as derived<sup>6</sup>, as a mass-particle  $\Theta_\varphi$  *immediate* entanglement realm in space:
  - a. Immediate-entanglement concepts such as:
    - i. Line of sight (Fermat's principle).
    - ii. Principle of inertia.
    - iii. Stationary action principle.
  - b. This would then make identifying the *exact* location of a particle using *EM* (constrained by *c*) problematic, creating the notion of *indeterminacy* for particle location, if indeed there is a more fundamental zero-point field principle ( $\Theta_\Phi$ ) at play than what measurement ( $\Theta_\varphi$ ) allows.
- (xix) Underlying mass-particles ( $\Theta_\varphi$ ) in *immediate* ( $\Theta_\Phi$ ) entanglement would be an underlying intrinsic *EM* ( $\Theta$ ) immediate entanglement ( $\Theta_\Phi$ ) for all those mass-particles:
  - a. The effect of the zero-point ( $\Theta_\Phi$ ) field on the *EM* ( $\Theta$ ) field would be to make the *EM* field status as a wave function also uncertain upon the "immediate" basis of the  $\Theta_\Phi$  field, a feature known to physics requiring the idea of "wave function collapse" ([48]: p10) to describe how a wave function can be identified, and thus *indeterminacy* for wave function status.

By (xix), the quantum state ( $\Theta$ ) of a particle ( $\Theta_\varphi$ ) therefore, namely the  $\Theta$  feature intrinsic to  $\Theta_\varphi$ , prescribes a phenomenon for particles sharing spatial proximity (through generation or interaction) such that the quantum state ( $\Theta$ ) of each particle ( $\Theta_\varphi$ ) of a group of particles cannot be described independently of the quantum state ( $\Theta$ ) of the other particles ( $\Theta_\varphi$ ), even if the particles are separated by a large distance [55]. This was also described from the aspect of the time-equation and associated absolute *time-before* time-points in paper 29 [29], "*Time and Non-Locality: Resolving Bell's Theorem*"<sup>7</sup>. here though the  $\Theta_\Phi$  field could be best described as:

- (xx) the field principle that underwrites a fundamental principle of relativity, namely that the laws for time and space are the same for all bodies in any and every instance of time and point in space according to this zero-point field basis.

<sup>6</sup> ([35]: p29, eq3), ([39]: p44, eq19-20), ([40]: p20, eq4-10), ([42]: p14, eq14, eq21).

<sup>7</sup> See section 4.

#### 4. Gravity, and planetary perihelion/aphelion and precession

In short, the derived  $\theta_\phi$  field mandates that it is not possible to predict the value of a mass ( $\theta_\phi$ ) quantity with arbitrary certainty, even if all initial conditions<sup>8</sup> are specified. Further to such, the  $\theta_\phi$  field also was demonstrated by derivation to elucidate Fermat's principle, the stationary action principle, and the principle of inertia, as per paper 47 [47].

Thus, there are four features to mass ( $\theta_\phi$ ) in space by the effect of the proposed zero-point gravitational ( $\theta_\phi$ ) field:

- (xxi) Indeterminacy.
- (xxii) Fermat's principle
- (xxiii) Stationary action principle.
- (xxiv) Principle of inertia.

There is a 5<sup>th</sup> principle to consider nonetheless, and that is the temporal component of the  $\theta_\phi$  field (mass-field) and how that such a field effect is constrained by  $c$  yet nonetheless a part of the 1d, 2d, and 3d *timespace* realms. Quite simply, here would be a different type of gravity effect, not as the zero-point "action at a distance"  $\theta_\phi$  gravitational field effect, yet an observed and  $c$ -limited mass-field effect. These two types of gravity field effects were derived in paper 22 ([22]: p13-26), namely gravity A ( $\theta_\phi$ ) and gravity B ( $\theta_\phi$ ). The mass-field effect, namely the  $\theta_\phi$  field effect, is what is understood of gravitational waves, constrained by  $c$ , and not the proposed "action at a distance" (immediate) zero-point energy  $\theta_\phi$  gravitational field basis.

