The zero-dimensional physical theory (VII): charting infinity using the Riemann zeta function and Ramanujan summation in deriving dimensional number paradigms

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Abstract: Proposed here is a zero-dimensional number theory for physical phenomena charting the concept of infinity in using the Riemann zeta function and Ramanujan summation. The key common dimensional basis here is zero-dimensional time as a moment, and zero-dimensional space as an infinitesimal point. Key to the number theory are derived dimensional number paradigms and associated equations from the proposed intertwining of zero-dimensional time and zero-dimensional space underwriting known physical phenomenal equations. Examples of these numbers are the values for the golden ratio, Euler's identity, π, and the numbers 10, 12, and -1/12. These proposed derived number paradigms and equation relationships are thence demonstrated to derive known constants and associated equations of physical phenomena such as the fine structure constant, Planck's constant, and gravitational constant, together with their associated known equations. By such, it is shown that the proposed zero-dimensional time and zero-dimensional space axioms and their derived dimensional number paradigms represent the core underlying code of physical reality.

Keywords: zero-dimensional; timespace; singularity paradox; Xemdir; Riemann zeta function; Euler zeta function; Ramanujan summation; Casimir effect

1. Introduction

Here Temporal Mechanics[1] in continuing its series of papers[2] shall present the unique idea of charting infinity using that same zero-dimensional number theory of its predecessor paper [54]. By such, dimensional number paradigms are shown to emerge forming the basis for the mathematics and associated number theory of a proposed physical theory describing physical reality. The aim here is to show how the known equations of physical reality can be directly derived as *timespace* paradigms from a number theory basis leading to the notion of a unified number theory behind the workings of physical reality.

Specifically proposed here is a process of creating zero-dimensional axioms that by their association can derive a number theory which can then be scaled to physical reality demonstrating its existence and purpose thereof. The added descriptive feature here is to demonstrate how the concept of infinity can be derived as a dimensional construct such that other dimensional features of time and space used to describe infinity are directly relatable via derived equations matching physical phenomena to that derived dimensional representation for infinity.

Paper 55 [54] highlighted how the Clay Mathematics Institute (CMI) Millennium Prize (MP) problems[3] require the idea of defining the mathematical idea of infinity to then be applied to the proposed dimensions of time and space. Mathematics though has no real solution to the question of infinity other than by using set theory. Here, issues with set theory will be uncovered and shown as being flawed in trying to describe physical phenomena. Although set theory may be entirely useful as a mathematical theory per se, here the idea of set theory as a tool for dimensional analysis is put into question.

In proposing a zero-dimensional basis for infinity, a number theory is derived which can then be shown to resolve the Riemann hypothesis [49][4] in mapping the primes using a zero-dimensional based Fibonacci algorithm. That zero-dimensional based Fibonacci algorithm can then be shown to locate a dimensional scaling mechanism for infinity in referring to the *Ramanujan Summation* [57] forming a "hub" for the dimensions of time and space deriving the locale and associated dimensional mechanics of the atom[5]. From there, references will be made to the other papers of Temporal Mechanics directly related to this basis in deriving the known equations and constants of physical reality.

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[1] The current work of 56 papers detailing a new mathematical approach to the dimensions of time and space as zero-dimensional logic, see https://www.xemdir.com/.

[2][1][2][3][4][5][6][7][8][9][9][11][9][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][51][52][53][54][54].

[3] "*To celebrate mathematics in the new millennium, the Clay Mathematics Institute of Cambridge, Massachusetts (CMI) established seven Prize Problems. The Prizes were conceived to record some of the most difficult problems with which mathematicians were grappling at the turn of the second millennium; to elevate in the consciousness of the general public the fact that in mathematics, the frontier is still open and abounds in important unsolved problems; to emphasize the importance of working towards a solution of the deepest, most difficult problems; and to recognize achievement in mathematics of historical magnitude"* [54][56].

[4] [49]: p18-24, eq13-25.

[5] Namely, the fine structure and Planck constants, and thence atomic, subatomic, and elementary particle scales.

In achieving such, this paper is constructed as follows:

1. Introduction
2. State of the art
3. Mass and motion
4. Principle of relativity
5. Zero and infinite sets
6. Dimensions as axioms
7. Epistemology by axioms
8. Time and space equations
9. The 10 timespace paradigm
10. The 12 timespace paradigm
11. The $\frac{-1}{12}$ timespace paradigm
12. The S_0 timespace paradigm
13. Physical emergence
14. The challenges
15. In summary
16. Conclusion

In short, delivered here will be a continuation of the proofs forwarded for the CMI MP problems of paper 55 [54][6] by way of identifying a Riemann zeta function value for infinity demonstrated as entirely relevant to the zero-dimensional analysis for time and space and thence physical phenomena, presenting the case for the concept of infinity as an entirely relevant and dimensionally useful paradigm. By such, this new paradigm shall be demonstrated in deriving equations known to science and associated disciplines of phenomenal analysis.

2. State of the art

The importance of mathematics as number theories for physical theories describing physical phenomena is without question. Evidence of such is noting the key current mathematics quests in being applicable to physical reality and thence physical theories, notably the CMI MP problems. Also of note is the importance of physics in advancing our species in allowing us to better read the signs of physical reality to be just as better adapted to events.

Explaining reality as per dimensional analysis though with number theories is no easy thing as highlighted by the difficulty of the CMI MP problem list. Core there is the issue of defining infinity and how time and space operate from 0 to infinite scales. There, the question for the CMI MP problems is

[6] [54]: p8-14.

how to define infinity with dimensional analysis in the form of the 3-sphere[7], unavoidably involving the idea of needing to define infinity and thence by contemporary protocols employ set theory. The idea there is conjecturing that if a relationship between numbers can be proven, and a relationship between numbers and the dimensions if not physical reality can be established, then the relationship of number types can point to underlying laws of physical reality. Ideally for such to work, numbers need to be associated to dimensional scales. Paper 55 [54] proposed that such is what the CMI MP problems have underwritten in asking through its various questions as problems how a 3-sphere can be scaled to zero (0) and infinity (∞), and if the primes can be mapped in the context of such, and if so how. There, the obvious quest in physics is to unravel the nature of what can rightly be considered a "*singularity*"[8].

Identified in paper 55 [55][9] was how current approaches to physical theory development using number theory is constrained by the current phenomenal basis of physical theory formulation, namely mass and motion as per momentum, and not by a primary exercise of dimensional analysis (time and space) despite general relativity's worded description of curved spacetime. There, by that oversight, the case was presented of current physical and associated number theories having improperly addressed the idea of a point in space and moment in time. The evidence of this oversight was proposed to be the core problem of physical theory formulation; highlighted there was how contemporary physical theory formulation has reached the problem of upholding a model of the universe that is dependent on unfounded ingredients, namely dark energy and dark matter, ingredients that are required for spatial expansion with time from time's proposed beginning, namely as per the ΛCDM[10] model (big bang model). Upon such, number theory conjectures are proposed to thence request such be solved with a number theory describing the dimensional number theory at play for such a cosmological model proposal. The state of the art is therefore by its absence of number theory very much in the dark in describing mathematically how the dimensions are meant to work for the current proposed physical theories, all of which depend primarily on the idea of mass and relative motion of mass.

3. Mass and motion

The principle of mass and motion, and thence the ideas of force, acceleration, and momentum, cannot be denied recognition for their utility to the application of physical theories. A tremendous amount of physical theory enlightenment has been achieved in physics upon these processes. In fact, the execution of physics is still based on the principles of mass and motion and thus momentum, as fundamental principles of both gravity and electromagnetism (EM), each being described with the idea of momentum. By such, an entire mathematical ecosystem of equations has developed on the primary notion of momentum.

[7] The 3-sphere as a higher dimensional analogue of a sphere.

[8] [54]: p7-8.

[9] [54]: p4-16.

[10] The current agreed cosmological model (simply, the big bang), Λ as the symbol for dark energy and CDM signifying "cold dark matter" to support the idea of a "big bang".

Sir Isaac Newton [58] developed physics greatly in describing the elliptical orbits of planets with his force-inertia-momentum logic. What was missing there with Newton's work was a description for gravity in a way that not only accounted for the elliptical orbits of planets (their perihelion) yet their perihelion *precession*. There also though with Newton's work was the idea of aether. With the results of the Michelson Morley experiment, the idea of aether was abandoned, argued away with a new physical theory basis of Albert Einstein's special relativity, describing the motion of mass regarding light and the relativity of moving objects. Einstein though decided to bend his flat spacetime model of special relativity to describe the precession of the planets with his theory of general relativity. In doing so though, flat spacetime became curved, and by that curving new features became intertwined in that curved spacetime theory attempting to describe gravity, a key feature being how spacetime can stretch as it curves. This all lead to a chosen basis for cosmology, to describe the redshift of stars, to provide a basis for what appeared to be an expanding universe of stars. It seemed like a good fit, and so to this day the ΛCDM model is in play and continually tested. There is supporting evidence helping general relativity along, including how general relativity proposes light to bend to gravity as though being a part of the curvature of spacetime, and how with something supermassive (and thus super curved) light would find it difficult to escape that proposed curvature. In other words, from the simple proposal of curved spacetime Einstein could explain features of light found in the astrophysical analysis of the stars.

