A time-equation *thought experiment* deriving 3D space as *timespace* in forming the basis for particle and field phenomena

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Abstract: A key feature of physics theory formulation is the "*thought experiment*", an instrumental key with specific conditions to unlocking the mechanics of physical phenomena, conditions as this paper highlights that have been overlooked by Einstein's own *thought experiment*s with his works of Special and General Relativity. To demonstrate such, two processes shall be presented here, the first being an analysis of contemporary physics which holds physical phenomena (namely momentum-inertia-mass) as the basis for physics theory, and the second approach (Temporal Mechanics) using the temporal and spatial perception ability of human consciousness and associated proposed formalism of mathematical logic as the basis for physics theory. The two approaches shall be compared based on what they can both achieve, here the results showing that making physical phenomena the key theoretic basis of physics theory itself leads to paradoxes of temporal and spatial mathematical interplay, whereas making the temporal and spatial human consciousness ability and associated formalism of mathematical logic as the key theoretic basis, as the proposed fundamental time-equation *thought experiment*, avoids those temporal and spatial abstractions and paradoxes of dimensional analysis for physical phenomena.

Keywords: time-equation; *thought experiment*; General Relativity; *timespace*; Temporal Mechanics; fine structure constant; Quantum Mechanics; time-domain; Lagrangian

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1. Introduction

The discipline of physics relies on three key concepts, namely physical phenomena, the measurement of physical phenomena, and thence the theory for physical phenomena. Physical phenomena are generally assumed as the question of study, namely what is being *physically examined*, whereas measurement and theory depend on defining particular scales for dimensional measurement as a standard, scales that relate directly to a mathematics that can then describe the physical phenomena and the dimensions of time and space physical phenomena is a part/process of. Much of the aim of physics is to create a mathematical theory to explain the reason of physical phenomena, to then predict the behaviour of physical phenomena in establishing the basic laws of nature, the reliable events prescribing the behaviour of physical phenomena.

Here Temporal Mechanics [1-40] takes that process a step further by not assuming how we perceive physical phenomena, yet presenting the case that our perception ability of time and space in fact determines what is understandable to us in not just plain sight, yet as a mathematical theory, as though reality already represents the run of a natural simulation we are a part of and can access and fundamentally understand through our conscious abilities, as a proposed formalism of mathematical logic .

To demonstrate the effectiveness of such an approach, the current logistics of physics theory as a way to explain physical phenomena shall be examined while then comparing that approach to a proposed formalism of mathematical logic for time and space as a mathematizing of our perception abilities of time and space as though we exist in a natural simulation, as the proposed required *a priori* examination approach for physical phenomena.

Effectively, here shall be presented the case that making *physical phenomena* as an *a priori* of study (for mathematical *analysis* and mathematical theory *building*) leads to oversights and misjudgements for the more fundamental processes of our cognitive abilities of time and space, fundamental dimensional processes that are proposed to represent a basic code of our temporal and spatial conscious appreciation and thence realistic perception and theoretic abilities. As shall be demonstrated, to derive time and space as dimensions from a primary theoretic base and examination of physical phenomena leads to abstractions of measurement *for* the dimensions of time and space, simply because time and space are (or rather should be) already implicit to physical phenomena.

The result of these abstractions of measurement and dynamics shall be highlighted to be the big bang theory (λCDM model) as a requirement for a metric expansion of space which takes root from Albert Einstein's theory of General Relativity, a metric expansion of space requiring a large amount of energy to accommodate for quantum fluctuations (as derived by Quantum Mechanics) in that metrically expanding space. Fundamentally, the root cause of the cosmological constant problem shall be demonstrated to be Einstein's General Relativity theory in not accounting for quantum fluctuations of light in space (and those energy values), together with Quantum Mechanics not only failing to account for a theory of gravity yet in also presuming the energy value of quantum fluctuations in free space as according to $E = hf$.

In constructing this paper, the following sections are proposed:

Here it shall be demonstrated that the main problem of making *physical phenomena* the *a priori* of physics theory is the idea of time and energy, the key flaw in Einstein's General Relativity in missing the quantum fluctuations and associated energy requirements of space, together with Quantum Mechanics not being able to derive the value of G, the gravitational constant, leading to a vast array of incorrect scales of measurement for cosmology theory and associated astrophysical analysis, particularly the study of black holes. The proposed solution here is to derive the idea of energy and a wave function as fundamental processes of the interoperation of the dimension(s) of time with space, and to then derive physical phenomena from that basis/approach, primarily to derive G from that basis.

The focus here therefore is examining how *spacetime* theory went wrong, and then providing a solution through a more fundamental analysis of the dimensions of time and space as they relate to our *conscious abilities of time and space*, and how such then can form a more correct basis for quantum phenomena in deriving a temporal wave function as an EM analogue field and then deriving the correct (known) value for G.

2. The flaw of *spacetime*

Modern cosmology understands the span of reality being from a great beginning (big bang) and associated metric expansion of space with an indeterminant end other than the phenomena of black holes. The core process of reasoning there is Einstein's *spacetime* theory, namely gravity being a curvature of *spacetime*. To be noted is that the metric expansion of space is the principal idea attempting to understand the phenomena of stars and black holes, whereby *spacetime* is described by a metric which changes over time such that the spatial dimensions appear to grow or stretch as the observed scale of the universe of stars appears to get older, and thus as time also grows. Yet, to be questioned here is the consistency between time and space, those growths as the metric expansion of space and associated metric expansion of time (as the observed universe is proposed to get older with the metric expansion of space).

It is interesting to note that:

(i) Einstein only explained the *effect* of time from the analysis of the movement of inertial bodies in regard to light.

(ii) cosmology became an "aetiology" of *space* as the big bang from a zero-time start date.

(iii) any expansion of space would need to run with a clock of *time*.

(iv) the metric/mathematical expansion of space is a feature of cosmology, underlying the big bang theory (λCDM), as a result of Einstein's formulation of General Relativity.

(v) yet the metric expansion of space is not called a metric expansion of *spacetime*, simply because time in *spacetime* theory is considered as a result of the process of mass and thence *gravity moving mass*.

The known issue with Einstein's General Relativity requiring a big bang (and that derived required energy) was the cosmological constant problem, having Einstein consider finding a reason, a basis, for his calculation of the energy required for his gravity equation to work *as* the big bang requirement as determined by the required quantum fluctuations of space proposed by Quantum Mechanics.

Essentially, the fundamentals for General Relativity and thence current cosmology are:

(vi) momentum-inertia-mass leading to gravity (curvature of *spacetime*),

(vii) requiring an amount of energy a factor of 10^{121} above the known energy of space,

(viii) meaning a 0-temporal date was formed for time and it (time) presumably expanded with space as a different concept to light, that space and light are not intimately connected, otherwise light at c would be ahead of such an expansion of space if at c time=0,

(ix) and yet the more *spacetime* expands the less dense the energy would supposedly become in *spacetime*,

(x) all of such (energy weakening as *spacetime* expands) being contradictory to the isotropic $CMBR$ data.

The key problem there is that for time to pass in the context of a metric expansion of space then such requires space to be disconnected from the idea of light if at c time=0, yet according to Einstein's General Relativity light *yields* to *spacetime*. So, on the one hand Einstein proposes a *metric expansion of space* as a temporal event not regarded as *spacetime* (yet "space"), and yet on the other hand there is *spacetime* as per Einstein's use of it as a curvature regarding gravity.

If cosmology is flawed, it is perhaps not just General Relativity (the large scale description) which is the problem, that mechanism of logic and associated thought processes for its ultimate aetiology, yet the idea of disassociating space with time in the fashion mentioned above (vi-x), namely that disparity between <u>*a metric expansion of space*</u> and <u>*spacetime*</u>.

In short, there appears to be *no* consistency with *time* in *spacetime* cosmology theory, broadly from the expansion of space *regarding light* to the relative motion of mass *regarding light*. With an expansion of space as a concept surely time must be scaled there also as an expansion from the "0" reference of the big bang, the 0 reference of space and the 0 reference of time, otherwise there is *no fundamental dimensional* consistency between time, space, energy, and c in the context of a big bang event to where we are now and how time here is described as the result of the relative motion of objects in space, the flaw there being that the basis of physics theory, the only designed consistency, is the idea of momentum-inertia-mass, and not time and space, hence the fundamental flaw of physics theory revealing itself as such, a problem most apparent with how time is handled by the concept of *spacetime* theory and its disparity with a metric expansion of space and the orphaned account of time there.

The proposal by Temporal Mechanics is to focus primarily on making the consistency of logic for time and space set as a fundamental *thought experiment* and to then model and derive physical phenomena upon such.

In short, Temporal Mechanics finds the problem with *spacetime* in its roots with how Einstein imagined time in his *thought experiments*; Einstein's simulation of real-world events with his *thought experiments* took root with his theory of Special Relativity and then expanded to his theory of General Relativity (gravity), applying such to the large scale (cosmology), only to reach the wrong value for the energy of space according to the calculations of Quantum Mechanics ($E = hf$), as per his cosmological constant problem, which he removed (cosmological constant), only to then require the need for a metric expansion of space and associated requirement for dark energy to power such a metric expansion of space. Here Temporal Mechanics with an improved *thought experiment* basis can derive cosmological phenomena (gravity, gravitational waves, black holes, redshift scales, and a constant $CMBR$) without the problems of a metric expansion of space model and thus not needing dark energy or dark matter.

3. Consciousness-simulation as the basis for a *thought experiment*

What is a *thought experiment* in physics? What is a *thought experiment* simulating, and ideally with what (using what, namely our conscious abilities with time and space), and more pertinently, *about what (*namely our conscious abilities of time and space and what is being delivered to such in a way that is metrically measured to our ability there*)*?

A *thought experiment* is usually considered as a hypothetical situation in which a hypothesis, theory, or principle is laid out for the purpose of thinking through its consequences, to then ideally be tested with scientific experiment. Ernst Mach was the first to in our modern history present the idea, a process he termed as a *Gedankenexperiment* [41]. Yet the idea can be found in ancient Greek as *deiknymi* where the *thought experiment* was primarily based on hypothesis and not experiment per se [42]. More recently, Lindsay Yeates [43] considers there to be 7 types of *thought experiment*s, namely *prefactual*, *counterfactual*, *semifactual*, *predictive*, *hindcasting*, *retrodiction*, and *backcasting*,

Here Temporal Mechanics proposes to take the idea of a *thought experiment* to the very basics of our cognitive abilities with time and space, and to then compare that process with the most well-known *thought experiment*s of physics as exercised by Albert Einstein. There, Temporal Mechanics has found that Einstein rushed into the *thought experiment* arena with broad-spectrum assumptions on how our consciousness works in assuming time. The further problem there was how Einstein set a standard for the *thought experiment* process in making momentum-inertia-mass the fundamental basis of inquiry for theory, which then had its effect on Quantum Mechanics and that process of theoretic development.

Temporal Mechanics has found that to make the leap from the real to the imaginary, to give validation to a *thought experiment*, one must be mindful that a *thought experiment* is a simulation using our conscious abilities either in assuming time and space, or not. Einstein went a certain distance there with definitions and assumptions based on physical phenomena per se. Yet how far can the simulation of a *thought experiment* go regarding our perceptive abilities regarding *time*?