Thus, the fifth feature for the gravitational phenomena of mass is:

- (xxv) Mass-field waves, as gravitational ( $\theta_\phi$ , mass-attractive) waves.

A feature to note there for the phenomena of mass is the effect of the zero-point  $\theta_\phi$  field (gravity) on the  $\theta_\phi$  (mass) field in an *immediate* manner. Here, in the  $\theta_\phi$  field underwriting an uncertain location (non-static/stationary effect, as per  $e^{\frac{i\pi}{t_B}} + 1_{t_N} = 0_{t_A}$ ) for mass objects, there is derived thence to be the basic idea of continual oscillation/spin for mass, logically resulting in the idea of particle spin and particle vibration on a most fundamental level<sup>9</sup> to accommodate for such an underwritten condition.

By such (xxi)-(xxv), it is proposed that the effect of one mass with another, each having motion in regard to each other as point-locales in respect to each other, is to produce a  $\theta_\phi$  mass-field wave effect that is bound by the value of  $c$ , a mass-field wave effect that in all appearance is attractive by the

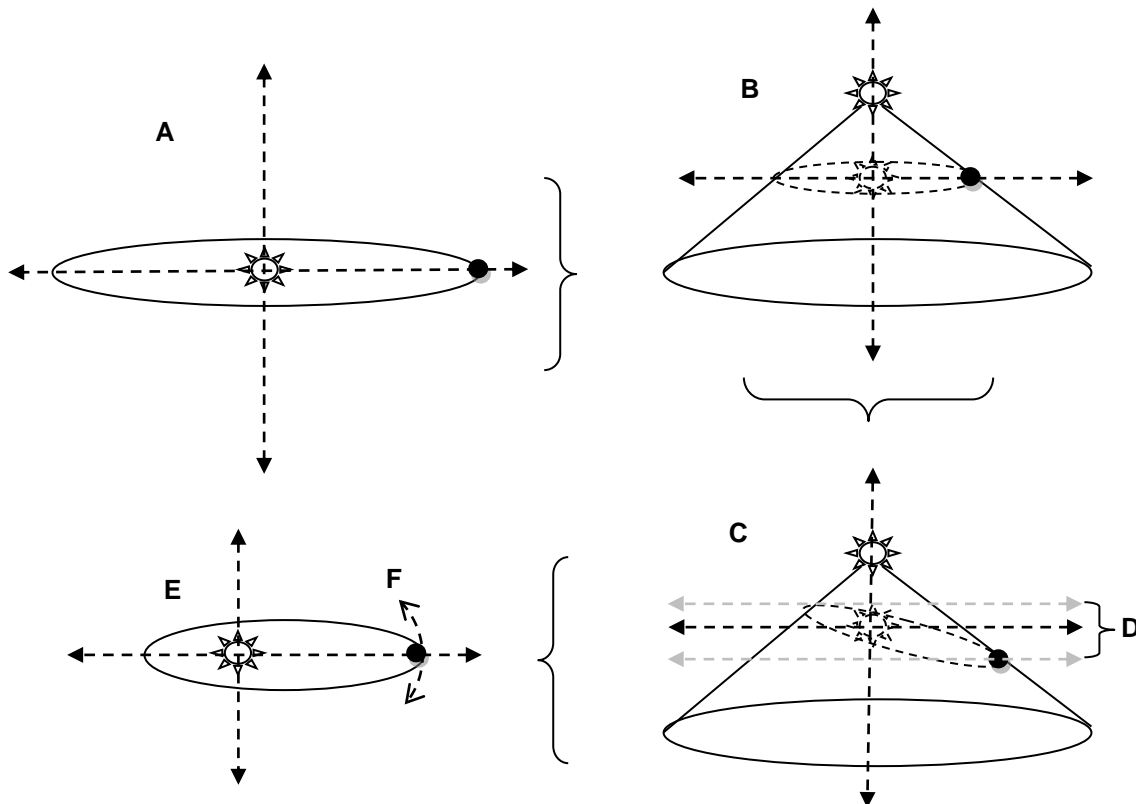
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<sup>8</sup> See section 4

<sup>9</sup> ([22]: p17-23), ([23]: p12-28).

effect of the  $\theta_\phi$  field<sup>10</sup>, yet a mass field effect that that is bound by  $EM$  as a partial destructive interference resonance of an  $EM$  field ( $EM^{DIR}, \theta_\phi$ ). Here, such is the proposed known feature of gravity and associated known gravitational wave<sup>11</sup> feature of gravity, yet more precisely  $\theta_\phi$  field waves.