The previous paper of Temporal Mechanics [54] has shown though that there is no real dimensional mathematics to Einstein's general relativity work, and so the search is on to find that dimensional mathematics, that dimensional number theory, describing how space relates with time as a number theory. The search for that number theory is proposed to be in the form of the CMI MP problem list. However, paper 55 [54][11] has found that curving the dimensions as per curved spacetime is an unlikely solution basis for the precession of the perihelion of planets.

The key basis at play with Einstein's general relativity, and thence the key basis for cosmology theory, is not in fact a number theory yet a worded description. Although one would think the key basis of general relativity is mathematics for the dimensions of time and space, yet all evidence presents the case that such is not so, otherwise the search for a dimensional number theory to describe Einstein's proposal of 4d curved spacetime (as a 3-sphere analogue) and its applicability to cosmology would not be in play. Aside from relying on mass and motion as the key basis for Einstein's philosophical work (in its absence of being suitably mathematical), there was one fundamental idea that general relativity was found to be in breach of, and that is the principle of relativity.

4. Principle of relativity

In physics, the principle of relativity is the *requirement that the equations describing the laws of physics have the same form in all admissible frames of reference***.** In the case of general relativity:

[11] [54]: p14-16.

(i) There is an absence of *actual equations describing the dimensions*, given the need for the CMI MP problem list to find those equations.

(ii) There is also an absence of *upholding the structure of descriptions for the dimensions and associated phenomena in their having the same form in all admissible frames of reference*

Both (i-ii) problems are evident with general relativity. This is highlighted in the wording of the CMI MP problem list in view of the current physics models in play, especially with the Hodge conjecture aiming to describe loose and rigid 3-spheres as an analogue to Einstein's 4d curved spacetime (general relativity) highlighting the suspicious handling of the principle of relativity with general relativity.

In fact, the Hodge conjecture[12] acknowledges the requirement for both local and universal rigidity yet conceding to a type of looseness in between such. The task there is to explain how the looseness and rigidity can merge without corrupting a principle of relativity, namely in being held in the one and the same dimensional number theory description as what the Lorentz invariance and covariance achieved for special relativity's flat spacetime. The fact that such a dimensional number theory is not evident highlights that the principle of relativity is more than likely being abused with how Einstein's 4d spacetime general relativity is being used until proven otherwise, specifically there in how it presumed with words alone to describe Lorentz covariance by applying such *locally* at every *averaged* Lagrangian time-frame and thus pseudo spacetime point *region* as a *presumed exact point of spacetime*.

Although Einstein upheld the principle of relativity for his special relativity theory work which successfully explained away the particle ether, as what was required in describing the Michelson Morley experiment results, together with describing the constancy of the speed of light for all frames of reference, that principle of relativity was all but abandoned in curving flat spacetime without the sufficient mathematics to demonstrate how the principle of relativity can be upheld. Some consider Einstein's general relativity presented an *elegant mathematical solution*, yet in all fact there is no real mathematics executed there else there would be no search on for the mathematics that can support curved spacetime theory as evident by the CMI MP problems. Although the Einstein field equations relate the Einstein tensor to a stress-energy tensor[13], nothing there is said of the dimensions of time and space themselves as a number theory let alone mathematics. In fact, the mathematics Einstein used was in the form of a new language of symbols and descriptions that were merely associated to each other to propose an intended result for mass, motion, and energy.

This feature of Einstein's mathematics, or rather lack thereof, highlights the actual true problem in physics, namely not sufficiently describing the dimensions of space and time in the first place, as axioms, as self-evident proposals to then be tested by way of a number-theory hypothesis applied to physical phenomena. This issue with Einstein's mathematics is evident by the highly overlooked fact

[12] As stated by the Clay Mathematics Institute [59].

[13] Representing the distribution of energy, momentum, and stress in Einstein's proposed spacetime manifold.

that when curved spacetime is employed as per Einstein's general relativity the flat spacetime calculations become altered and no longer give Newton's correct elliptical calculations. Indeed, Einstein sought to describe the precession of the elliptical perihelion of planets, yet in doing so by his spacetime geometry description as an averaging of point locales with the averaging of infinitesimal Lagrangian time-frames general relativity inevitably distorted the correct elliptical calculations of flat spacetime. It does nonetheless appear that those well-versed in mathematical physics understand this and so are in search of a number theory that can address this issue in the form of resolving the Poincare[14], Hodge, and the Birch and Swinnerton-Dyer[15] conjectures as described in paper 55[16].

Admittedly, it would have been a great surprise to Einstein that his curved 4d spacetime theory would be annexed in the form of a metric expansion of space, a mathematical feature his work did not accommodate for yet was proposed nonetheless by Georges Lema [62] to account for the redshift of stars as another elegant solution. Here, general relativity was in an entirely new context of theoretic congress for which the strict mathematics of curved 4d spacetime was not and is still not available.

The identified underlying problem here is proposed to be exactly what the CMI MP problems have identified as the problem, namely the lack of mathematics for the description of the dimensions by general relativity as a theory of gravity, or rather the absence of properly describing the dimensions in the form of a number theory. The implication here is that the dimensions themselves should ideally be discussed as more fundamental axioms, more fundamental than the idea of mass and motion.

Indeed, the question must be asked, what axiomatically comes first, a dimension or the ideas of mass and motion themselves, of *momentum*? Is the idea of making mass the axiom of choice the idea of mass explaining itself as an axiom should in being self-evident? Or can the dimensions of time and space and their presumed mathematical relationship speak for themselves in a manner more primary than mass itself given the correct description for such?

Simply the question is whether mass and motion grant/emerge the dimensions, or do the dimensions grant/emerge mass and its motion relative to other masses?

In the absence of describing the dimensions sufficiency with a discrete mathematics if not number theory, presenting the case of a worded physical theory of curved 4d spacetime has the effect if not implication that space and time are somehow connected as dimensions, such almost suggests that distance in space may as well represent a passage of time, a self-evident absurdity. In other words, without properly defining the distinction between space and time on a zero-dimensional (point in space and moment in time) level with a discrete mathematics or number theory, then such will undoubtedly result in theoretic problems owing to the poverty of number theory refinement there.

The anatomy of how this theoretic problem has emerged, namely by having made momentum (mass and velocity) an axiom, is proposed as follows:

[14] As stated by the Clay Mathematics Institute [60].

[15] As stated by the Clay Mathematics Institute [61].

[16] [54]: p8-12.

(iii) Velocity connotes a time and space relationship, which in an advanced sense will emerge into a spacetime theory regarding mass as momentum and thence gravity as the process of mass behaving with mass as motion (by force).

(iv) The problem in breaking up the notion of time and space thence becomes apparent as a spacetime field equation, given distance is not equitable to time, especially given mass does not obey how much time passes over a length of space.

(v) Thus, there must exist a disconnect between time and space on a fundamental level, and so therefore axioms ideally need to be forged *separately* for time and space in the form of a number theory if indeed a number theory is to describe the dimensions (as proposed by the CMI MP problems).

How is it possible to resolve this dilemma of properly defining the distinction between time and space if not for departing from mass and motion as axioms? The next question to ask there is how to define time and space as axioms. Fundamentally there, the question should be about their zero-dimensional features, namely if there is such a thing as a dimension of space then how can a dimension of space be defined if it is potentially without limit in being a type of "nothingness", as an infinitude of zero-dimensional points as a general limitless void? Indeed though, how can the idea of *nothing* expand? Fundamentally, what indeed is a point in space and how does one zero-dimensional point relate with another in the absence of properly scaling the size of a point?

The absence of suitably answering such questions is perhaps why mass has been and still is used as the primary axiom ahead of space, simply because mass can move in space and infer an expansion of space by its relative movement *with* if not *within* space. Yet is such the only solution given the problem of using mass and motion as primary axioms and the noted "principle of relativity" incursions? The proposed solution here is to examine number and dimensional theory more closely.

5. Zero and infinite sets

According to Encyclopaedia Britannica [63]:

> *Set theory is a branch of mathematics that studies sets. Sets are a collection of (typically) well-defined objects. Most basically, set theory describes the relationship between objects and whether they are elements (or members) of a given set. Sets are also objects, and thus can be related to each other with symbolized notations representing these set relationships.*

Set theory was initiated by Richard Dedekind and Georg Cantor in the 1870s, Georg Cantor being commonly considered as the founder of set theory as a foundational system for the whole of mathematics in proposing the framework to develop a mathematical theory of infinity. Contemporary

work in set theory addresses a vast array of ideas from the proposed structure of the real number line to the study of the consistency of large cardinals.