Temporal Mechanics has found that the most effective refutation against Einstein is in understanding the mismatch he provided for this *thought experiment*s, namely the mismatch between that natural reality simulation key of thought endowed with qualities of time he assumed for his *thought experiment*s, only to want to then derive what time is using the "*a priori*" of momentum-inertia-mass with his Special and General Relativity work.

A proper discussion about the basis of a *thought experiment*, presumably in addressing our fundamental conscious abilities of time and space and associated capability of mathematical logic, requires a proper look at philosophy and the work done there.

Temporal Mechanics considers three philosophical works of significance regarding space and time, namely the work of Rene Descartes leading to his “cartesian coordinate system” for space [44], the work of Martin Heidegger with his analysis of time in “*Being and Time*” [45], and Sartre’s “*Being and nothingness*” [46].

These three works were analysed in “*The Conception of Time*” [10], and how together they could represent a mathematical code presenting the basis for a *thought experiment* reference. There, Temporal Mechanics chose Martin Heidegger’s *Being and Time* [45] as a study for the idea of *time* owing to his subject matter of "***time***" and how that relates with the phenomenological aspects of consciousness and thence subject-object phenomenal interplay.

Here, Temporal Mechanics proposes that the importance of understanding philosophy regarding a *thought experiment* in physics is in also acknowledging a basic mathematical formalism of logic for the ideas of time and space as we perceive and reason such, of getting the *thought experiment* foundations right (which Einstein overlooked).

Not only was philosophy considered, yet the discipline of Medicine.

Medicine is indeed a vast discipline regarding consciousness, yet certain basic parameters in relaying consciousness with physical phenomena and vice-versa become apparent regarding the performance of the human being, noting that *mathematics* is a *tool* to deliver what we are meant to explain mathematically via our perception abilities.

For instance, if we take the mechanism of the eye and how it relays signals to the brain, and also if we take the mechanism of the ear likewise, we realize two basic phenomenal issues at play, namely sight and sound. Sound is related to how we position ourselves with gravity, those vestibules of our inner ear complex, and there of course is also primarily an EM game at play with our eyes for sight. Sight to us is primarily EM, and the rod-cone structure of our retina captures all of such, and sound to us is a drumbeat of our ear’s tympanic membrane, connected as a way to realize gravity, *spatial orientation*. How all of such (including the other senses) is melded as one is what our brain delivers as our perception ability, per our cerebral, cerebellar, brain stem, limbic, and so on, systems.

The question thus is, “why not *mathematize* our perception ability regarding light and gravity to then form a mathematical description of physical phenomena regarding light and gravity?”

Simply, Temporal Mechanics proposes that the simulation for reality already exists *as reality*, and that all that is required for a good basis for physics theory is an ideal *thought experiment*, as a proper understanding of the basis for our perception ability as a code of perception that can be mathematized, a simulation key as a mathematics to explain physical phenomena as structured as it is to our perception ability of it.

Temporal Mechanics as a derivation process in using the temporal and spatial perceptive capability of human awareness (which is what any standard process of physics aims to achieve, namely perceive, measure, and theorize) presents a mathematical formalism for the human perception abilities of time and space, primarily, as a blueprint to explain physical phenomena. Such does not imply that human awareness in being mathematized becomes artificial, yet that there is a natural mathematics to not only the reality we perceive, yet how we perceive reality, a fundamental code of performance in line with a fundamental mathematics central to the dimensions of time and space, an idea not foreign to physics, namely the idea of mathematics being a fundamental part of nature and not primarily a human construction [47].

Conversely, the idea of artificial intelligence (AI), namely *any system that perceives its environment and takes actions that maximize its chance of achieving its goals* [48], aims to do the same thing our own conscious performance can achieve (among other options available to us), namely perform its role upon a *computer-based simulated reality database of commands*, as compared to the real simulation of reality we as humans have access to. Simply, a computer first needs to simulate reality-commands for its reference into its database *as* its own code of being cognizant of reality in the context of the directives programmed into the AI. Yet, as humans we can access/understand the real-world simulation and more accurately understand those underlying rules/commands of reality (laws of physics that make us who we are) through understanding how our ability of perception, of interacting with the real-world simulation, *works*.

Temporal Mechanics has found that the core problem with a computer trying to simulate reality is that computers rely on the *time-now* datum reference *exclusively*, that arrow of time, whereas Temporal Mechanics can demonstrate that there exists three time-domains, *time-before*, *time-now*, and *time-after*, and their general interoperation as a time-equation is required to properly present a simulation, a thought experiment, a blueprint, of reality, of physical phenomena.

The real question now is how does one mathematize our conscious ability with time, or can it be done better by an advanced machine with a greater reservoir of data at its disposal than our memory and cognitive stores of data alone?

Most AI systems are based on human behavioural modelling (as basic models of cognitive drives) and mathematical probability. Here though if reality can be compared to a great computer simulation already in play, the proposal is to take our perception ability in that great *real and working simulation* (reality), a code for that great simulation we are all a part of as conscious beings, and to then use that code of our perception ability in that great simulation to determine how time and space are mathematically related *in* that great simulation. In short, Temporal Mechanics labels the human temporal perception ability with a mathematical equation t*o then derive space, 3d space,* and thence derive phenomena in the time-domain of *time-now*, and to then compare that *thought experiment* process and associated derivations with known data. All phenomena that is real in time and space should thence be derivable if the *thought experiment* process is correct, and the work of Temporal Mechanics proves exactly such in matching physical phenomena known to physics and those data values with what Temporal Mechanics *can derive*.

The deliberation there is as fundamental as it is precise, namely accepting we have an ability to mathematize how we are conscious of time and space, and to then do justice to that agility and ability scientifically by demonstrating how mathematizing our perception ability is not just unique as compared to other theories, yet more real.

The process of Temporal Mechanics as the time-equation thought experiment follows the following course:

(a) propose a time-equation based on our temporal perception ability,
(b) relate the time-equation to space as *timespace* (not to be confused with *spacetime*),
(c) derive the phenomena of light and energy,
(d) derive/formulate how physical phenomena manifests in the form of particles and their field force effects,
(e) relate *timespace*, light, energy, mass (and forces, namely EM, G, strong, and weak) with the small scale (atomic locale) to the large scale (cosmology and associated astrophysical phenomena), deriving those scales,
(f) derive the physical phenomenal values of the sun,
(g) derive the redshift of light of observed galaxies and associated astrophysical phenomena (stars),
(h) to thence identify how the energy related to *timespace* is equalized as an isotropic $CMBR$ event for the solar system, resolving the axis of evil problem,
(i) then by all of such deriving black hole phenomena according to its known observed feature.

In short, Temporal Mechanics presents a time-equation *thought experiment* as a blueprint for physical phenomena to manifest upon (or rather *according to*) in being concordant with our temporal and spatial perception abilities, as though to understand reality all we need do is understand the temporal and spatial code of our perception ability, the proposed key to understanding this real-world natural simulation.

4. Temporal Mechanics

Temporal Mechanics, as a summary of its 40 papers [1-40], asks *how* to fundamentally define a *thought experiment*, yet in more importantly asking what is assumed there in the *thought experiment* of physical phenomena in space, of the relative motion of objects in space.

Temporal Mechanics asks 3 questions of Einstein's derivation of time in avoiding making those errors:

- The first question Temporal Mechanics asks is, ***"How did Einstein derive time from momentum-inertia-mass as a thought experiment?".*** Essentially, Einstein presented the case that time is a result of the relative motion of objects in space, like a mass-doppler effect. The question is if two objects in relative motion create/emerge the idea of time, what comes first, the relative motion of mass objects or time? Is not time already implicit in relative motion?

- The second question Temporal Mechanics asks is, ***"what is energy as a concept without time, without the concept of change?"*** Indeed, it is no coincidence that Einstein derived time and then reached, according to Quantum Mechanics ($E = hf$), the quantum fluctuation value of energy in space way off the known vacuum energy value, warranting the need for dark energy.

- The third question Temporal Mechanics asks is, ***"what is wrong there, Einstein's General Relativity or Quantum Mechanics regarding the vacuum energy?"***. If they're both right, *dark energy* should link Einstein's General Relativity work with Quantum Mechanics, essentially linking the understanding of black holes with light and energy. Is such the case?

Although it could be said that there was no need for Einstein to derive time, because time already had been defined as per a clock (quite a simple premise), and that Einstein was merely determining how time could be affected by the relative motion of objects in space, the question Temporal Mechanics asks is how time as a dimension is integral to space as a dimension on an *a priori* level. There, the question is, "how is mass as momentum-inertia an *a priori* without movement and ***thus how does time relate with space*** to make momentum-inertia-mass valid in the first place?" Such is what Einstein attempted to explain, yet his General Relativity work failed to account for quantum fluctuations in free space in his calculations, leading to the cosmological constant problem.

In looking at this issue another way, the current way of utilizing time in physics is by way of an *action* principle for momentum and energy in a *time-now* datum reference. In physics, action is a numerical value describing how a physical system has *changed over time*. In the case of a particle moving with a specified velocity, the action is the momentum of the particle multiplied by the distance it moves as an accumulated value, or simply twice its kinetic energy times the length of time for which it has that amount of energy accumulated in that time period. The *action* is typically represented as an integral over time, taken along the path of the system between the initial time and the final time of the development of the system as per the following equation:

$$S = \int_{t_1}^{t_2} L\, dt \qquad (1.)$$

Here, the integrand L is called the Lagrangian, a formulation of classical mechanics founded on the stationary action principle, defining a mechanical system to be a pair $(M,\ L)$ of a configuration space (M) and a smooth function (L) called a *Lagrangian*, where $L = T - V$ and where T and V are the kinetic and potential energy of the system. Action therefore has the dimensions of [energy] × [time], and its SI unit is thus Js, which is identical to the unit of angular momentum.

Note that with the integrand L *action* is confined to *"two"* time labels in the datum reference of physical phenomena, temporal labels of t_1 and t_2 in the datum reference of *time-now*, and thus say t_{N1} and t_{N2}.

With Temporal Mechanics, the action principle is over-arched by an accessory system of temporal capability care of its proposed time-domains and associated time-equation, to accommodate for the fundamental issue of causality between a particle and its gravitational field force.

In short, the idea of the *Lagrangian* is not being disputed for the datum reference of space for *time-now*. What is proposed here nonetheless is a greater perspective of time as per the time-domains and associated time-equation applied to the dimensional features (1d, 2d, 3d) of space.

Temporal Mechanics proposes making the process of examining time more precise with a time equation expressed as specific time-domains of *time-before*, *time-now*, and *time-after*, to bring more precision to events in *time-now*, more precision than the Lagrangian method can offer, and above all more relevance to our temporal cognitive abilities.