Why is such significant? To note is that the alignment of these  $\theta_\phi$  field waves and their required phenomena for that  $\theta_\phi$  field wave effect to occur is that the mass motion phenomena of this  $\theta_\phi$  field effect (and thus motion of mass) would need to be *orthogonal* to the zero-point gravitational action-at-a-distance  $\theta_\phi$  field effect, orthogonal so as not to *be* the zero-point  $\theta_\phi$  gravitational field effect. Consider figure 4.



**Figure 4:** a resultant schematic for the self-attractive nature of mass/gravity ( $\theta_\phi$ ) by the overall resultant effect of zero-point gravity ( $\theta_\phi$ ), here resulting in an elliptical path of planets (E) by the orthogonal effect (D) of the  $\theta_\phi$  field on the  $\theta_\phi$  field, then also incurring planetary precession (F) owing to the orthogonal effect (D) in regard to the primary solar mass reference plane (A) and (B) in conjunction with the rotation of the planet around the sun.

Of note with figure 4 is how the orthogonal effect of the  $\theta_\phi$  field on the  $\theta_\phi$  field results in an elliptical path of a lesser mass around a greater mass (sun), the sun there occupying the focal point of the ellipse and the planet the arc of the ellipse. In other words, here the fundamental basis for elliptical

<sup>10</sup> ([35]: p29, eq3), ([39]: p44, eq19-20), ([40]: p20, eq4-10), ([42]: p14, eq14, eq21).

<sup>11</sup> Not a precise description of the phenomena as a label.

planetary motion is described warranting not just a perihelion/aphelion, yet planetary precession also. There in figure 4 the planetary precession (F) is a part of the orthogonal component (D) also warranting the elliptical trace (E). This is something that was not picked up by Newton in his formulation for gravity simply because the bases of his formulation were mass and momentum, and not a more fundamental zero-point energy field basis. In other words, here is a description that takes Newton's [57] and Kepler's [58] geometry to a new level without having to bend spacetime where the precession of planets is accounted for.

In therefore calculating the motion of the planets of this solar system, one would consider:

- (xxvi) a spherical/circular "action at a distance" value for the  $\Theta_\phi$  zero-point gravitational effect as per a circular orbit (A) and (B) in figure 4, namely as a result of the derived notions of Fermat's principle, stationary-action principle, and principle of inertia (xxi)-(xxiii),
- (xxvii) and then appropriate to such a required  $\Theta_\phi$  *orthogonal* gravitational wave field effect and thus mass-motion effect as this wave field effect perpendicular to the direction of planetary circular motion, namely in two directions perpendicular to the direction of the circular rotation of a planet around the sun, as (C) and (D) in figure 4:
  - a. one as a *precession* value (one orthogonal direction, as (F) in figure 4),
  - b. and the other as a *perihelion* value for the elliptical orbits of the planets (another orthogonal value as (E) in figure 4),
  - c. while also accounting for a conservation of energy requirement with those orthogonal motions mediating around the zero-point  $\Theta_\phi$  field effect.

The elliptical orbits of the planets (perihelion/aphelion) and their associated precession values can thence be derived, and thence the precession and perihelion/aphelion of the planets calculated by such a process, namely calculating the feature of  $EM(\theta)$  accommodated for by mass in the context of the  $t_B + 1 = t_A$  time-equation seeking to perfect the value of  $\pi$  (namely, in finding parity with the space-equation of  $e^{i\pi} + 1_{t_N} = 0_{t_A}$ ), from an atomic scale to a proposed macroscopic scale. Such a calculation was achieved in paper 14 ([14]: p26-30) in taking into consideration the entire energy requirements for this proposed conservation of energy process, namely from the microscopic scale (Lamb shift) to the macroscopic scale (CMBR). Here though the **requirement** for the precession and perihelion **is derived** without merely being labelled by bending/stretching flat spacetime.