Owing to the design structure of set theory, the main problem in using sets for physical theories is that numbers as sets ask how numbers fall into specific categories regarding each other, namely as a way of labelling types of numbers and their association to each other, notably with the idea of infinity being the greatest set of all. In other words, relating numbers to each other in the form of sets adds artificial if not fictitious labels to define the sets in play. The philosopher Ludwig Wittgenstein condemned set theory for being based on the construction of fictitious symbolism. There, Wittgenstein identified mathematics with algorithmic human deduction, highlighting there that the need for a secure foundation for mathematics based on the construction of fictitious symbolism was nonsensical [64]. In all, set theory has repeatedly shown that it has little actual practical application as a pure mathematics for the dimensions of time and space other than being used as a tool for complex and sophisticated mathematical concepts.

The problem therefore with providing a structure to number theory, such as set theory and its associated theories, is that such a structure exists as its own independent construct. That construct, whether sets and associated number relations and associated descriptions of infinity, has been found by zero-dimensional number theory to interfere with a more basic axiom of the dimensions of time and space. In other words, executed here is a replacement of those set theory constructs for the idea of the dimensions themselves, and to then let a new number theory develop based on that new zero-dimensional basis for numbers. Here, two numbers are considered, “0” for a spatial point and “1” for a moment in time.

In short, the basic idea of set theory is the arbitrary formulation of groups of numbers with each other. The question being asked here of set theory is how with set theory is it possible to plot time with space as inter-related number values if time and space represent entirely different dimensional concepts to each other?

As a solution, proposed here is that instead of using fictitious symbolism known to and constructed for set theory, such should be replaced with the dimensions of time and space, namely to:

(vi) Define a point in space mathematically.

(vii) Define a moment in time mathematically.

(viii) Define the overall set of infinite points in space using the idea of a moment in time given sch is where reality exists, namely in the time-domain of *time-now*.

Is it possible to define a point in space? Is it possible to define a moment in time?

Simply, the work of Temporal Mechanics (zero-dimensional logic) shows that the zero-set needs to be examined for both space and time exclusive to each with separate number labels, namely that:

(ix) The dimensions of space and time are mathematically exclusive on a zero-dimensional level.

(x) The non-zero dimensions of time and space emerge from the zero-dimensional basis of time and space.

(xi) It is how the zero-dimensional set of time relates with that of space that results in non-zero dimensions of time and space.

How such is constructed shall now be explained.

6. Dimensions as axioms

Commonly, the dimension (d) of a mathematical space (or object) is informally defined as the minimum number of coordinates needed to specify any point within it. Time is commonly considered as a singular dimension (1d) different if not exclusive to space (3d) whereby unlike space one cannot move freely within it yet be subject to the known constraint of time's arrow. There are several issues with both these definitions which shall be addressed shortly, the basic one being how a point in space as zero-dimensional space can be specified on dimensional space, and whether a moment in time as zero-dimensional time can be real in association to zero-dimensional *and* dimensional space.

An axiom, postulate, or assumption is a statement that is taken to be true, to serve as a premise or starting point for further reasoning and arguments from which other statements are logically derived. Here with the dimensions of time and space the idea is to start from zero-dimensionally, to assume nothing, and to thus define zero-dimensional space and zero-dimensional time. Primarily, here the proposal is to define zero-dimensional time and zero-dimensional space with numbers to then emerge a number theory from the proposed relationship between zero-dimensional space and zero-dimensional time. Proposed here are two key ideas as the basis for the proposed axioms of time and space:

(xii) The logical place to start with the dimension of space is a point in space as zero-dimensional space.

(xiii) The logical place to start with the dimension of time is a moment in time as zero-dimensional time.

The real issue is , "how big is a point and how does one point relate to another?"

The work of zero-dimensional logic identified this as the zero-dimensional (zero-infinity, $0{\sim}\infty$) paradox[17] problem that needs resolving, namely, how to scale a point, and further to such, how to not confuse the mathematical number labelling of zero-dimensional time with zero-dimensional space.

Noting that the idea of redefining an axiom of physics is a challenging thing for any theorist if not reader, consider the following primer questions:

[17] [43]: p1-5; [44]: p4-12; [49]: p7-16.

(xiv) How does one define a point in space, and how big can it be?

(xv) Does the size of the observer of a point matter?

(xvi) Is it necessary to scale the size of a point?

(xvii) Can scales of things change for the reference of the observer without changing the meaning or importance of that of which the scale is being changed?

(xviii) If axioms are self-evident, how is a spatial point self-evident?

(xix) Can dimensional time (time's flow) exist for zero-dimensional space, and if so how, and if not why?

(xx) Is our existence in the time-domain of *time-now* as zero-dimensional time self-evident?

(xxi) Can the idea of a point as an infinitesimal dot as a "0" concept of space, despite existing in a time-domain of *time-now,* be a self-evident thing?

(xxii) Is it possible to suggest that space comprises of an infinite number of points everywhere in the time-domain of *time-now*?

Of course, zero-dimensionality here as zero-dimensional time and zero-dimensional space are dimensionless, purely conceptual, the question is how dimensionality (non-zero) for time and space can emerge. The solution here was forged in recognizing that:

(xxiii) Zero-dimensional time as time that does not pass is not zero-dimensional space.

(xxiv) If zero-dimensional space is the value of "0", zero-dimensional-time as a moment must be another number.

(xxv) Zero-dimensional time as a moment is proposed to represent the value of "1".

(xxvi) How zero-dimensional points relate to each other as dimensionality for space is by introducing two new paradigms for time, not as *time-now* as a moment, yet the ideas of *time-before* and *time-after*, thence creating dimensionality for time.

(xxvii) Dimensionality of time can thence derive dimensionality of space.

Technically, the whole temporal baseline event for points in space as zero-dimensions (0) can only be a singular (1) moment in time. Yet that singular (1) moment in time is proposed to exist *infinitely* anywhere and everywhere points (0) exist. The construction of the spatial dimensions between each point was then questioned. From there was how the "1" value of time relates with all "0" points in space. To achieve that growth of a spatial dimension between points, two new features for time were created, *time-before* and *time-after*.

Wedged nonetheless there must be a description for infinity (∞) given the scaling paradox problem of zero-dimensional time and zero-dimensional space[18]. The following epistemology of the zero-infinity $(0\sim\infty)$ paradox problem in addressing the concept of infinity is worthy of consideration:

[18] [43]: p1-5; [44]: p4-12; [49]: p7-16.

(xxviii) Approaching infinity must *approach* a limit if indeed zero-dimensional time as "1" is associated somehow to zero-dimensional space, as much as $\frac{1}{\infty}$ approaches zero, zero being an infinitesimal limit: $\frac{1}{\infty} \to 0$.

(xxix) The association of zero-dimensional space (points) relating with zero-dimensional time (moments) underwrites an infinite (∞) number of zero-dimensional spatial points partnering with the number "1" as 'time" as a moment for that infinite (∞) number of zero-dimensional points in space.

(xxx) By that partnering of zero-dimensional time and space, zero-dimensional time can be considered as the product, the result, of an infinite number (∞) of spatial points, as that ∞-tethering of zero-dimensional points, as *time-now=1*.

(xxxi) The issue is defining how therefore zero-dimensional time relates with zero-dimensional space as that product, that result, that tethering.

Simply, the proposal here is that to understand ∞ is to understand 0, specifically as ∞ expressed in a fraction with 1, as $\frac{1}{\infty} \to 0$.

The proposal here therefore is to consider extending zero-dimensional time to the time paradigms of *time-before* and *time-after* to explain the relationship between zero-dimensional time and zero-dimensional space, and thence use dimensionality for time to describe how one zero-dimensional point in space relates with another zero-dimensional point in space as dimensional space by the proposed *time-before* and *time-after* tethering. Therefore:

(xxxii) The fundamental proposal here is to define the zero-dimensionality of time and zero-dimensionality of space *ab initio* with numbers that can uphold the need for time and space to be defined as zero-dimensionality separately from each other yet tethered.

The proposal here is to give empty space *as zero-dimensional space* a scaling from zero to infinity and to thence in that process warrant it with dimensions, and that the way to achieve such is to address the zero-infinity ($0 \sim \infty$) paradox problem, namely "how big is a point". Here also, the use of *time-before* with *time-after* prevents time from being locked as a scale to zero-dimensional space. This is achieved by locking the moment as zero-dimensional time with zero-dimensional space and then allowing dimensional time as *time-before* and *time-after* to be fluid with dimensional space, thence giving space real dimensions with time.

This entire process was described in paper 49 [49]:

- *Zero-dimensional number theory* [49]

7. Epistemology by axioms

The general proposal here is one of defining mathematical axioms *ab initio* for the zero-dimensionality of time and space and to then let that system of zero-dimensional time and zero-dimensional space relate with each other. By their proposed relationship new mathematical and dimensional constructs emerge which then relate an interpretation for themselves and how they relate with other emerging number paradigms and associated mathematical and associated equation constructs. Here therefore an epistemology emerges from the ab initio axiomatic constraints for the zero-dimensionality of time and space, the fundamental axioms for zero-dimensionality being the only constraint for the emerging epistemology.

The manner of this proposal needs to consider the following:

(xxxiii) The zero-dimensional number theory and associated formalism is based on axioms as a hypothesis that emerges descriptions that are to be tested.