The time-equation proposal is perhaps best summarised in paper 8 as follows ([8]: p3-4):

> *In mathematics, an equation is a statement that asserts the equality of two expressions. To present an "absolute" equation for time requires a type of equality to be established between two expressions/properties of time. What can we say about "time" that has two properties using both "1" (as t_N) and t_B, as an expression of equality?*
>
> *If time is a singularity, we can relate time-before to time-after along a basic linear mathematical construct as via t_N. This has been the Achilles heel it seems of our logic of time, so let us break it down further. For instance, we know that placing t_B next to t_N requires a negative sign for t_B (equation 1) given t_B is a "backward/negative" step compared to t_N.*
>
> $(-t_B) + 1 =$ <u>*fundamental property A*</u> *equation 1.*
>
> *Yet, if time is a singularity, we can present the case that t_N can also be "per" $(-t_B)$ as another equation as technically t_B would already be contained within the t_N construct, as it would have already happened (equation 2).*
>
> $\frac{1}{(-t_B)} =$ <u>*fundamental property B*</u> *equation 2.*

Thus, if these two features represent fundamental properties of time, and time itself is a singularity, then fundamental property A must equate to fundamental property B (equation 3.)

$$(-t_B) + 1 = \frac{1}{(-t_B)} \qquad \textit{equation 3.}$$

From equation 3, we arrive at the following (equations 4-5).

$$t_B^2 - t_B = 1 \qquad \textit{equation 4.}$$
$$t_B + 1 = t_B^2 \qquad \textit{equation 5.}$$

Equation 5 is interesting, as essentially it suggests that if we consider an "arrow of time" equation that is absolute, and we add the past as a "positive value" (as it would be in considering an arrow of time equation) to t_N, as past + present, only logically we would arrive at the future, let us call t_A (equation 6.)

$$t_B + 1 = t_A \qquad \textit{equation 6.}$$

Yet as we know, $t_B^2 = t_A$ (equation 7.)

$$t_B^2 = t_A \qquad \textit{equation 7.}$$

This time-equation explains the golden ratio being integral to the arrow of time.

There, are expressed the three time-domains, *time-before* (t_B), *time-now* (t_N) and *time-after* (t_A).

Paper 40 ([40]: p9-19) proposes how the Lagrangian as a *time-now* time-domain can be extended with the time-domains of *time-before* to *time-after* via *time-now* as per the time-equation $t_B + 1 = t_A$ (where $t_A = t_B^2$), here represented by figures 1:

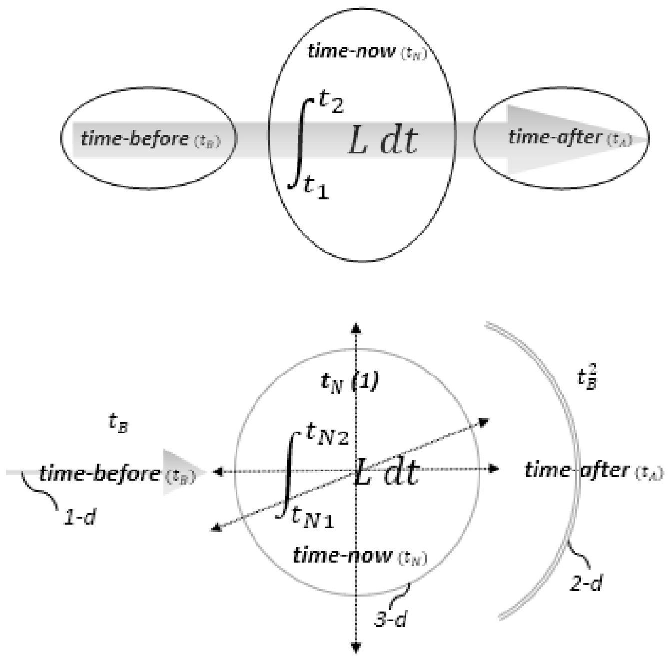


Figure 1: Space as the 1-d (time-before, t_B), 2-d (time-after, t_A) and 3-d (time-now, t_N) vacuum that acts as a spatial-scale backdrop for the temporal wave function that primarily requires the time-domains of *time-before*, *time-now*, and *time-after*, despite physical phenomena existing in the *time-now* time-domain, and thus there a phenomenal feature of space.

How the time equation was applied to space was presented in paper 2, pages 3-14 ([2]: p3-14). The key feature there was applying the time-equation to Pythagorean algebraic space, noting how space is associated in its construction with the time-domain parameters of *time-before* as 1d space, *time-now* space 3d space, and *time-after* as 2d space, leading to the development of the temporal wave function.

Temporal Mechanics has found [1-40] that what happens in the datum-reference of *time-now* ultimately is a code of relative motion for objects in space, and thence those associated phenomenal attributes in *time-now*.

Why *time-now* as the datum-reference?

Temporal Mechanics has found that particle formation is a result of the temporal wave function undergoing "destructive interference resonance" (DIR), as explained in paper 38 ([38]: p17-22), and as a process of destructive interference resonance it represents a "naught" (0) event for the temporal wave function, as though the time-equation is requested to consider *time-after*=0.

The effect this has is pushing physical phenomena out of the datum-reference of *time-after*.

If though *time-after*=t_B^2, it also pushes physical phenomena out of the datum-reference of *time-before*.

Thus, the result is physical phenomena in the datum reference of *time-now*.

The idea of gravity therefore has its requirement of *time-after*=0, and thus is a process of *time-before* and *time-after* holding physical phenomena in *time-now*.

Thus, to properly explain gravity, the datum-references of *time-before*, *time-now*, and *time-after* all need to be considered.

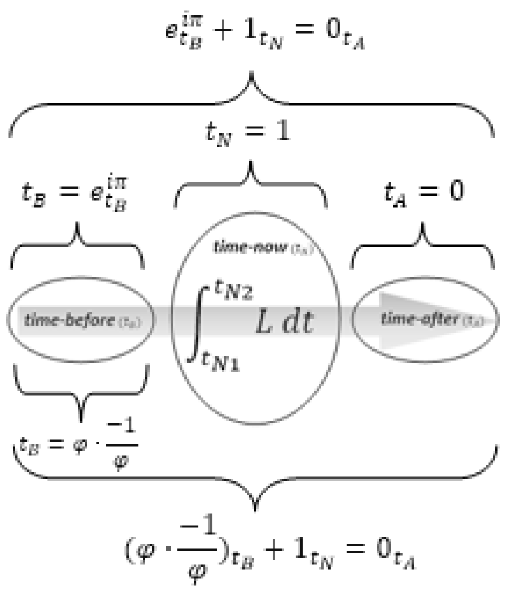


Figure 2: The idea of gravity being a part of an entropic process where $t_A = 0$, and to accommodate for such t_B primarily represents a complete representation of the golden ratio as $\varphi \cdot \frac{-1}{\varphi}$ together with an emergent representation of $e^{i\pi}$.

In figure 2, the process is of describing how physical phenomena is confined to the datum-reference of *time-now*, and how gravity in that same process came to be integral to two proposed basic equations, one as the primary temporal wave function folding equation (DIR process) as equation 2, and the other as an emergent/associated Euler equation as equation 3, as follows:

$$(\varphi \cdot \frac{-1}{\varphi})_{t_B} + 1_{t_N} = 0_{t_A} \tag{2.}$$

$$e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A} \tag{3.}$$

The time-domain of *time-now* though still depends on, must, the basis of *time-before* as the key descriptor for the time-equation, and thus the situation becomes apparent of a new accessory time-equation in regard to gravity and thence the energy required for gravity, namely a new feature of *time-before* when added to $t_N = 1$ resulting in a “0” event.

Temporal Mechanics has demonstrated the time equation ($t_B + 1 = t_A$) to represent the fundamental basis and link for all the key equations of physics, deriving and linking $G,\ k_e,\ h$, and α as presented in paper 39 [39].

In short, Temporal Mechanics creates ***absolute precision for time-now*** by giving it the value of $t_N = 1$ in the time equation, and to then have the time-domain values of *time-before* and *time-after* form callipers around that to lead to the known equations of the physical constants. Paper 40, chapter 4, p9-19 ([40]: p9-19) explains this process in comparison to the Lagrangian process.

Conversely, the Lagrangian is a function between two values of time to reach an infinitesimal value as a series of averages reduced to zero, a series of averages approaching an infinitesimal scale, a process though that is still not ***exact***. Temporal Mechanics considers the idea of *exact* to be defining the *time-now* time-domain of physical phenomena as "1" and then around that formulating the laws of physical phenomena as a flow of time with the time-domains of *time-before* and *time-after*. Through this entire process, the flow of time becomes integral to the physical constants and their associated dynamic equations of force and location as per defining "1" for *time-now (as a moment)*; <u>defining "1" for *time-now* is basically saying "1" as a factor can apply to anything, namely *time-before* or *time-after*, as though there is that intrinsic loop of *time-now* to any potential event that has happened (*time-before*) or will happen (*time-after*)</u>. Such was an intuitive consideration, yet has been demonstrated to work in deriving what it has.

Ultimately therefore, Temporal Mechanics proposes that there is a basic mathematics at play with *time-now*=1 that applies to *time-before* and *time-after* as much as 1 applied to "*any value*" still results in that "*any value*". To note is that with $t_N = 1$, "1" is not a *period* of time, yet the *moment* as *time-now*, and is arbitrarily defined as such. Such is why the mathematics of Temporal Mechanics utilizes a *temporal calculus,* namely a *new process* of using time with numbers intrinsic to a fundamentally new approach to the concept of time, as *a fundamental time-process*, and not just fundamental time-process, yet also a fundamentally new mathematics for that time-process. Of course, *periods* of time can be measured *above* this fundamental process of time such as with a Lagrangian, yet the important thing is to *first account for this fundamental process of time with space*. The Lagrangian conversely deals with periods of time without specifying a spatial locale *through* that period of time the infinitesimal function is applying itself to.

In short, Temporal Mechanics proposes that time can dilate or contract dependent on the relative motion of objects in space, yet Temporal Mechanics proposes *a fundamental layer to time with space responsible for the known laws of physics* ***upon which*** *other phenomenal qualities of time (classical and relativistic) manifest.* To understand that fundamental layer is to understand the *axiom of time* being proposed.

6. The axiom of time

An axiom, as defined by Meriam Webster [49], is as follows:

1: *a statement accepted as true as the basis for argument or inference*
2: *an established rule or principle or a self-evident truth*
3: *a* maxim *widely accepted on its intrinsic merit*

An axiom is quite simply a postulate, or even more simply an assumption, a starting point of proposal for further reasoning to be developed upon. It is thus considered as a basic premise.

In philosophy, an axiom refers to what is categorically true, entirely self-evident.

The *primary philosophical axiom* proposal for time can be reached in considering that time (as is self-evident to human perception) *as an arrow* is based on three basic concepts, namely *time-before*, *time-now*, and *time-after*, where *time-before* is the past, *time-now* is the universal datum-reference of perception, and *time-after* is the future as a type of unknown paradigm, all as our perception holds to be self-evident and true. From that primary philosophical proposal, as an axiom, can be derived the mathematical axiom, the time-equation.

Fundamentally therefore, the universal time axiom proposed by Temporal Mechanics is based on fundamental and self-evident features of human temporal perception, *namely that the arrow of time has three features, time-before, time-now, and time-after, where the datum reference of perception is held in time-now*.

What does such have to do with universal time being a mathematical or physical process?