It may seem anomalous to suggest that gravitational waves are intrinsic to how mass as a mass-field effect ( $\Theta_\phi$ ) (and thus the motion of mass) behaves in space by the combined effect of the  $EM(\theta)$  and  $EM_X^{DIR}(\Theta_\phi)$  fields, and with the case of the perihelion/aphelion and precession of Mercury that any gravitational wave effect there describing its motion would be miniscule given its mass. However, the problem there lies with incorrectly scaling the phenomena of the stars and associated black hole phenomena, phenomena which Temporal Mechanics derives to be  $\sim 10^{18}$  orders of magnitude<sup>12</sup> under what contemporary physics considers to be correct. That order of magnitude difference is due to the

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<sup>12</sup> To be presented as a calculation in a subsequent paper.

“electron degeneracy” phenomena<sup>13</sup> considered to be the primary description for stellar astrophysical phenomena.

## 5. Determinism, and the logistic map equation

It is important to note that the idea of determinism regarding mass/gravity as the  $\Theta_\phi$  field would prescribe the maintenance of the *principle of relativity* [56], namely the status quo of the *timespace* relations of equations and associated physical attributes. Here, *determinism* is the basis of the time-equation and how it relates with space. Yet such is not to say the future can be predicted, yet that there always exists a fundamental unknowability in the future especially regarding the location of a mass object if indeed zero-point gravity operates according to  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  where  $t_A = 0$ . Simply, the proposed system of *timespace* here although having temporal intentionality as  $t_B + 1 = t_A$  has nonetheless a basic zero-point energy basis of unknowability as intentionality as per  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$ .

Imagine every object in motion yet the fundamental effect of zero-point gravity (and not standard  $c$ -limited gravity) being immediate for such to work. In that process therefore, there is and must always be an uncertainty in how one object relates with another gravitationally in that immediate temporal context as the  $\Theta_\phi$  component when juggled with the  $\Theta_\phi$   $c$ -limited component. The question is how that uncertainty is wired into an immediate zero-point effect of gravity. It is so care of the fundamental time-equation logistics with space on the zero-dimensional level for time and space. Simply,  $\Theta_\phi$  uncertainty is always already wired into zero-point  $\Theta_\phi$  gravitational field positions.

In mathematical demonstration of this, if a “supplementary” equation for *timespace* were to be now considered, one that acknowledges the zero-point “action at a distance” idea of the  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  equation and the standard  $t_B + 1 = t_A$  time-equation, and then combining the two according to a certain manner of regard, one such manner of combination can be most basically considered as  $e_{t_B}^{i\pi} = -1_{t_A}$ . Here, the  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  space-equation as the zero-point “action at a distance” equation is proposed to by-pass a flow of time per-se in relieving that duty to the basic  $t_B + 1 = t_A$  time-equation. By such, the following equation can apply for the standard time-equation in replacing  $t_A$  with  $e_{t_B}^{i\pi}$  as  $-1$ :

$$t_B + 1 = -1. \quad (1)$$

This can be expanded to  $t_B + 1 = t_B - t_A$ , if indeed  $t_B - t_A = -1$ . Thus, we get the following in noting  $t_B^2 = t_A$ :

$$t_B + 1 = t_B(1 - t_B). \quad (2)$$

Now let us add in a temporospatial component “ $x$ ”:

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<sup>13</sup> As derived and described in paper 42 ([42]: p7-16).

$$x_{(t_B+1)} = x_{t_B}(1 - x_{t_B}) \quad (3)$$

The scale of “ $x$ ” needs to be considered, and so we must add a new constant  $k$ ; thus repairing eq. 2 we now have:

$$x_{(t_B+1)} = k \cdot x_{t_B}(1 - x_{t_B}) \quad (4)$$

This constant  $k$  would represent a feature that highlights a *sensitivity* to the underlying temporal wave function processes at play, as what can be termed the “*initial conditions*” for “ $x$ ”.