(xxxiv) As a dimensional description conjecture, such is proposed to execute its proof by being scaled with known physical phenomenal scales (such as the charge of the electron e_c and speed of light c) arriving as a number theory, such in representing by derivation the same equations known for physical phenomena.

Of importance to also note is that the zero-dimensional number theory is not abiding by other works on dimensionality such as Einstein's spacetime theories (special and general relativity); this zero-dimensional number theory is the first theory of its kind that uses a number theory annexing the zero-dimensions of both space *and* time.

By this "epistemology by axioms" approach, what really needed to be addressed there was the idea of how to define basic axioms for time and space, and so the idea of the philosophy of not just numbers yet the dimensions had to be addressed. Indeed, numbers can only be calculated *based on* a mental facility that one has, to then relate concepts calculated in one's mind to physical reality. Thus, the process that ensued was one of:

(xxxv) *zero-dimensional philosophy → zero-dimensional number theory → zero-dimensional physical theory.*

This process was executed with papers 48-55 [48-55], namely *zero-dimensional philosophy* (paper 48 [48]) ***and then*** *zero-dimensional number theory* (paper 49 [49]), following volume 8 (papers 50-56 [50-55], 56 being this paper) for the *zero-dimensional physical theory* series of papers.

Ultimately, a key human quest appears to involve calculating reality with numbers. Despite a moment of time existing everywhere and anywhere, and with each moment of time a point in space existing anywhere and everywhere, the human task is calculating how all that works. Paper 48 [48] describes that process of numbers as different numbers labelling the proposed zero-dimensionality of time and space so as not to lead to the contradiction of *time=space*. For that contradiction to be avoided

(as much as moving a length in time is not a second), two basic unique mathematical values needed to be tagged to the ideas of a moment in time and point in space. The conjecture was and still is to use 1 for a moment in time and 0 for a point in space. There, one moment in space compared to another moment in space is still separated in time by 0 as $1 - 1 = 0$.

The interesting feature to all of this is that in introducing *time-before* and *time-after* with *time-now* (moment), space is then able to become dimensionally relevant from zero-dimensionality. By such, the 3 dimensions of space are derived, more specifically are capped there at the value of 3, as presented in papers 44 [44][19] and 49 [49][20].

In short, the work of Temporal Mechanics (zero-dimensional logic) generates words based on known and continually well researched ideas of physical phenomena as an epistemology to the number relationships that result as equations from the proposed zero-dimensional axioms, much like mathematical hieroglyphs as primers that need to be deciphered into contemporary physics language. The issue to now ask is what are the implications of the number theory solutions being related as dimensions. Although the papers of volume 8 of Temporal Mechanics have described these ideas, here shall now be specific accounts of *timespace* number paradigms that can be derived from this number theory pointing to physical phenomenal equations and associated relative scales.

8. The time and space equations

The temporal components for each dimension of space were central to the derived Fibonacci (golden ratio) *time equation*. The golden ratio time equation $t_B + 1 = t_A$ (where $t_B^2 = t_A$) then proposed an analogous Euler identity equation in the form of $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$, as per papers 44[21] and 49[22]:

The fuller number theory context of the time and space equations was presented in paper 49 [49] after dedicating papers 45-47 [45-47] on giving the Temporal Mechanics series of papers (1-43) [1-43] a full review of the time and space equations of paper 44 [44].

These two equations were then used to resolve the Riemann hypothesis, simply by using the golden ratio in a Euclidean geometric manner to describe the number properties of the dimensions, deriving 3 spatial dimensions as a maximum, and thence applying the golden ratio time equation to Euler's identity as the proposed analogous space equation. There, the "0" Riemann results for the Riemann zeta function are not only essential to mapping the primes from 0 to ∞, yet how time as a moment (1) relates with space as a point (0).

Once again, labelling time as "1" as a moment for any potential "0" point in space is important because here distance between spatial points does not represent a change in value for time, otherwise one finds themselves in Einstein's general relativity problem of how to mathematically describe space

[19] [44]: p8-12.

[20] [49]: p10-16, (xliv)-(lxxv).

[21] [44]: p8-12.

[22] [49]: p10-16, (xliv)-(lxxv).

and time as one, a problem the CMI has sought to address with its MP problem list. Thus, fundamentally in paper 49 [49] was shown how the time and space equations relate via a Riemann zeta function pathway, thence proposing a full mapping of the primes in the context of a description for dimensional (spatial) infinity. From there the following paper described how to scale the number theory to physical phenomena. There, paper 50 [50] presented that process of scaling the dimensional number theory to physical phenomena:

- *The zero-dimensional physical theory (I): solving reality's puzzle* [50].

Paper 51 [51] then presented how the dimensional number theory and thence physical theory is limited by fundamental scaling constraints of measurement, underwriting a solution to the idea of turbulence and the elliptical (perihelion) precession orbits of planets:

- *The zero-dimensional physical theory (II): causality, locality, and indeterminacy* [51].

Paper 52 [52] then proposed how that physical theory can be graphed as an observable reality with all the correct observed scales and known physical constants in play:

- *The zero-dimensional physical theory (III): graphing time and space* [52].

Following such, paper 53 [53] presented a scheme of proving this new theory in a way the axioms and thence construction of Einstein's 4d spacetime cannot:

- *The zero-dimensional physical theory (IV): zero-point field dynamics* [53].

Paper 54 [54] then approached the idea of information, energy, and intelligence in approaching a basis for resolving the *P v NP* problem:

- *The zero-dimensional physical theory (V): information, energy, efficiency, and intelligence* [54].

Thus, paper 48 [48] presented the zero-dimensional philosophy, paper 49 [49] then presented the number theory as a hypothesis, and paper 50 [50] then scaled that number theory to physical reality as an initial process of proof. Following such, paper 51 [51] presented the problems with identifying time and space dimensional locales, and then paper 52 [52] graphed zero points and associated features with time to arrive at the dimensional graphing of time and space. Paper 53 [53] then took the added step of proposing experimental proof which general relativity, quantum mechanics, and the standard model are unable to propose by their design limitations. The graphing of *timespace* derived in paper 52 [52] was then accompanied with a description of the limitation of that graphing in paper 54 [54], and then applied to the CMI MP problems in paper 55 [54] offering proposed number theory solutions to not

only the 7 CMI MP problems, yet solutions to Fermat's conjecture (dimensional solution), Goldbach's conjecture, the twin prime problem, and the Beal conjecture:

- *The zero-dimensional physical theory (VI): charting the Clay Mathematics Institute Millennium Prize problems and Beal conjecture* [54]

To also note is that the time equation $t_B + 1 = t_A$ has an inbuilt scaling spatial feature as the golden ratio variables φ and $\frac{-1}{\varphi}$ highlighted to form the basis for the dipolar EM, despite EM always being in play with the proposed gravitational space equation of $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$. The question is how and by what number paradigm processes, as shall be now discovered.

9. The 10 *timespace* paradigm

The feature with the time equation $t_B + 1 = t_A$ (where $t_B^2 = t_A$) is that t_B as a quadratic solution are φ and $\frac{-1}{\varphi}$. Therefore, when t_B adapts to $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$ a new process needs to come into play for both features of t_B to account for an $e^{i\pi}$ feature, namely the mathematical product $\varphi \cdot \frac{-1}{\varphi} = -1$. There, the first step was determining how the time equation as a φ and $\frac{-1}{\varphi}$ dimensional function in space arrives at a value of π. Clearly both features of the golden ratio are in play, yet how? This was approached by applying each feature of the golden ratio according to the abridged time and space equation $\varphi \cdot \frac{-1}{\varphi}(t_B) + 1(t_N 1) = 0(t_A)$, see link[23].

As another way of describing such, the π-feature is a proposed requirement for the time equation adapting to space if indeed from a point in 3d space uniform *timespace* as the derived time equation wave function extends outwards as a spherical front.

To achieve π, the focus on the time equation required asking how such can be achieved. It was found the only way to achieve the π requirement was to consider a 10-factorial for a unit wave function according to that 10-factorial derivation in paper 52 [52]. Although this was initially derived in paper 2 [2][24], paper 52 [52][25] gave a fuller context of the utility of this 10-factorial time equation requirement as a mapping of the *timespace* wave function.

This 10-factorial (as the proposed 10 *timespace* paradigm) feature is also curious in representing the addition of the first three primes, primes derived by the Riemann zeta function using the golden ratio and Euler's equation, as presented in paper 49 [49][26].

[23] [49]: p15, eq8.

[24] [2]: p14, eq1-6.

[25] [52]: p11-24, eq7-10.

[26] [49]: p33-34.

Therefore, the 10 *timespace* paradigm is derived on two key fronts, namely for the time equation $t_B + 1 = t_A$ and space equation $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$, thence setting itself as a key *timespace* number paradigm:

(xxxvi) Time equation agenda: establishing a *space equation* description for π.

(xxxvii) Space equation agenda: establish a *time equation* sequence of the first three primes, presumably one for each dimension of space, as shall be described ahead.