Universal time is the key physical *axiom* here, namely that *from that initial philosophical axiom is an associated mathematical axiom, a time-equation, as $t_B + 1 = t_B^2$ where t_B is time-before, time-now as t_N is the value of "1", and time-after as t_A is t_B^2, and that the idea of universal time as time-now is as "1", as though time here is a constant, as "1", harbouring passage from time-before to time-after, yet time-now being a universal moment*. In other words, there exists a "constant" for time in the *time-now* realm, and as a constant it suggests the passage of time in *time-now* is universal, or more simply, for any and every reference in *time-now* space there exists a moment, a unit concept of time, a *time-now*, such that there exists a basic paradigm where time is a constant ***for*** *separate references of space*, thus conveying a type of *symmetry* in time implying that all physical processes in *time-now* are equitable, *whenever* they are measured, an idea proposed by Emmy Noether [50].

From those first two axioms comes a third, namely that *the speed of transmission between any two time-now datum-references is "c", or in other words, in the context of a universal time paradigm as a moment where time does not pass, time **does** pass "**between**" different datum-references in space in the context of c.*

Such are the universal time axioms, neatly as follows:

(i) *That the arrow of time has three features, three time-domains, time-before (t_B), time-now (t_N), and time-after (t_A), where the datum reference of perception is held in time-now.*

(ii) *From that initial philosophical axiom (i) is an associated mathematical axiom, a time-equation, as $t_B + 1 = t_B^2$ where t_B is time-before, time-now (t_N) is "1", and time-after (t_A) is t_B^2, where universal time as time-now is as "1", as though time here is a constant, as "1", harbouring passage from time-before to time-after, yet time-now being a universal moment where time does not pass.*

(iii) *From those first two axioms comes a third, namely that the speed of information transmission/communication between any two time-now datum-references is "c", or in other words, in the context of a universal time paradigm as a moment where time does not pass (ii), time **does** pass "**between**" different datum-references in space in the manner of c.*

To further describe this process, the idea of time as time-points in space was developed, given the time-equation primarily relied on t_B as per the time-equation; thus *time-before* time-points were envisaged as a *field* of time-points, a "potentiality" of points for *time-now*, held in a *time-before* realm, as a *non-local* realm compared to space in the *time-now* datum reference.

From this *time-before* time-point realm the idea of time-points inter-relating with each other was developed upon, and how they would do such with the idea itself of space using Pythagorean Theorem Algebra ([2]: p3-11), noting the following simple definitions for points and lines as proposed by Euclid in carrying the work of Pythagoras, as presented in "*God Created the Integers: The Mathematical Breakthroughs that Changed History, edited by Stephen Hawking, p7*".[42]:

1. A **point** is that which has no part
2. A **line** is breadthless length
3. The extremities of lines are points
4. A **straight line** is a line which lies evenly with the points on itself.

Using those basic Pythagorean principles, the concept of space in *time-now*, in the datum reference, was thus derived from the time-equation ([2]: p3-11).

The next step was to propose how time-points relate with each other in space, and this was achieved using the concept of a *speed for transmission* between time-point references in space, a speed of information transmission held at a constant value despite the reference or relative motion of those references, as the value of c, *a level at which, a speed at which*, care of axiom-(ii), time would not pass.

Therefore, from the most basic philosophical axiom, axiom-(i), came a mathematical axiom, axiom-(ii) for the universal moment of time *for each reference in space*, and then a combination implying that information transfer between time-points through the datum reference of time-now is held at c as axiom-(iii).

The subsequent steps from the initial philosophical axiom, axiom-(i), that Temporal Mechanics makes is in establishing how the time-equation, axiom-(ii), leads to a *time-now* wave function in space deriving the value of c, axiom-(iii), as the speed of wave function development/progression between different spatial datum references, ***at*** which speed nonetheless time does not pass, axiom-(ii).

Papers 31-35 [31-35] presented a general overview of this process, with paper 31 [31] representing the primary account of time-space-circuits, as strings of time-points forming circuits that describe the behaviour of c with particles, whereby the known values for particles and field forces are derived.

By comparison, what did Einstein propose? Technically, Einstein presented postulates, not philosophical and mathematical axioms per se. The two key postulates he presented are as follows:

- *The laws of physics take the same form in all inertial frames of reference.*
- *The speed of light in free space has the same value c in all inertial frames of reference.*

Note here Einstein's focus being on "inertia" in holding that light carries the concept of inertia via its energy, and that light as c is a "constant" for all inertial frames of reference.

Philosophically regarding time, if not mathematically, Einstein stated that "*time is what a clock measures*". Such is not an axiom, as an axiom cannot rely on the invention of something such as a clock. Indeed, the concept of a clock has been used to uphold Einstein's relativity theory for time while so very delicately not confronting the idea of time not passing at c. Simply, *Einstein failed to properly define time*, and subsequently failed by a factor of 10^{121} to calculate the energy of space (cosmological constant problem).

Here Temporal Mechanics has gone beyond the postulates of Einstein towards defining the idea of time in regard to space, as per based initially on a philosophical axiom (i), and then a mathematical axiom (ii), and then both (iii), thence correctly deriving the value for the energy of space, the vacuum energy, avoiding the need for dark energy and dark matter.

6. The Temporal Mechanics *time-equation thought experiment*

The process of Temporal Mechanics is in formulating time-domains to capture the idea of our consciousness capability of time with space, and to mathematize such as a time-equation, and then applying such to Euclidean/Pythagorean space in developing a temporal wave function as the foundational *thought experiment*, as per paper 2 ([2]: p4-6), as follows:

3.1 A closer look at the axioms for space and time

To consider a "moment", as time not passing, it may as well be infinite time from the reference of another process of time. Thus, obviously, to define time is to define a reference of <u>timing</u>.

The definition of time proposed here, in addressing such an issue of <u>timing</u>, requires two references held in the same context of laws proposed for the flow of time. How?

The initial paper presented time to represent the three basic equations: $t_A = t_B^2, t_N = 1,\ t_N = t_A - t_B$*, ([1]; eq. 3, 4, 5), giving rise to* $\frac{t_A + t_B}{t_A} = \frac{t_A}{t_B}$ *([1]; eq. 6), providing two outcomes, two concepts, for time,* φ *(1.61803)* and $\frac{-1}{\varphi}$ *(–0.61803), as per the golden ratio. In short, the underlying premise was that time needs to be relative to itself, to somehow to bring into effect the idea of temporal "flow", of <u>timing</u>.*

In now developing upon the initial paper [1], let us label the two features of the golden ratio φ *and* $\frac{-1}{\varphi}$ *to* t_B*.*

Here, we propose that the two variables for time, φ *and* $\frac{-1}{\varphi}$*, would be at right angles to each other in terms of a temporal axis alignment, if indeed one value say* φ *is one axis and the other value namely* $\frac{-1}{\varphi}$ *is another axis.*

To note here is that we are regarding time "before" (t_B*) in considering* φ *and* $\frac{-1}{\varphi}$*, given time "now"* t_N *is defined as "1", and the future* t_A *as* t_B^2*.*

To now work with these features, let us take two axes for time before (t_B*), one as* φ *the other as* $\frac{-1}{\varphi}$ *(fig. 1.).*

If we apply "both" results to each other as a vector function in our interest of applying this to 0-scalar space as a t_A *entity, and thus* t_B^2*, we arrive at (eq. 1.) (fig 2.):*

$$\left(\frac{-1}{\varphi}\right)^2 + \varphi^2 = \sim 3 \qquad (1)$$

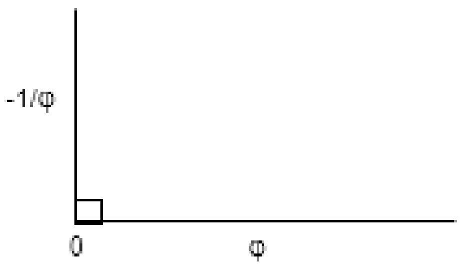


Figure 1: two axes of time, $\frac{-1}{\varphi}$nd φ,

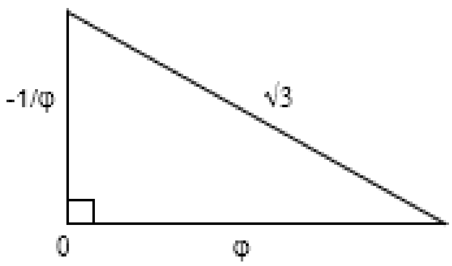


Figure 2: two axes of time, $\frac{-1}{\varphi}$ and φ, which then result in the value of ~ $\sqrt{3}$ (in a squared relationship).

To note is that as the time-equation considers that time is the essential time-before (t_B) time step, then "space" in being an independent entity to time as t_B would be the "now" (t_N) time step while also including the "after" (t_A) time step. And so, we need to calculate the vectors for space in the time-after event (t_A) and the time-now event (t_N) to understand what is happening with theoretical 0-scalar space in regard to time-before (t_B).

3.2 Applying the axioms of time to space (space as an "after" and "now" event)

As suggested, in applying both results of the golden ratio as a time-after (t_A, t_B^2) event we would have a value of "3" (t_B^2) for space (eq. 1). We can perhaps propose with hypothetical licence that this "3" value can, as a spatial vector grid, represent the 3 dimensions of 0-scalar space, 3 "now" ($t_N = 1$) timelines in space (fig. 3), noting the absence of arrows for the axes.

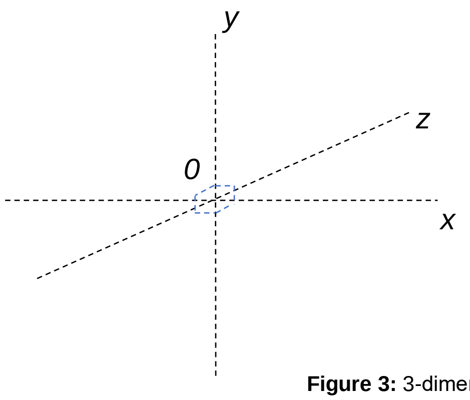


Figure 3: 3-dimensional space ($3{\cdot}1t_N$ space*)*

Such a 3d space construct is what was assumed in the first paper regarding 0-scalar space ([1]; p1-3). Let us take a step back though. For instance, the √3 value (fig. 2.) as t_B ($\sqrt{t_A}$), our time platform of consideration, "should" still be at right angles to the overall time-now (t_N) "1" outcome (as the three dimensions for space) (fig. 4.):

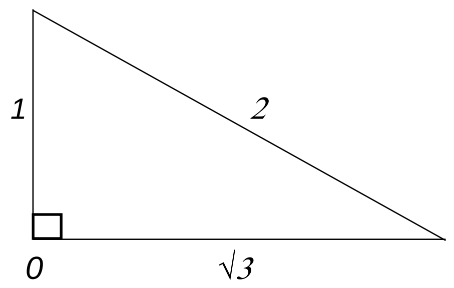


Figure 4: two axes of time, 1 and $\sqrt{3}$, which then result in the value of 2 (in a squared relationship).

Thus, we can say that time-before (t_B) as √3 when applied this way to time-now (t_N) as 1, then "1" as time-now reaches a value of "2" (which would be integral to t_B). Here it is proposed that "2" represents a double t_N (1), meaning there are proposed to be two t_N applications for t_B. Of course, we know there are two golden ratio values, yet these two values are already factored in, so we must entertain a new concept when applying such a factor to space.