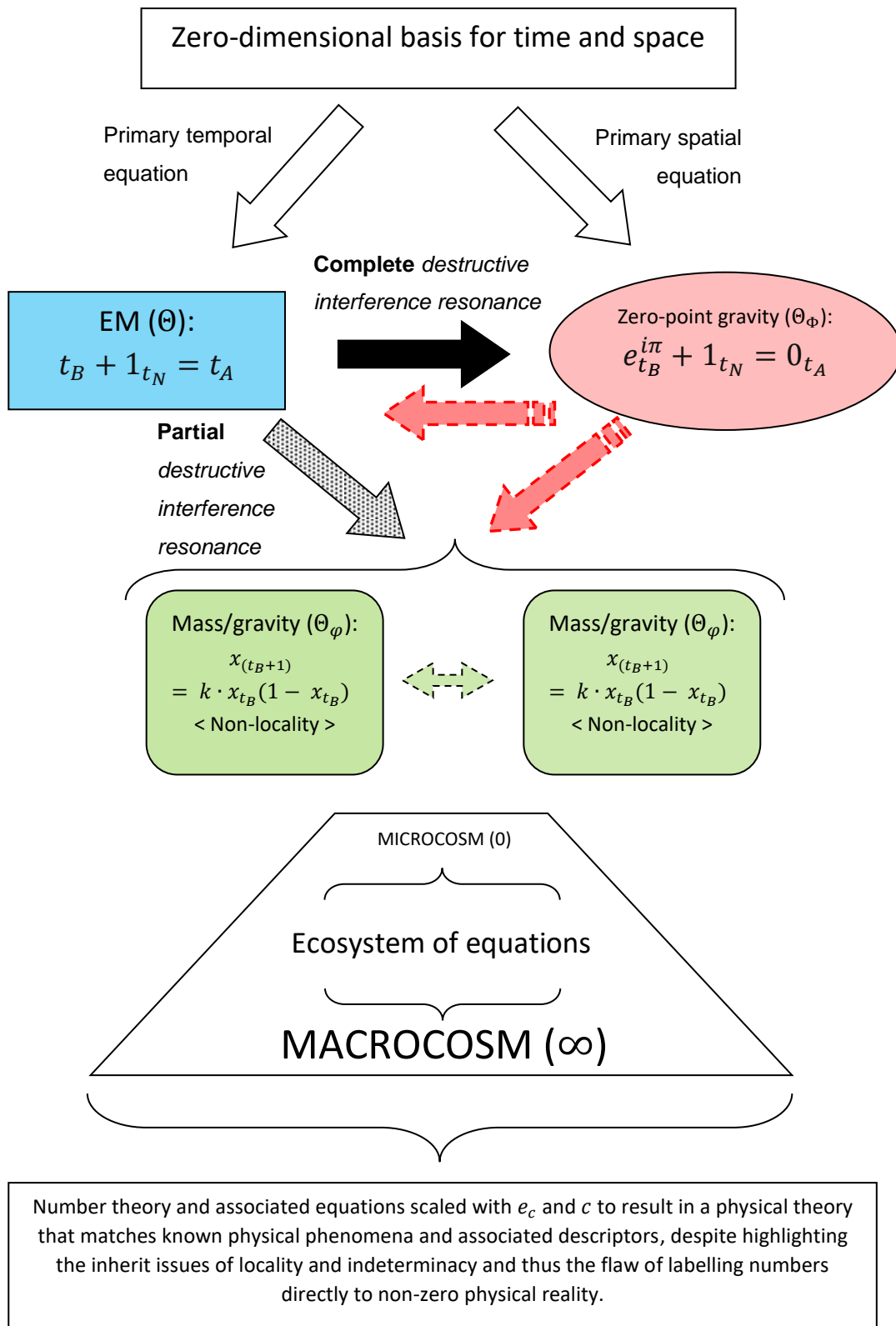
This equation would represent how any condition for “ $x$ ” would evolve in time, would propagate through time, having an underlying structure in being the feature of the  $t_B + 1 = t_A$   $c$ -scaled time-equation adapting to the  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  zero-point space-equation.