In short, the 10 *timespace* paradigm presents itself as a key link between the time equation $t_B + 1 = t_A$ and space equation $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ that would undoubtedly feature in any emerging number theory equations by the association of the time equation with the space equation as presented in paper 36 [36][27]. There in the work of Temporal Mechanics the 10 *timespace* paradigm is shown to be intrinsic to the following derivations:

(xxxviii) The Planck scale for fundamental mass[28].

(xxxix) The value of the electron mass[29].

(xl) The gravitational constant[30].

In short, the 10 *timespace* paradigm forms a link between the time equation $t_B + 1 = t_A$ and space equation $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$. Are there number paradigms specific to the time equation and space equation other than the golden ratio for the time equation and Euler's identity for the space equation?

10. The 12 *timespace* paradigm

In addressing the question of a number paradigm intrinsic to the time equation $t_B + 1 = t_A$ other than the golden ratio values of φ and $\frac{-1}{\varphi}$, the idea of how the time equation relates with the space equation needs reconsideration. Here, note needs to be made of paper 52 [52] describing that association as the equation $(t_B \cdot -2\sqrt{3}) + 1 = \pi$, see link[31].

Following that description, the following are the key equations of the temporal wave function as from paper 2 [2][32] and paper 52 [52][33]:

[27] [36]: p6-18.

[28] [36]: p10-18.

[29] [36]: p14-18

[30] [36]: p18-21.

[31] [52]: p13, eq6.

[32] ([2]: p10-12, eq3-6.

[33] [52]: p20-23, eq7-10.

$$(\frac{-1}{\varphi}\cdot -2\sqrt{3}) + 1 = 3.140919 \quad (1.)$$

$$(\varphi\cdot -2\sqrt{3}) + 1 = -4.605020 \quad (2.)$$

$$(\frac{-1}{\varphi}\cdot -2\sqrt{3})^2 = \frac{12}{\varphi^2} = 4.583533 \quad (3.)$$

$$\left(\varphi\cdot -2\sqrt{3}\right)^2 = 12\varphi^2 = 31.416253\ (\sim 10\,\pi\,) \quad (4.)$$

Of note there is the temporal *electric moment* equation as equation 1, and the *magnetic dipole moment* equation as equation 2. Furthermore, of note there is the 12-factorial integral to the 10-factorial of the time equation for equation 4, namely in satisfying the condition of π, and thus intrinsic to the proposed atomic scale, as presented in paper 52 [52][34].

Paper 52 [52] offers the greater context description for the zero-dimensional number theory, yet to be noted is how equations 1-4 have nonetheless been carried through paper 2 [2] onwards. Through the papers, the 12-factorial has been shown to be integral in the following contexts:

(xli) How space works with time regarding a basic background feature of mass and energy [5][35][37][36].

(xlii) A maximum proposed redshift effect of light in the electron degeneracy zone creating the phenomena of the redshift of stars [13][37][32][38][33][39].

Given how this 12-factorial is intrinsic to the time equation, and given the space equation has its t_B value as the value of -1 as $e^{i\pi}$, it would be logical to therefore suggest that intrinsic to the space equation's $e^{i\pi}$ value of -1 would be a value of a factor that when factored with 12 results in -1. This value would be $\frac{-1}{12}$. How though is the $\frac{-1}{12}$ factor derived and what significance is it to physical theory equations and associated phenomena?

11. The $\frac{-1}{12}$ *timespace* paradigm

To find the mysterious $\frac{-1}{12}$ factor is to look more closely into the $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ equation, specifically how this equation relates to the Riemann zeta function. The idea here is to find a way at arriving at the value of $\frac{-1}{12}$ using the Riemann zeta function. There, it is found that the Riemann zeta

[34] [52]: p6-31, fig1-17.

[35] [5]: p2-11.

[36] [37]: p14-23.

[37] [13]: p9-13.

[38] [32]: p8-20.

[39] [33]: p8-18.

function can be used in a rather unique way in achieving this result as per the *Ramanujan infinite series summation* [65][66][67].

The logic behind the Ramanujan infinite series summation is by creating an infinite addition series of all the natural numbers, yet by doing such with the Euler zeta function and then adapting this to the Riemann zeta function.

To be noted is that indeed the infinite sum of all the natural numbers is not equal to $\frac{-1}{12}$. Yet the point of the Ramanujan infinite series summation is to highlight how the Euler zeta function can be expressed by the Riemann zeta function (as per complex analysis of the Euler zeta function) by extending the definition of the Euler zeta function to numbers $x \leq 1$ in a way that gives finite values. Mathematically this works by defining a new function, say $\zeta(x)$ so that for $x > 1$ the following becomes evident:

$$\zeta(x) = S(x) = 1 + \frac{1}{2^x} + \frac{1}{3^x} + \frac{1}{4^x} \ldots \tag{5.}$$

There, as per analytic continuation for $x \leq 1$, the function $\zeta(x)$ has finite values as the *Riemann zeta function*. This was presented in paper 49 [49][40].

Simply, by this method there exists a new function as $\zeta(s)$ as the Riemann zeta function that is analogous to the Euler zeta function $S(x)$ for values $x > 1$. Yet, when values $x \leq 1$ are inputted the zeta function gives a finite output. More interestingly is that when $x = -1$ is inputted into the zeta function the following results:

$$\zeta(-1) = \frac{-1}{12} \tag{6.}$$

The obvious anomaly there is by immediately thinking that if $\zeta(x) = S(x)$ for $x = -1$, then the following must be true:

$$S(-1) = 1 + 2 + 3 + 4 \ldots = \zeta(-1) = \frac{-1}{12} \tag{7.}$$

As a raw mathematics this is indeed *untrue* unless for using:

(xliii) a dimensional application, namely the zero-dimensional application for time and space,

(xliv) to thence result in the two primary equations of $t_B + 1 = t_A$ for time and $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$ for space,

(xlv) equations which can then uphold the Riemann zeta function [49][41],

(xlvi) and then by deduction confirm $e^{i\pi} = -1$,

[40] [49]: p18-24.

[41] [49]: p18-24.

(xlvii) and thence by $\varphi \cdot \frac{-1}{\varphi} = -1$ a $\frac{-1}{12}$ result for the Ramanujan summation can indeed be confirmed as being zero-dimensionally and thence dimensionally relevant.

The next question to ask is how this $\frac{-1}{12}$ factor as a $\frac{-1}{12}$ *timespace* number paradigm executes itself with a physical theory and associated physical phenomenal descriptors in the form of equations and equation constants.

The interpretation here is that owing to the solution to the $0{\sim}\infty$ paradox problem, specifically in deriving an infinite sum by this Euler→Riemann zeta function process, then the following are true:

(xlviii) every potential point in space is associated to this $\frac{-1}{12}$ result,

(xlix) and thus the $\frac{-1}{12}$ result would be intrinsic to a feature of empty zero-point (zero-dimensional) space,

(l) and thus, as paper 50 [50] finds, the $\frac{-1}{12}$ result would be intrinsic to a feature of presumably either gravity or zero-point energy if not both.

Is there evidence for such?

Contemporary physics theory has shown that the Ramanujan summation is in fact a way of giving mathematical description to the Casimir effect [68]. There, according to classical physics, there shouldn't be any net force acting between closely align parallel facing plates. Conversely, in using quantum calculations, the total energy density between the two plates has the following infinite sum apply:

$$1 + 8 + 27 + 64 + \cdots \tag{8.}$$

Interestingly, this infinite sum is the same series function as what results by inputting the value $x = -3$ into the Euler zeta function:

$$S(-3) = 1 + \frac{1}{2^{-3}} + \frac{1}{3^{-3}} + \frac{1}{4^{-3}} \ldots = 1 + 8 + 27 + 64 \ldots \tag{9.}$$

This though is a divergent series which therefore implies an infinite value and thence energy density, a value which is contradictory to the known phenomenal features of Casimir effect. Yet, in assuming that the infinite sum can be executed by the Riemann zeta function as opposed to the Euler zeta function for $x = -3$, a finite value and thence proposed energy density results. That finite value thence points to the idea of an *attractive* force existing between two closely aligned opposing plates despite classical physics considering that there should be no force between two closely aligned opposing plates.

Physics research confirms the Casimir effect, namely that it corresponded to an energy density equal to $\zeta(-3)$. Note here the importance of -3 as a value confirming by default, if not by proxy, that this effect happens in "3" dimensions of space. This was derived in paper 49 [49], namely the 3 dimensions of space, there by such offering proof for Fermat's conjecture in the context of providing a solution to the Riemann hypothesis, also presenting a proposed solution to the Beal conjecture in paper 55 [54][42].

Temporal Mechanics has found the vacuum energy is indeed derived using a $\frac{-1}{12}$-factor, yet the utility of the $\frac{-1}{12}$-factor was considered as a normal variant of the already derived 12-factor. Here though the $\frac{-1}{12}$-factor is derived on this more fundamental Riemann zeta function level.