*Thus, it is proposed that for space we would have 3 dimensions incorporating **2** temporal outcomes for each of the 3 axes. Thus, we can say that these two results represent "2" t_B temporal applications in a 3d spatial matrix.*

We could therefore say that if we create a 0 reference for each 3d spatial matrix, then the "2" value would represent the dual directions on each axis away from the 0 point (fig. 5.), noting the addition of the arrows on the axes as compared to figure 3:

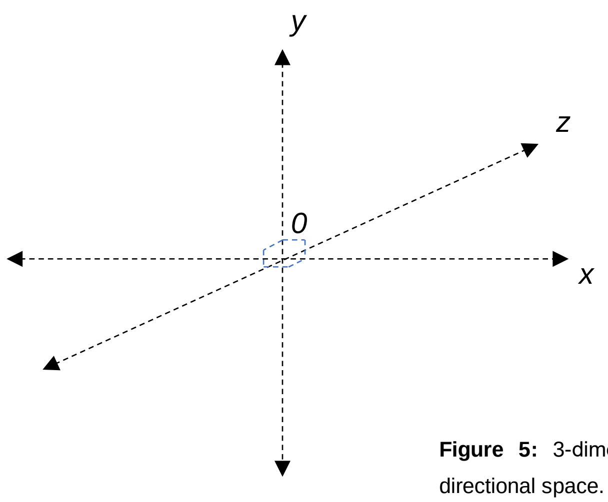


Figure 5: 3-dimensional ($3{\cdot}1t_N$ space) dual directional space.

The next step is to ask how that temporal wave function performs, namely as any event from a point source would in space, and thus under the condition of π such that a locale can be defined for π. With that locale, Temporal Mechanics found it needed to use two fundamental references for physical phenomena to make the "*thought experiment*" real, and there those two features were found to be the charge of the electron e_c and the Bohr radius a^0.

The following describes the process of the temporal wave function theoretic construction from the above excerpt, paper 2, pages 6-14 ([2]: p6-14):

3.3 Developing the wave function of time in space

Now then let us look at this dual temporal axis modelling in 3d space.

It would be simple to say that if we "multiply" each time result for t_B, namely φ and $\frac{-1}{\varphi}$, we get the value of "-1"; $\varphi \cdot \frac{-1}{\varphi} = -1$.

Yet to be noted primarily is that $\varphi - \frac{1}{\varphi} = 1$ (if $\varphi = 1.61803$ and $\frac{1}{\varphi} = 0.61803$).

*What this means is that if we are applying one time value to another, it is proposed at this level of theoretic modelling that those two values for time would be **separated by a gross value of "1"** as t_N. When we apply this to a basic 3d 0-scalar spatial grid though we arrive at what appears to be an anomaly while considering both the x-axis and y-axis as features of space for time (fig. 6)*

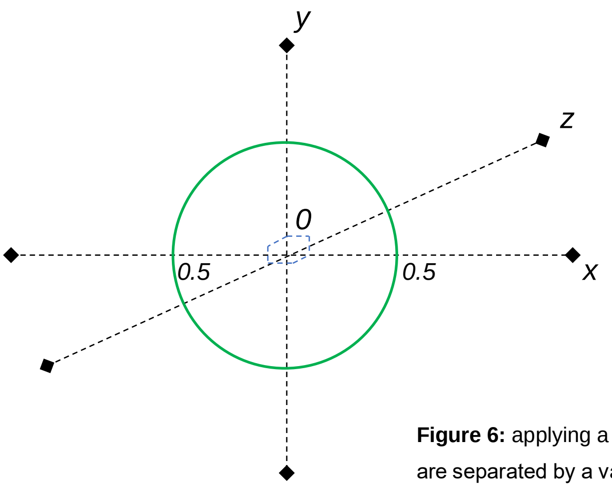


Figure 6: applying a time value to another, they are separated by a value of "1" circumscribing a circle around the z axis with a 0-scalar spatial central reference.

In therefore assuming any orientation of axes, we would need a <u>spherical time front</u> if indeed time moves in two directions along each axis according to the same "flow" rate c (as shall be derived), in that <u>for each axis</u> would be traced a circle around each associated axis, namely as the value of π (fig. 7)

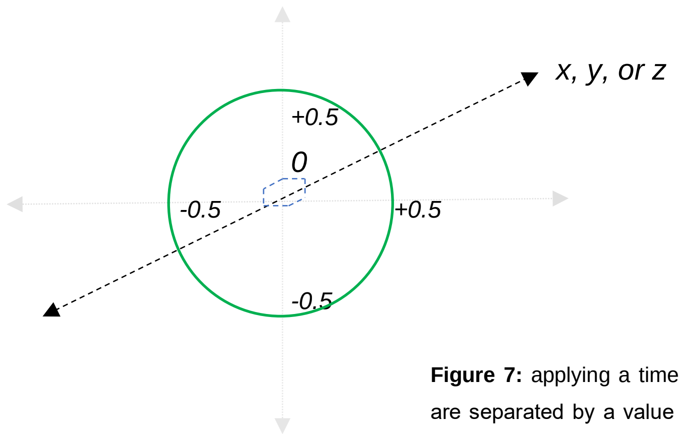


Figure 7: applying a time value to another, they are separated by a value of "1" circumscribing a circle around the x, y, or z axis.

This is so because both time points are separated by a value of 1 and thus could exist anywhere spherically around that 3d 0-scalar dual directional 3-axis spatial grid as for a required uniform time progression (as t_N, as the value of 1 dictates).

Note that the value of "1" is being transferred into a spatial consideration as per equation 1 and figure 4, namely that $\sqrt{3}$ is being applied to "1" to get 2 results for time, which brings inclusivity of "1" as a value into spatial consideration.

Thus, we can rightly consider that the distance between one temporal point to the next for a nominated axis would form the trace of the circumference of a circle with a diameter-equivalence of "1" giving the value of π, as per a spatial application of time.

To further note is that the way that time is being applied as a φ or $\frac{-1}{\varphi}$ entity as t_B to space is of course with the factor of "√3", and a factor of "2". Not only this, but the result is also "negative" in regard to space (-1), it has to be, as much as the two values of the golden ratio (φ, $\frac{-1}{\varphi}$) when applied to each other is the value of -1, simply because that is how we are applying such to space, ultimately, namely two values considered equally proportionally to space. Thus, for (φ, $\frac{-1}{\varphi}$) as t_B we would have to factor in the value of -2√3.

Thus, the equation we arrive at for time's flow calculated in space therefore becomes:

$$(t_B \cdot -2\sqrt{3}) + 1 = \pi \qquad (2)$$

It is not as simple as this though.

"Time" being applied to "space", according to the time-equation, <u>has conditions</u>, so figure 7 is not the exact topography that needs to unfold.

*What is required in order to satisfy the time-equation conditions is for "time" to seek to be a circle <u>**along** each spatial axis in each of the two directions around a central 0-scalar spatial reference</u>.*

*In therefore time needing to trace a value of π in space <u>**along**</u> each axis direction, we can only consider figure 8 to hold true for the **x-axis** (here, for descriptive purposes of simplicity, in only considering the x-axis for space):*

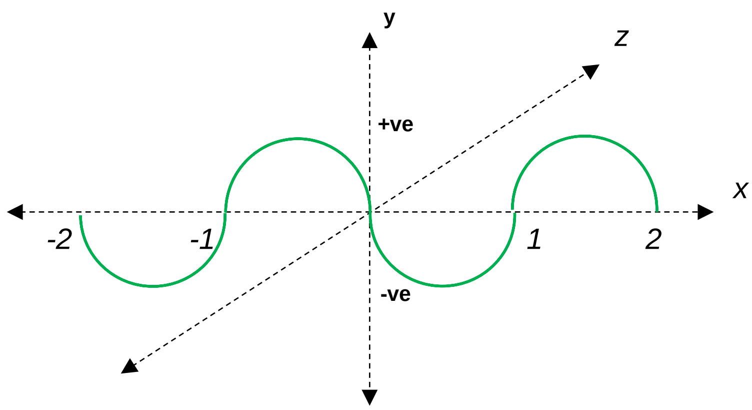


Figure 8: for the trace value of $\frac{-1}{\varphi}$ we would reach a value of π in each direction of the x-axis (here as the value of "2" in each direction of the x-axis, the overall trace length for this sinusoidal wave would represent a value of 2π in factoring in the dual directions along the x-axis from the 0 reference, π along each direction symbolised as "2" semicircular diameters.

Now note the following five key points:

- *The two possible wave function outcomes for the x-axis (nominated here as the spatial axis) in space represent the two directions the temporal wave function would move along each axis in space, one needing to be the opposite direction of the other in space, and thus inverse wave-sign value (y-axis -ve, and +ve) at the "0" point of the x-axis and y-axis in recognition of this basis.*

- *Therefore, along those two directions of space (along the x-axis) for this wave function would represent two temporal phase alignments, one positive (y-axis +ve), the other negative (y-axis -ve), suggesting a type of paradoxical condition of time-forward and time-reverse for the wave function moving along either direction of the x-axis from 0.*

- *Paradoxically therefore, this wave function, having both positive and negative temporal features, would appear to have time stand-still, not pass, as it travels along the x-axis in either direction from 0, despite it representing a speed of transmission along the x-axis from 0 as an overall time-equation in space.*

- *Along each directional x-axis from 0 we must also nonetheless satisfy each wave function step to having traversed along each directional axis (here the x-axis) the value of "π" as a "unit" wave function length in space.*

- *The question to ask is how well this wave function is able to prescribe the value of π based on how it is mathematically defined from the temporal realm and associated time-equation in its application to space (here as the x-axis).*

On simple observation, we can suggest that we have developed a sinusoidal time-wave along a spatial axis given that time must move a value of π in each directional axis from the 0-scalar spatial reference point "0".