This is not the first-time mathematics has conceptualized this equation, as it represents the “logistic map equation” [59], used in chaos theory, defining the idea of chaos with an underlying sensitivity to initial conditions [60], promoting fractal lattices [61], an equation that has been used to successfully study sentient population growth. Here, the “ $x$ ” paradigm would be sensitive to the underlying initial conditions of the zero-dimensional basis, and that the value “ $k$ ” can be adjusted to accommodate for the proposed directive of the  $t_B + 1 = t_A$  time-equation with the  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  space-equation, and thus as per a fractal Fibonacci sequence [62] process of mass-mass association, given that the Fibonacci sequence is a golden ratio algorithm [63].

In now considering how in paper 29 [29] absolute *time-before* time-points were considered as the cause for the concept of non-locality, here that absolute *time-before* time-point reference is better described with  $e_{t_B}^{i\pi}$  as per  $e_{t_B}^{i\pi} = -1_{t_A}$  thence leading to the known phenomenal effects of mass as per the logistic map equation  $x_{(t_B+1)} = k \cdot x_{t_B}(1 - x_{t_B})$ . There, gravity as a field force effect can be considered as a negative energy value ( $e_{t_B}^{i\pi} = -1_{t_A}$ ), thence giving rise to its known kinetic effects on mass.

The overall structure of reality is therefore proposed to play out as vast conglomerations of temporal wave function interactions and resonances in a context of (in all appearance) the proposed logistic map equation as an amalgamation of the  $t_B + 1 = t_A$  time-equation and  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  space-equation instructing physical phenomena (mass) in the manner of  $x_{(t_B+1)} = k \cdot x_{t_B}(1 - x_{t_B})$ .

Thus, from an exact use of numbers (0 and 1) for zero-dimensional time and zero-dimensional space can be derived a zero-dimensional number theory that when scaled with the values of  $e_c$  and  $c$  results in a description of physical phenomena that clearly states that labelling numbers otherwise directly to physical phenomena will always result in errors due to the derived fundamental issues of locality and indeterminacy. Thus, figure 1 can be more accurately be presented as figure 5.



**Figure 5:** An overall schematic of the relationship between the proposed zero-dimensional number theory and physical phenomena.



In short, determinism is proposed to be executed by:

- (xxviii) The two zero-dimensional equations, namely  $t_B + 1 = t_A$  and  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  for time and space respectively.
- (xxix) Cause and effect being embedded in each of the zero-dimensional equations for time and space.
- (xxx) How ultimately the cause-and-effect nature of the two equations has each other determined as a cause and effect for each other.

For *timespace*, such prescribes a *temporal* direction of random events towards an equilibrium weighed as a value of 0, or rather gravitational equilibrium with the process of energy being executed *into* equilibrium *in approaching* a value of 0, and thus the basis for entropy with time's arrow.

The fundamental consideration is that all of such, in abiding ultimately by Euler's equation for space, is a process of having the basic microscopic time-equation driven processes adapt to an overall pan-gravity zero-point energy field effect, and thus a system in cycles of time, prescribing no actual beginning or end to time itself, as the time-equation  $t_B + 1 = t_A$  proposes, only beginnings and ends to mass-based events in *timespace* as Euler's equation  $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$  proposes.

## 6. Conclusion

The utility of the Temporal Mechanics zero-dimensional description for time and space certainly now becomes apparent in its description of causality, locality, and indeterminacy. Here, known problems and paradoxes in physics theory are resolved through this more fundamental (zero-dimensional) account of the dimensions of time and space, namely not making mass and momentum the axiom of choice for physical theory, yet the dimensions of time and space on a zero-point level. The next step for this series of papers is to add more description and analysis to this new idea of zero-point gravity ( $\theta_\phi$ ) underlying what is understood of standard gravity and those relevant dynamics with *EM* ( $\theta$ ) and mass ( $\theta_\phi$ ).

### Conflicts of Interest

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

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