Note with paper 37, page 28:

> *The 12-factorial therefore ($\varphi^2 > 12\varphi^2$) became considered as a mass-gravity feature, or more precisely, a particle-formation feature, and thus enthalpic.*
>
> *The following thus can be considered for the process:*
>
> $\varphi^2 \rightarrow 12\varphi^2 : ENTHALPIC$ *(M_{MG} building as a 12-factorial)*
> $12\varphi^2 \rightarrow \varphi^2 : ENTROPIC$ *(e_c building as a $\frac{1}{12}$-factorial)*
>
> *In all, the proposal is for the "$\varphi^2 > 12\varphi^2 > \varphi^2 etc$" cycle to represent an underlying entropy-enthalpy component of a general energy equation relevant to the $CMBR$. The question is how this relates to an isotropic $CMBR$.*

More correctly, there the entropic component should be $\frac{-1}{12}$ and not $\frac{1}{12}$ given the enthalpic component is a $+12$-factor. Here now the $\frac{-1}{12}$-factor can be understood correctly. Most significant to note is that the modelling for what was considered as the $\frac{1}{12}$ factor describes the vacuum energy in alliance with a derived value for the $CMBR$ as presented in paper 14 [14][43], thence also resolving Einstein's cosmological constant problem as described there. That error of Einstein's cosmological constant problem was further demonstrated in paper 45 [45][44].

Although the quantum descriptors used by Temporal Mechanics are different to that of quantum mechanics given the more fundamental zero-dimensional basis of the theoretic formulation of Temporal Mechanics, the Temporal Mechanics description of quantum phenomena still concurs with the physical phenomenal findings of quantum mechanics. With Temporal Mechanics though, the Casimir effect is proposed to be due to a $12\varphi^2 \rightarrow \varphi^2$process that Temporal Mechanics had not yet derived in paper 37 [37] yet was nonetheless proposed to exist as a $\frac{1}{12}$ entropic feature and thence force effect. More

[42] [54]: p25-26.

[43] [14]: p8-13, eq1-17.

[44] [45]: p27-32, eq1-2.

fundamentally now with this zero-dimensional time and space equation basis, the $\frac{-1}{12}$-factor is the proposed way the time equation (as EM) links with the space equation (as gravity) to then account for this Casimir effect phenomenon.

Simply, as derived by Temporal Mechanics, how the 12-factor and $\frac{-1}{12}$-factor relate together (-1) as 3d *timespace* is what is proposed to be an EM and mass zero-point energy spatial entanglement force, a driving pre-force (*time-before*) of gravity as $e^{i\pi} = -1$. Thus, although Casimir proposed and identified an effect regarding vacuum energy, his description of it was not complete. The new question to ask now with the work of Temporal Mechanics, especially given the Riemann zeta function was demonstrated to map the primes with the $t_B + 1 = t_A$ time equation and $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$ space equation, is how the idea of a prime number relates with *timespace* and if there is a new number paradigm to be uncovered there.

12. The S_0 *timespace* paradigm

In keeping the mapping of the primes from papers 44 [44][45] and 49 [49][46] relevant to the context of the derived 3d *timespace*, the following was proposed in paper 49 [49][47]:

> *Of note is how the idea of prime numbers[48] represent a feature of indivisibility as a value, namely a prime number being divisible by itself or 1, and how such a feature is instrumental in deriving the mass of the lightest "non-divisible" particle, the neutrino, as presented initially in paper 35 ([35]: p27-28) and thence further described in paper 44 ([44]: p20-22) as per the proposed prime number space-factor S_0 which is facilitated in deriving the mass of the lightest particle pairs (neutrino and antineutrino) from the Planck length lP.*
>
> *There, the prime feature of S_0 represents the addition of the first three primes (cubed) divided by 3, namely equations 1-2 from paper 35 ([35]: p27-28, eq1-2):*

$$S_0 = \frac{2^3+3^3+5^3}{3} = 53.\dot{3} \qquad \textit{([35]: p27, eq.1)}$$

$$\frac{lP}{S_0} = 3.03048 \cdot 10^{-37}\ kg \qquad \textit{([35]: p28, eq.2)}$$

[45] [44]: p14-19, eq13-23.

[46] [49]: p18-24, eq13-23.

[47] [49]: p33-35

[48] Noting how prime numbers were derived from the zero-dimensional number theory involving the dimensional objects of not just space yet also time, time being the proposed crib of mathematical operators, as described in sections 3-6 of paper 49 [49] .

Paper 44 then proposed that given the primes 2, 3, and 5 are annexed in an algorithm for space in regard to mass, as the equation $S_0 = \frac{2^3+3^3+5^3}{3} = 53.\dot{3}$ *([35]: p27, eq.1) and its relationship to elementary mass on the Planck scale* $\frac{lP}{S_0} = 3.03048 \cdot 10^{-37}\ kg$ *([35]: p28, eq.2), then it would follow that every prime number over 5 (namely 7 onwards) would be the result of the addition of any 3 of all the primes:*

$1 + 1 = 2$ *(at fault in requiring 1)*
$1 + 1 + 1 = 3$ *(at fault in requiring 1)*
$1 + 2 + 2 = 5$ *(at fault in requiring 1)*
$2 + 2 + 3 =$*7*
$3 + 3 + 5 = 11$
$3 + 3 + 7 = 13$
$3 + 3 + 13 = 19$ *etc*

The implication there is the uniqueness of the first three primes as:

(cxvi) *Arbitrating by default the particle phenomenal consequence of* $S_0 = \frac{2^3+3^3+5^3}{3} = 53.\dot{3}$.

(cxvii) *Such, as the most fundamental feature of an elementary particle's mass (and thus gravity), the Planck length (and thus* EM*), and space.*

Such is an entirely logical thing to consider, namely the relationship of primes (as indivisible numbers) guiding the fundamental relationship of physical phenomena (gravity and EM*) in space for indivisible particles, a derived and yet axial correlation between this zero-dimensional number theory and physical phenomena.*

Here, the idea of a prime number as an ***indivisible number*** (other than by itself and 1) was relevant to the smallest possible and thence ***indivisible*** particle, namely the neutrino, as presented in paper 35 [35][49]. One thing that was missing from the S_0 equation was how it would relate to the addition of its own prime family, namely $2 + 3 + 5 = 10$, as "10". There Temporal Mechanics finds that $\frac{S_0}{10} = 12 \cdot (\frac{2}{3})^2$. The number product of $12 \cdot (\frac{2}{3})^2$ featured in the initial description of the gravity constant G according to the equation $G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{21.8}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG} = 6.67355 \cdot 10^{-11}\ kg\ m^3\ s^{-3}$ [50]. That equation can now be written as follows:

$$G = \frac{S_0}{10} \cdot \pi(\frac{21.8}{22})^2 \cdot c^3 \cdot M_{MG} \qquad (10.)$$

[49] [35]: p27-28, eq1-2.

[50] [35]: p39, eq3.

To note therefore is how prime numbers as per $\frac{S_0}{10}$ relate specifically to the value of the lightest mass (M_{MG}), the proposed mass gap, and thence gravitational constant (G), together with the fine structure constant value α (relayed by $\frac{21.8}{22}$)[51] expressed as a circle surface area $\pi(\frac{21.8}{22})^2$, and c. Note also, the derivation of the classical Newtonian equation for gravity with the derived G constant in paper 40 [40][52] and the associated derivation of cosmic radiation particle radius[53] and speed[54].

13. Physical emergence

The proposed emergence of physical phenomena from the dimensional number theory platform is presented throughout papers 50-55 [55-55]. Here in this paper though key dimensional number paradigms are proposed to exist relevant to the emergence of physical phenomena, namely φ and $\frac{-1}{\varphi}$, π, e, 12, $\frac{-1}{12}$, 10, and S_0.

Central to note there is:

(li) φ and $\frac{-1}{\varphi}$ for the time equation,

(lii) e and π for the space equation,

(liii) 12 for the time equation,

(liv) $\frac{-1}{12}$ for the space equation,

(lv) 10 for the time and space equations,

(lvi) and S_0 for the emergence of mass and thence gravity.

Those numbers in association with the dimensions represent a hub, or rather a number-matrix, that by their association are proposed to emerge physical phenomena in line with known relative scales, equations, and equation constants, particularly including the fine structure constant (α)[55], Planck's constant (h)[56], gravitational constant (G)[57], Coulomb constant (k_e)[58], Avogadro's number (N_A)[59], and Boltzmann constant (k_B)[60].

[51] [39]: p46-48.

[52] [40]: p20-21, eq4-10.

[53] [40]: p23, eq12-13.

[54] [40]: p25-26, eq14.

[55] [39]: p46-52; [52]: p20-31.

[56] [39]: p52-58.

[57] [39]: p41-46, eq9-21.

[58] [39]: p59, eq36.

[59] [4]: p12, eq6.

[60] [14]: p25-26, eq13-17; [37]: p26; [39]: p53-59

Fundamental there is that for every point in space there represents the $\frac{-1}{12}$ infinite summation code describing zero-point energy, an energy basis that would on the surface be incorrectly translated as an infinite amount energy, yet owing to the construction of the dimensions each point in space being capped a certain way describing the feature of zero-point energy as *entropic gravity*[61]. In short, every point in space in the context of a moment in time is proposed to represent a resolved $0{\sim}\infty$ paradox problem by way of the derived infinite summation code.