Yet is such a standard sinusoidal wave as mathematics/physics knows it? No it is not. The important features to note here are that:

- *this is **not** a simple linear sinusoidal wave in space,*

- *this is a time-wave in space with both positive and negative temporal features,*

- *the implication being that time-forward is positive (y-axis) and time-reverse is negative (y-axis), both along either direction of the x-axis from the central 0 reference.*

*Although the direction in space may appear to be positive or negative in terms of a reference from "0" on a mathematical grid, space here is space, it is not considered positive or negative, and yet what to note here with this temporal wave function is that the temporal function itself of the time-wave, the vertical y-axis, is the temporal feature of the wave having both **positive** or **negative** values, as **time-forward** and **time-reverse** respectively.*

This feature will ultimately play a key role in explaining the particle nature of light and how at c time does not pass, to be presented in subsequent papers. Consider nonetheless an adaptation of figure 8, here as figures 8a and 8b:

Figure 8a

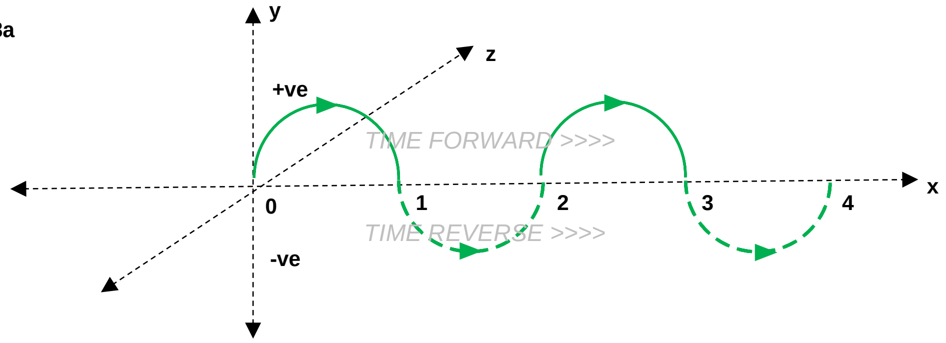
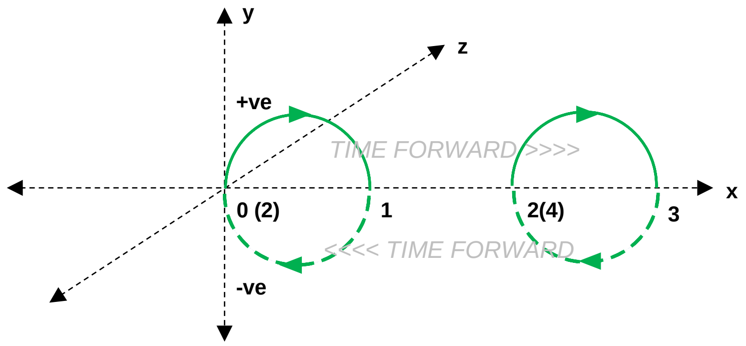


Figure 8b



Figures 8a-8b: note the primary temporal wave function as figure 8a, and the secondary time-circle "particle" effect of that wave function as figure 8b, both wave functions demonstrating the idea of time being an overall loop (not passing) as the progression of the temporal wave function, yet figure 8a being the primary focus for this paper and subsequent papers. Note also in figure 8b the time-reverse feature of values in brackets for the x-axis, as from figure 8a.

Note the time-circles in figure 8-b, how the negative region of the y-axis as time-reverse brings that part of the x-axis wave function back a step (in being time-reverse), twisted backwards, creating a time-circle as a type of time-now "virtual particle-ring", giving light an almost <u>particle-hopping</u> nature as it would progress along either direction of the x-axis from 0, almost like the light particle-ring is <u>tunnelling</u> as it trains along each direction of the x-axis from 0.

This particle feature though is a <u>secondary</u> effect of light and as such is <u>not considered part of the primary focus of examining the temporal wave function, yet will be pursued as a discussion point in subsequent papers.</u>

In short, the focus primarily here is how well this temporal wave operates primarily from first principles, and subsequently here how it must deliver π, and this will be a consistent theme through this paper and subsequent papers, namely focussing on the primary temporal wave function and not its secondary apparent particle effects, which without understanding the fundamental processes at play would be a misleading investigation.

Indeed therefore, the issue with π is the question of, "why assume that time as this wave would "move" through the axes of space continually as though beyond the length of π, extending outwards to infinity from 0, as opposed to just going back and forth along a "0.5" and "-0.5" x-axis grid presuming to trace π?". Note therefore the following:

- *The primary consideration is how time has been installed into space using the time-equation.*
- *Yet installing time into space requires the time equation to be modified, adapted, given space is a different creature to time, as per equation 2.*
- *To note is that we cannot modify t_N, only how time as φ or a $\frac{-1}{\varphi}$ entity is applied to space as an "after" and "now" event.*
- *We do know though that t_A must aim (as a mechanism of a spherical wavefront in time, a future placement of the wave function, a t_A event) to ultimately most basically for one axis (here the x-axis) **equal the value of π**, the length in space time has moved along an axis (as per equation 2).*

If we now factor in each value for the golden ratio we get the following two equations (bearing the assumption t_A must equate to π) (eq. 3, 4.).

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

$$(\varphi \cdot -2\sqrt{3}) + 1 = -4.605020 \quad (4)$$

Although the calculation of equation 2 for $\frac{-1}{\varphi}$ as t_B appears remarkably close to what the mathematics of time for space proposes, the results of these two equations appear anomalous for the exact value of π, noting only the value for $\frac{-1}{\varphi}$ appears close to the value of π (0.021% error). Yet are these results anomalous? Or can they be further utilised; do they point to something far more intricate and relevant? To answer such is to further investigate how the two golden ratio results for equation 2 can develop as a wave function.

*In addressing such, for the value of $\frac{-1}{\varphi}$, we would reach a value of approximately π in each direction of the x-axis from 0 as per fig. 8. Yet for the value for φ we reach the following graph (fig 9.) noting here the use of space as the x-axis once again, yet the temporal axis here **is the z-axis**:*

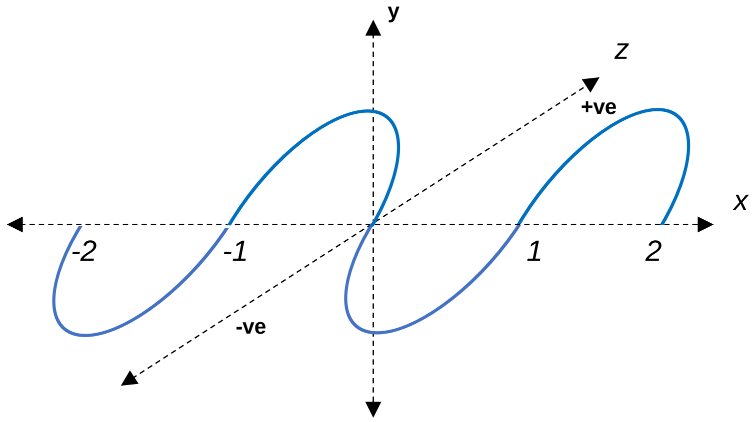


Figure 9: for the trace value of φ we would reach a value of 4.6 in each direction of the axis, the overall trace length for this sinusoidal wave would represent a value of 9.2 in factoring in the dual directions along the x-axis from the 0 reference.

According to paper 1, the time-equation has two features related to the idea of EM ([1]; p6-8).

Without much ado therefore, let us suggest that the result for $\frac{-1}{\varphi}$ *is the electric component (temporal axis being the y-axis) and the value for* φ *is the magnetic component (temporal axis being the z-axis). Why? Because we can only suggest that the value for* φ *when plugged into equation 2 is an ellipse [20], namely that it has a greater circumference than an ideally perfect circle, and thus has a dual pole centre of circumscription, as an ellipse does.*

Consider therefore figure 10 in considering φ *as the magnetic component of the wave function, and* $\frac{-1}{\varphi}$ *as the electric component of the wave function (value for* π *tracing a circle) as analogous to figure 6:*

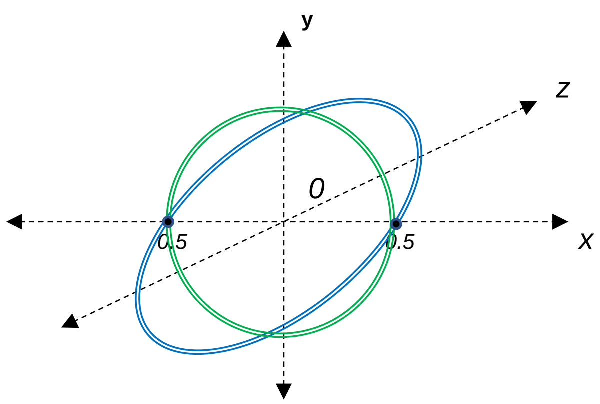


Figure 10: The circle ($\frac{-1}{\varphi}$) as the electric component (green) is a circumferential value of π, the ellipse (φ) as the magnetic component (blue) is a circumferential value of 4.6.

Now putting this as a wave function as per figures 8-9, in factoring the electric component as out of phase with the magnetic component, as per the initial paper deriving such to be so for the time-equation ([1]; p6-7):

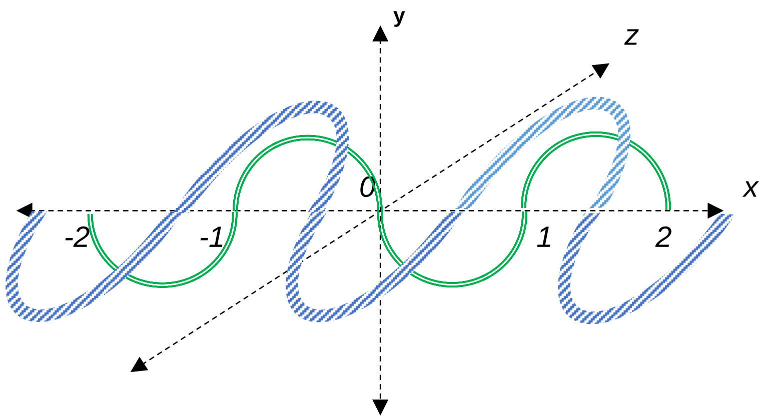


Figure 11: Green line electric component (x,y), blue line magnetic component (x,z), both waves out of phase with each other and perpendicular to each other.

Note that as from the previous paper [1] and the mathematical proof presented there, we are considering that the electric component is <u>out of phase</u> with the magnetic component in this spatial grid ([1]: p6 table 1, p7 fig10-12). Yet here we are confirming that the <u>magnetic</u> component exists as a <u>binary-pole</u>, and the <u>electric</u> component exists as a <u>monopole</u>. Note also that this graph would apply not just to the dual direction timeline of the x axis, but would also need to be applied to any potential directional x-axis in space.

3.4 Completing the wavefront for time in space

So, how do we perfect the wavefront value of π as a t_A result for $\frac{-1}{\varphi}$ as $t_B{}^2$, given $t_A = t_B{}^2$ is a condition for applying time to space as a perfect circle?

If we consider that $t_A = t_B{}^2$ (in ignoring the value of π as t_A for the moment) we get the following results for the golden ratio equation:

$$\left(\frac{-1}{\varphi} \cdot -2\sqrt{3}\right)^2 = 4.583533 \qquad (5)$$

$$(\varphi \cdot -2\sqrt{3})^2 = 31.416253 \qquad (6)$$

Note the squared value for $\frac{-1}{\varphi}$ (electric component, equation 5) is roughly the negative of the value of time for φ (magnetic component, equation 4), suggesting an embedded "negative" connection between the electric and magnetic components of the wave function in this networked time-looping structure; basically, when the electric component ($\frac{-1}{\varphi}$) is used as $t_B{}^{2,}$ then the result should be roughly a value of 4.6 as what the magnetic component per equation 4 proposes except with equation 5 as a positive value. The thinking here is that such is an underlying basis feature of the interlaced temporal sinusoidal wave going *from a positive curve to a negative curve divining the concept of EM induction, to be discussed further in a subsequent paper.*

To be noted more importantly though is the squared value for φ (31.416253) for equation 6, namely a close value for 10π in considering equation 3, the electric component step, closer than the initial equation 3 process for $\pi's$ formulation.

We can propose therefore that the value for φ in the context of equation 6 offers a closer value for π as the idea of a recalibrated "10" π electric component step process of equation 3, and thus what would appear to be the almost exact value for π, as the more correct scale to be put in play, as a type of compromise given the electric and magnetic components are intricately linked as the golden ratio anyway.

What happens to the electric component of the temporal wave function in this instance?