Consider figure 1 summarizing this process:

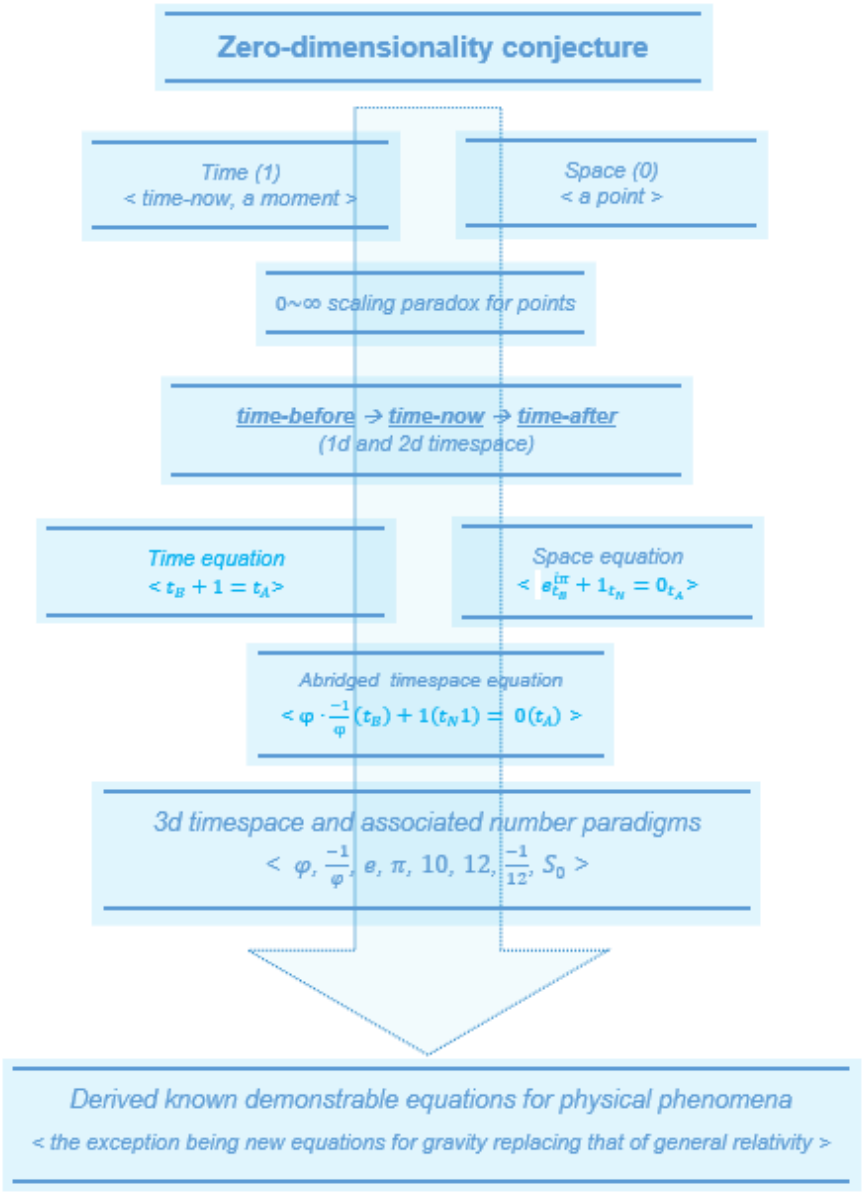

Figure 1: A hierarchical flow-chart from the zero-dimensionality conjecture leading to the proposed emergence of physical phenomena and associated relative scales.

[61] [42]: p24-56; [47]: p15-19; [53]: p2-8.

The primary process of that emergence of known demonstrable equations and associated constants is how the time equation $t_B + 1 = t_A$ relates with the space equation $e_{t_B}^{i\pi} + 1_{t_N} = 0_{t_A}$ given the derived dimensional limitation of space (3-dimensions) and those associated temporal dimensional features. Such is proposed to derive the atomic scale as presented in paper 52 [52][62].

There with the atomic scale and the associated number features of π, 10, and 12 is the associated Riemann zeta function infinite scaling for the spatial dimensions as $\frac{-1}{12}$ (space) paradigm despite appearing anomalous.

The idea of EM, mass, and gravity was thence derived in paper 52 [52] and followed up in paper 53 [53] with 3 basic mechanisms of proposed proof[63].

To note is how a 3d *timespace* reality with a maximum mass was derived in using these number paradigms and what the shape of that maximum mass *timespace* reality would detail, deriving the electron degeneracy neutrino, gravity constant (G), fine structure constant (α), Planck constant (h), and the phenomenal values of Sol, as per paper 39 [39].

Conversely, to note is how mass and motion as a lens of study through the years of contemporary physics formulation has evolved in the following way:

(lvii) The basic measurements of mass and motion in space lead to conjectures and hypothesis.

(lviii) Those hypotheses ideally require bases as axioms as self-evident conjectures.

(lix) The axioms and hypotheses uphold proposed equations and associated physical theory descriptions.

(lx) The physical theory descriptions then guide the measurements to further support the descriptions and thence physical theories.

(lxi) If the new measurements don't exactly fit the descriptions, then the axioms if not physical theory description may need to be brought into question.

The result of such has led contemporary physics to the ΛCDM physical theory model of reality. There though, the actual search is on for a number theory to support the ΛCDM physical theory. This was highlighted to be the role of the CMI MP problems, namely that there is no real mathematics available for the general relativity physical theory proposal underlying the ΛCDM physical theory model thence requiring the establishment of that number theory. Shown though with the approach of the CMI MP problem list is that *the process of dimensional construction for points in space and moments in time for the ΛCDM physical theory model of reality is flawed if not entirely absent, as with the idea of infinity.*

In other words, the idea of mass and motion as axioms in contemporary physics has been treated as axioms and not an emergence, thence overlooking the definition of the zero-dimensionality of time and space, together with overlooking a dimensionally relevant definition for infinity.

[62] [52]: p20-31.

[63] [53]: p8-25, fig2-6.

Here with Temporal Mechanics a zero-dimensional axiomatic base is considered to then derive the ideas of motion and mass. By such, the zero-dimensional number theory proposes each dimension of space has 3 quasi-dimensions of time (*time-before*, *time-now*, and *time-after*) implicit to an arrow of time for each dimension of space, thence arriving at 3 dimensions of time for the 3 dimensions of space, one dimension of time for each dimension of space, hence 1d, 2d, and 3d *timespace*. This is described in paper 52 [52][64] where the fluctuations of EM in space are then derived, thence the fine structure constant (α), and thence the zero-point energy level and its function with gravity[65].

Throughout the work of Temporal Mechanics, 1d, 2d, and 3d *timespace are only referred to*, never higher number dimensions. In fact, the three time-domains (*time-before*, *time-now*, *time-after*) form an arrow of time for each dimension of space, namely how 3d space is the true dimensional structure that 1d time via the time-domains effects itself through.

In the context of physicality and the associated dimensions there thus exists the basis of labelling the idea of a point in space and moment in time, the exception being that from that basis is emerged a scaling relevant to the real dimensions of space and associated dimensions of time. Simply, space is measured as distance regarding real dimensions from one nominated point to another, and time is measured as the dimensional relativity between points in space in the context of t_N1 as the equation $t_N1 - t_N1 = 0$, t_N1 being one point in space, thence deriving a limited and constant speed of EM transmission in empty space as c between any two points. There, time emerges as a measurement in the context of physicality in the following manner as derived in paper 45 [45][66]:

(lxii) Time as a t_N1 time-point as a momentary time-point for zero-dimensional space.

(lxiii) The general direction of time as the time-equation $t_B + t_N1 = t_A$, namely a forward direction of time utilizing the datum-reference of t_N1.

(lxiv) Time as $t_N1 - t_N1 = 0$ time-points as time *at the speed of transmission between* t_N1 *time-points*.

(lxv) The resultant temporal relativity and associated temporal doppler effects ([30]: p11-15) of objects in 3d *timespace* in the context of c where at c *time=0* (xvii) (namely a 0 *passage* of time).

(lxvi) The standard observed *passage* of time being due to (lxiii), namely the incremental cycles of the temporal wave function as *timespace* ([2]: p3-10):

a. Specifically, as the on-off feature of the temporal wave function as the increment between a t_N1 time-point moment/loop and the absolute absence of a t_N1 time-point moment/loop.

b. Such, owing to the need to disallow *time-after→time-before* given (lxiii) is a *time-forward* equation by its design ([43]: p2-8).

[64] [52]: p5-11.

[65] [52]: p20-31; [52]: p31-45.

[66] [45]: p12.

Therefore, although time can be observed to contract and lengthen owing to the relative motion of bodies (lxv), c is always a constant where at c *time=0* as a *passage* of time (lxiv), and yet the moment is still a valid and non-0 concept for time as $t_N 1$ (lxii). Thus, although Einstein was correct in considering c as a constant where at c time approaches the value of 0 (namely time not passing at c), together with attempting to uphold the principle of relativity, Einstein's spacetime (where time contributes to the curvature of space as gravity) fails to define the fundamental basis of time itself. With Temporal mechanics conversely, dimensionality must always still exist *in the context of a moment* (zero-dimensional time) upon the basis of the zero-dimensionality of space (points). In other words, there's a moment happening right now on Mars, on the sun, anywhere, the problem being that between each moment is the relativity of zero-dimensional points and how one zero-dimensional point location can relate to another. To resolve that problem the idea of time beyond a moment is required, thence requiring the ideas of *time-before* and *time-after* as quasi-dimensions of time, thence deriving the arrow of time, and thence also deriving the dimensions of space, EM, "*c*" and why *at* "*c*" time does not pass (still a moment), and of course deriving mass.

The favourable feature of the proposal of ***time as a moment everywhere***[67] *is that such is proposed to represent the basis for a force that has escaped the attention of physics.* To *know what* that fundamental force is and *how* it works is to head to the *dimensions as axioms* and ***not*** *mass/momentum as the axiom*. This force is proposed to underwrite the idea of not just EM *entanglement* yet gravitational entanglement[68]. More interesting is that this fundamental force is based on numbers, and not just numbers, yet *primes* and *irrationals (golden ratio and Euler's number).* It is interesting Sir Isaac Newton made exact calculations for gravity in thinking gravity to be an immediate field force exempt from "c" except for not describing the *precession* of the perihelion of planets. More interesting is that Einstein's description for the precession of Mercury was mostly in words with a limited albeit entirely abstract mathematics. By such, it is little wonder that there thence became the need for the CMI (or comparable agency) to ask the question of what 4d spacetime *mathematically is and how such relates to infinity* [54].

As has been shown here though, the idea of getting close to the true meaning of gravity without a proper trudging of numbers from 0 to ∞, and thence a proper and full solution to the Riemann hypothesis, can only be impossible.

14. The challenges

With this new dimensional number theory basis of formulating a physical theory ripe with equations that can be verified by known physical research, the question is asked regarding what this new zero-dimensional number theory approach can offer physics. This question was the theme of paper 53 [53] where three new experiments were proposed to test the validity of this zero-dimensional number

[67] *Despite "c" and that limitation of "c".*

[68] [47]: p15-19; [53]: p2-8.

theory approach to physical theory formulation, experiments constructed in a way to highlight what contemporary physical theories cannot propose simply owing to their mass-momentum design basis and not zero-dimensional zero-point design basis. Those three experiment proposals and their specifications were discussed and their implications to contemporary physics theories[69] outlined.

The idea of zero-point energy, gravity, and thence quantum gravity is the forefront of physics research and theoretic development today. So too is the search for the mathematics behind such. This search for such a mathematics is evident with the current list of what are considered globally as the most difficult problems in number and set theory as forwarded to the public by the CMI in their MP problem list offering. This was discussed in paper 55 [54][70]. There, the individual logic of those questions was examined for their likelihood of serving a solution basis, all of such thence compared to the zero-dimensional logic basis. There in that paper [54] solutions to those problems were offered from the zero-dimensional logic basis. Following that paper, namely here with this paper, dimensional number paradigms have been identified that demonstrate an underlying and interconnected mathematics and associated set of equations to 3d *timespace* paralleling perfectly with known physical phenomenal traits those equations are related to as a dimensional and thence emerging physical phenomenal descriptions.

Although the work of Temporal Mechanics spans 8 volumes comprising of 7 papers per volume, currently totalling 56 papers, more theoretic work is proposed along the following lines:

(lxvii) Forming dimensional number paradigm and associated equation links with the already derived equations in the current series of papers.

(lxviii) Presenting the case for the newly identified “electron degeneracy phenomena” and how that relates with astrophysical phenomena as presented in paper 42 [42][71].

(lxix) Thence presenting a new cosmological model not dependent on general relativity and associated ΛCDM big bang.

There, Temporal Mechanics has delivered the basis for a more practical solar system based cosmological model that can present descriptions for astrophysical phenomena with an underlying number theory that general relativity is devoid of. By such, the added challenge exists regarding the highly disruptive nature of Temporal Mechanics, namely as to how current research can integrate Temporal Mechanics into its own specific lines of research. Further information of the work of Temporal Mechanics can be gained from its official website: https://www.xemdir.com/.

[69] [54]: p8-27.

[70] [54]: p1-16.

[71] [42]: p7-55.

15. In summary

In summary, the following has been proposed:

(lxx) Labelling the dimensions of time and space with numbers as a process of abstraction can only be a *conjecture*, a proposal, to be tested.

(lxxi) *Conjecture* requires the proposal of what are considered as scripted albeit self-evident axioms.

(lxxii) There (lxxi), the question is asked if or not it is plausible to consider zero-dimensional space as a point, yet further to that if or not it is plausible to ascribe the number "0" to a point in any countable dimension.

(lxxiii) There (lxxii), the question is also asked as to how to define zero-dimensional time, given time is not space.

(lxxiv) Thence, the question is how to label zero-dimensional time with a number in forming a *timespace* grid and how to avoid the obvious problem of time not being equivalent to *space*.

How should such (lxx-lxxiv) be resolved?

Papers 48-55 [48-55] of Temporal Mechanics describe and resolve those problems in addressing and resolving the proposed and self-evident $0\sim\infty$ scaling paradox problem of a point, namely resolving how big a point is and how a zero-dimensional point extends to another to form real dimensions, and thence how the idea of time is involved there as an independent dimension. There, it is proposed that time as an independent dimension is constructed differently to space, with a different approach to the application of numbers, interconnected nonetheless with the proposed number definition for a point in space.

As a process, al of such is a hypothesis that needs testing. The *testing though* is ***deriving*** the dimensions of time and space and then deriving number paradigms associated to those dimensions and thence associated equations from those number paradigms that have been found intrinsic if not essential to physical phenomena, constants such as the fine structure constant, gravity constant, Planck constant and so on, and not just such, yet how physical phenomena emerges from the number theory of the dimensions *consistent with known descriptions and associated equations.*

Indeed, it is well known 0 is related with real numbers, irrationals, and primes via the Euler and Riemann zeta function. The question is how those numbers can be related to not just the idea of infinity, *yet the dimensions of time and space**.*** This is much of the focus of the CMI MP problems, namely finding how a number theory can apply to time and space [54]. Identified there is the problem of the 3-sphere trying to be analogous to Einstein's 4d spacetime. The problem there is trying the same mathematics for time as for space, as though deriving time from space, which has been shown to be nonsensical, resulting in all sorts of problems and thence perhaps why no one has solved any of the problems beyond what was proposed as a solution for the Poincare conjecture.

Simply, what is missing in contemporary dimensional number theory is the mathematical definition for a point in space and moment in time, how they relate, and then ***how*** dimensional space and time emerge from their zero-dimensional space and time counterparts. Involved there also must be a description for infinity and thus a ***scaling*** issue for space addressed. The solution proposed by Temporal Mechanics is to propose the extra time-domains of *time-before* and *time-after* associated to the zero-dimensional *time-now*. There, 1d time is formed and thence how one point in space can relate to another thence creating dimensionality for space [49].

Once again, that proposal has been tested for what it can derive and if it as a number theory is analogous to what is *dimensionally/phenomenally real*. All of such is to highlight what can be constructed and then tested as a hypothesis; ultimately zero-dimensional space can only be proven mathematically by default, by proxy, by a conjecture that relates dimensional time and dimensional space.

Indeed, all numbers are relative in terms of the dimensions, for where does one create a zero-dimensional reference for space given a zero-dimensional reference can be anywhere? The issue presented by Temporal Mechanics is how space as zero-dimensionality can be scaled with zero-dimensional time, namely how they can be defined in reference *to each other. There, it can be shown how time and space relate as dimensions (non-zero) and thence derive the number theory foundation for how physicality emerges, a physical theory by proxy which can then be tested with what is known of physical reality regarding equations and constants with those known chosen scales of metrology.* There, Temporal Mechanics has found that physicality results from the need of the dimensions of space and time to address and resolve the $0\sim\infty$ scaling paradox problem[72] of a point in space and moment of time.

16. Conclusion

The Temporal Mechanics (zero-dimensional logic) work has put much[73] of the physical equation work of current physical theories together, yet now the task is tightening all the bolts and screws of the equations through the work of Temporal Mechanics with each other, yet primarily how they fit with each other around a basic key dimensional "hub" equation matrix bringing resolution to one of the most curious anomalies in number theory, namely the Ramanujan summation. This new hub has been shown to provide clarity to the interlinking of all the derived equations relevant to physical phenomena, presenting the case for an underlying dimensional number theory to physical reality.

[72] Currently approached by physics as a singularity for time and space ([54]: p7-8).

[73] The only exception being the equations for general relativity which have been demonstrated to be flawed; see paper 55 [54].

Conflicts of Interest

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

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