In therefore considering using 10π as the magnetic t_A step as an "electric" ($\frac{-1}{\varphi}$) component, such on a spatial grid would represent how that electric wave function component would align with the primary magnetic wave function component, as per figure 12:

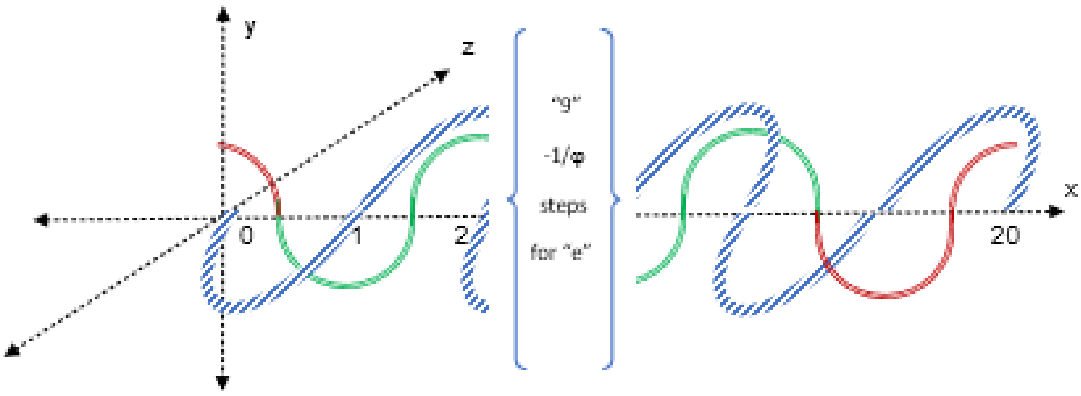


Figure 12: Green line electric component (x,y), blue line magnetic component (x,z), both waves out of phase with each other and perpendicular to each other, magnetic wave used as the 0 start point extending 10 wavelengths ahead. Note the red line area though regarding the electric component, and only 9 full electric wavelengths have been completed, leaving another two partial wavelengths.

Thus, at the start of the magnetic wave, we have a partial electric component, and so too at the end of the magnetic wave (see the red shaded line figure 12). Yet as per the initial paper, according to quanta being a package of a full wavelength ([1]; p13-15) we have to consider that if we are to annex the use of a full and not partial electric step, we need to consider 11 electric steps not 9.

Thus, as we are regarding the electric component for light as the true representation for π, figure 13 is in order:

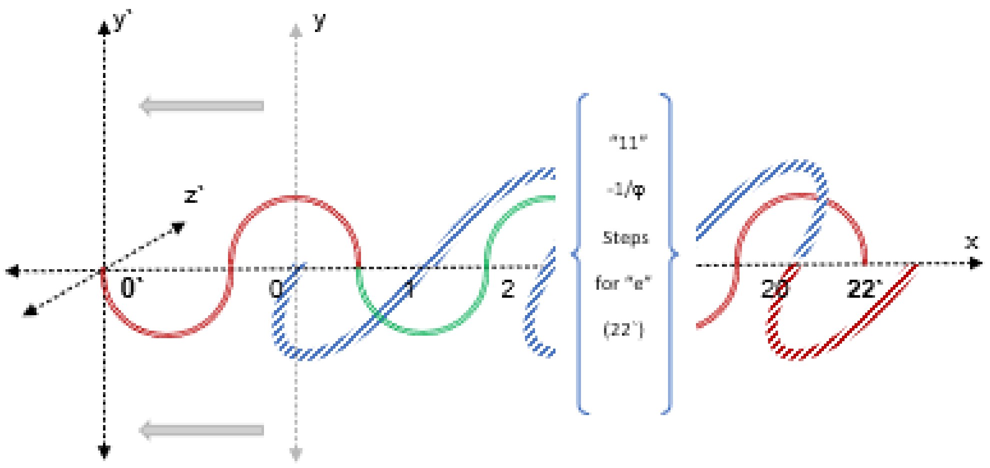


Figure 13: : Note the completion of the electric components of the wave function toward the 0` and 22` markers.

Thus, the idea here is to:

- *Grant equation 6,* $(\varphi \cdot -2\sqrt{3})^2 = 31.416253$*, as the nominated value for a factor of* π*.*
- *To achieve this value (*31.416253*) it needs to be re-interpreted into both a* π *and thence a* $\frac{-1}{\varphi}$ *feature.*
- *To do this requires scaling such as* 10π *steps as a* $t_A = t_B^2$ *magnetic agenda, namely in giving precedence to the magnetic feature of the temporal wave function.*
- *Yet, in giving precedence to the magnetic wave function feature, components of the electric wave function feature are compromised.*
- *This thence warrants the addition of electric wave function components to complete the electric wave function* π*-requirement component for each of its wave function steps.*

Given the wave function progression is in "two" directions from the 0 (0`) reference, (as per fig 8.) along each direction of the x-axis from 0 (0`), we need 11 full $\frac{-1}{\varphi}$ *wavelengths on each side of the x-axis 0 (0`) reference to complete what is required for the two values of the golden ratio (*φ*,* $\frac{-1}{\varphi}$*) to reach* π *along the x-axis for space.*

Thus, there are two results for the golden ratio for $\frac{-1}{\varphi}$ *extending a* π *length in each direction (eq. 3) along the x-axis from 0 (0`), the other as* t_B^2 *result extending 22-*π *lengths (eq. 6), two results on the x-axis extending diametrically opposed to each other from 0 for 11 electric temporal wave function steps.*

Note that we are using the electric step because this is considered as the only way for the wave function to satisfy its requirement to trace π*. The fact two solutions for* φ *and* $\frac{-1}{\varphi}$ *(eq. 4, 5) are not true to* π*-time means they must correct as a process of temporal flow, and thus the wave continues until it satisfies its* π *condition, as per ~11* $\frac{-1}{\varphi}$ *steps along each axis away from the* $\frac{-1}{\varphi}$ *new 0-point. When this happens, when* *the 22-steps are completed, as per the initial paper ([1]; p10-12), the temporal wave function is then proposed to arc back on itself as a concept of wave function "destructive interference" resonance, a resonance that folds back on itself, to thence coagulate matter, as proposed, in the form of the electron, proton, and neutron (as will be explained), subsequent to which the atom is organised according to the derived Rydberg formula ([1]; p15: $R_\infty = \frac{\lambda_E}{2(2\pi a_0)^2}$), and from there quanta can be absorbed or emanate from the atom based on the process of electrons jumping between a shell, ultimately beyond the atom emanating infinitely given it has already satisfied its integration into space in reaching its required tracing of π ([1]; p13-17).*

Once again, to be mindful is that an understated feature here is why we are using the x-axis as a flow of time in space; we have arbitrarily chosen the x-axis for the flow of time in space, as technically in a t_N context we can only use "1" dimension for time (here $t_N = 1$). In a subsequent paper we shall develop this wave function further to incorporate the idea of subatomic particle spin, and in doing so, explain the exact nature of this π-adjusted wave function to dynamically incorporate the y and z axes with space in a more integrated fashion.

This forms the basic mathematical code for any *point* (temporal reference) in space, which determines the potentiality for an atomic locale anywhere in *timespace*.

Note that the term "point source" is used there to describe the reference point of "0" for the spatial axes. A "source" though suggests a temporal beginning, which then ultimately implies a "great beginning" like a big bang, which technically is not the case here. The time-equation is a constant loop. Instead of "point *source*" therefore the "0" axial reference is really a point "*reference*". Thus, from a 0-point reference in space, which could be potentially anywhere, the temporal wave function that develops is the fundamental spatial transformation code, much in the same way of the Lorentz transformation, yet here in accommodating for the time-equation.

Simply, here the transformation mathematics starts with the time-equation which is then applied to the idea of Pythagorean algebraic space which then forms a temporal wave function to then present the case for an *atomic locale* under the condition of π.

The following diagram represents how figure 13 from paper 2 ([2]: p14, fig13) is proposed to relate as a 0-point reference for the atomic radius r as $r = a^0$ (Bohr radius), here as figure 3:

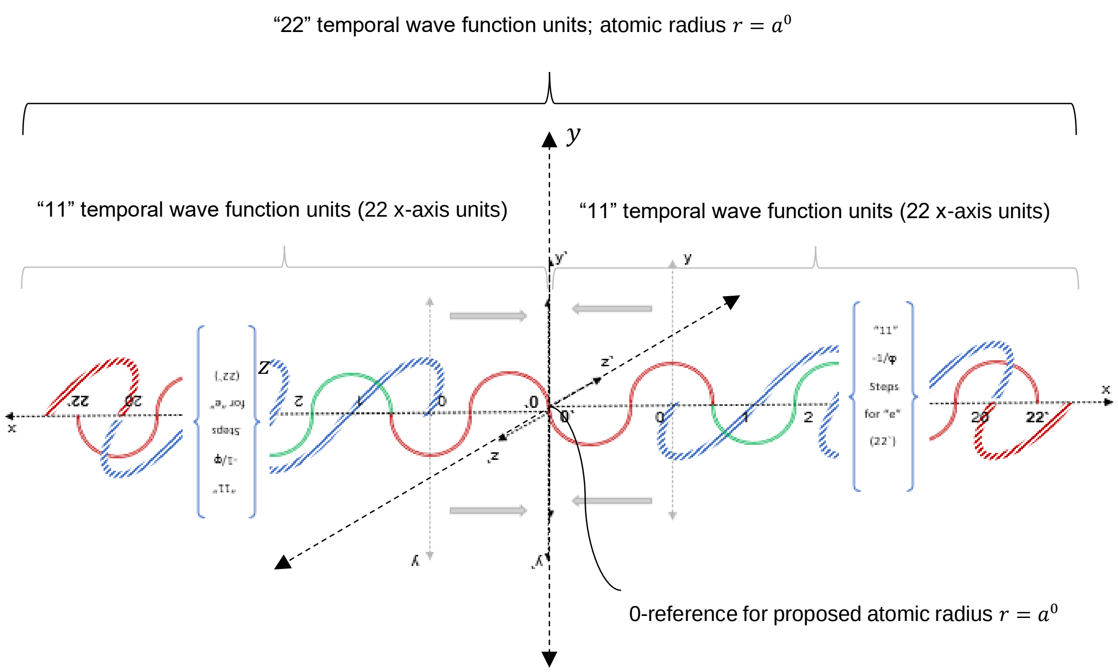


Figure 3: here is how figure 13 from paper 2 ([2]: p14, fig13) is proposed to relate as a 0-point reference for the atomic radius r as $r = a^0$ (Bohr radius),

The next 0-point reference is for the *atom*, as per figure 4, as an adaptation of figure 3:

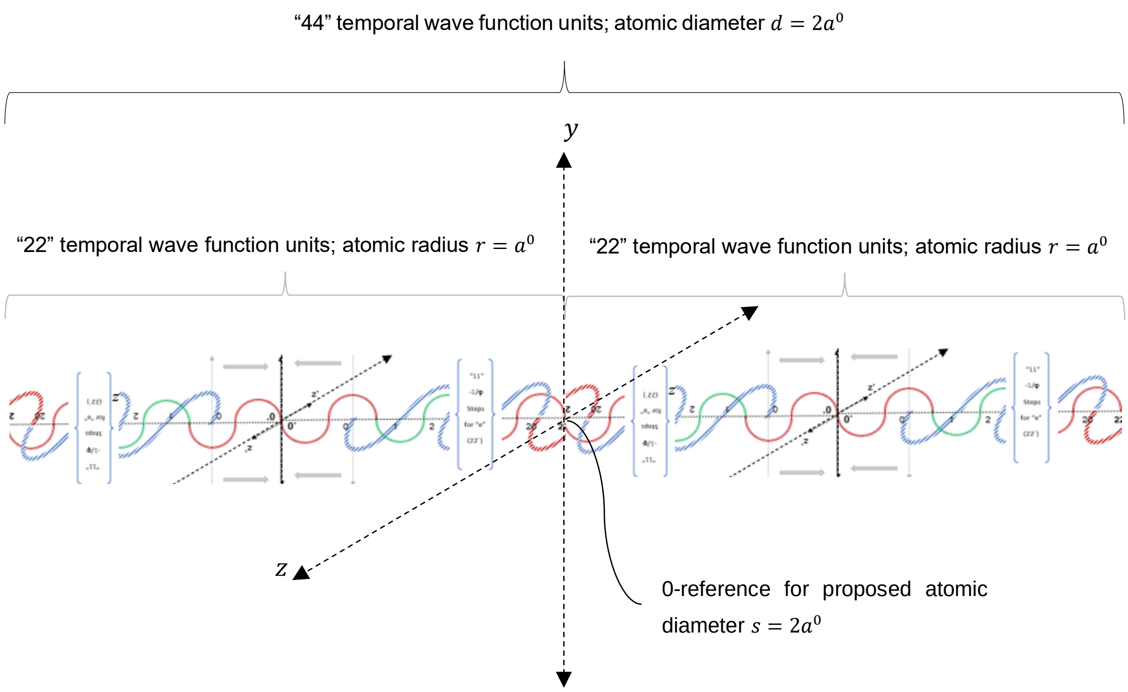


Figure 4: from figure 3 as a new 0-point reference is now the overall atomic scale.

The real question now is, "what *determines* the ***physical manifestation*** of an atomic locale based on this time-equation *thought experiment* blueprint, namely how do the subatomic and elementary particles come into effect?".

The atomic locale manifestation is the process of the theoretic development of Temporal Mechanics in the subsequent works/papers [3-40], namely, to define the conditions that need to exist for the atomic locale for not only particles to manifest, yet how separate atomic locales and particles *link* with other atomic locales and particles *as per the field forces associated to particle manifestation*, all of which were required to be derived and assembled.

The first step of that derivation/construction process was determining some basic ideas of the potential atomic locale construction, and that was initially presented in paper 2 subsequent to the above excerpt, as follows ([2]: p15):

3.5 The fine structure constant

Thus, for 22 wavelength steps (in using both directions from a $\frac{-1}{\varphi}$ 0-scalar reference point), the wavelength λ of the atomic EM would be given by the following equation (where a^0 is the Bohr radius):

$$\lambda = \frac{a^0}{22} \tag{7}$$

If we factor in the value of 2π the equation becomes:

$$\frac{\lambda}{2\pi} = \frac{a^0}{2\pi \cdot 22} \quad = a^0 \cdot \frac{1}{138} \tag{8}$$

Compare this to the equation for the fine structure constant of the atom ($\frac{1}{137}$) [3]. This is similar to the true value of the fine structure constant which points to the fact, via calculation, that the number of wavelengths is not 22 yet 21.8. Why? It is proposed that the fine structure constant is the need for a monopolar time force to find the perfection of a circle, and can only do so in considering two monopolar electric sources, ultimately as 22 wavelengths between each two monopolar sources, the electron and proton (as shall be derived), as per the atom, yet with a slight length contraction of that 22 value, from 22 to 21.8.

Why the length contraction in the atom to bring the calculated value of $\frac{1}{138}$ to $\frac{1}{137}$?

It is proposed to be due to the overall interaction between the electron and the proton, that attractive force between the two when they become manifest as the atom, a force we have yet to factor in (although the basis for their existence was explained in the first paper ([1]; p9-11), a feature that shall be explained in subsequent papers.

Simply, the proposed fine structure constant here ($\frac{1}{137}$) would be indicative of the electromagnetic strength between the subatomic charged particles.

Thus, in recalibrating our "22" scale to accommodate for the fine structure constant, it brings it to 21.8 (eq.9), a recalibration to be verified in subsequent papers.

$$\frac{\lambda}{2\pi} = \frac{a^0}{2\pi \cdot 21.8} = \frac{a^0}{137} \qquad (9)$$

Here is a basic fundamental insight to the workings of the fine structure constant and how it is calibrated. As the above excerpt from paper 2 highlights ([2]: p15), it was proposed that there would be a type of contraction of the "22" temporal wave function steps of the *atomic radius* to a value of "21.8" owing to the proposed *particle charges* in play (positive and negative) and their effect on one another. That had not been demonstrated at the time of paper 2 [2]. Yet much of the work of Temporal Mechanics from paper 2 [2] set out to derive the particles, their charges, and thence the true value for the fine structure constant ([39]: p46-52). However, there was one overlooked piece of evidence of paper 2 [2] that is worthy of investigation lending support to the "21.8" amendment, and it bears particular reference to the "basic" "10"-step π calculation, namely the following once again ([2]: p12-14):

3.4 Completing the wavefront for time in space

So, how do we perfect the wavefront value of π as a t_A result for $\frac{-1}{\varphi}$ as t_B^2, given $t_A = t_B^2$ is a condition for applying time to space as a perfect circle?

If we consider that $t_A = t_B^2$ (in ignoring the value of π as t_A for the moment) we get the following results for the golden ratio equation:

$$(\frac{-1}{\varphi} \cdot -2\sqrt{3})^2 = 4.583533 \qquad (5)$$

$$(\varphi \cdot -2\sqrt{3})^2 = 31.416253 \qquad (6)$$

Note the squared value for $\frac{-1}{\varphi}$ (electric component, equation 5) is roughly the negative of the value of time for φ (magnetic component, equation 4), suggesting an embedded "negative" connection between the electric and magnetic components of the wave function in this networked time-looping structure; basically, when the electric component $(\frac{-1}{\varphi})$ is used as t_B^2, then the result should be roughly a value of 4.6 as what the magnetic component per equation 4 proposes except with equation 5 as a positive value. The thinking here is that such is an underlying basis feature of the interlaced temporal sinusoidal wave going from a positive curve to a negative curve divining the concept of EM induction, to be discussed further in a subsequent paper.

<u>To be noted more importantly though</u> is the squared value for φ (31.416253) for equation 6, namely a close value for <u>10π</u> in considering equation 3, the electric component step, closer than the initial equation 3 process for $\pi's$ formulation.

We can propose therefore that the value for φ in the context of equation 6 offers a closer value for π as the idea of a recalibrated "10" π electric component step process of equation 3, and thus what would appear to be the almost exact value for π, <u>as the more correct scale to be put in play</u>, as a type of compromise given the electric and magnetic components are intricately linked as the golden ratio anyway.

What happens to the electric component of the temporal wave function in this instance?

In therefore considering using 10π as the magnetic t_A ***step as an*** *“electric” $\left(\frac{-1}{\varphi}\right)$ component, such on a spatial grid would represent how that electric wave function component would align with the primary magnetic wave function component, as per figure 12:*

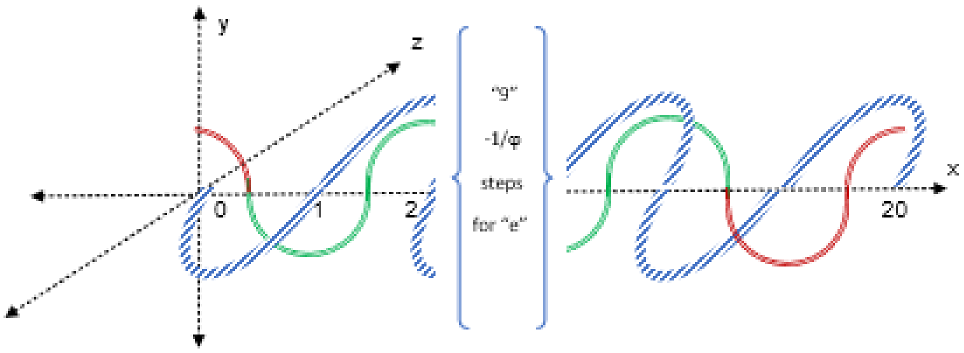
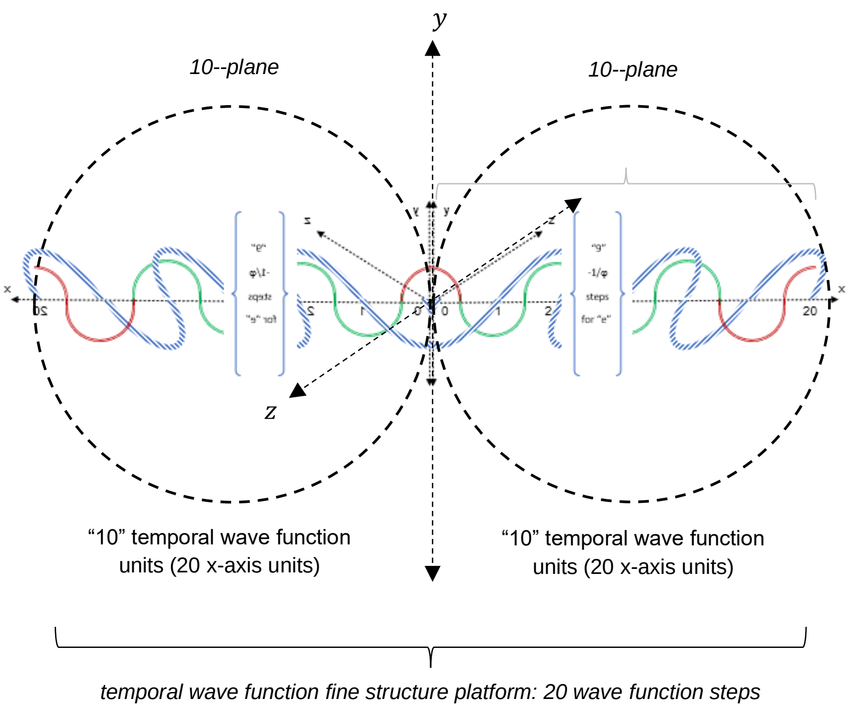


Figure 12: Green line electric component (x,y), blue line magnetic component (x,z), both waves out of phase with each other and perpendicular to each other, magnetic wave used as the 0 start point extending 10 wavelengths ahead. Note the red line area though regarding the electric component, and only 9 full electric wavelengths have been completed, leaving another two partial wavelengths.

Essentially, what we have here is a basic plane of influence for a basic “20” value (10 wave function steps for each x-axis vector direction) x-axis calibration, such for “10” temporal wave function units from a 0-reference, as per figure 5:

Figure 5: from figure 12, paper 2 ([2]: p13, fig12) is the temporal wave function *10-plane*, namely “10” temporal wave function units as the basic temporal wave function scale in addressing the π-requirement.



Proposed here is a basic plane of influence for a basic "20" value (10 wave function steps for each x-axis vector direction) x-axis calibration, such for "10" temporal wave function units from a 0-reference. Such is proposed to represent a basic *uncalibrated* range and <u>*not*</u> calibrated to 22 wave function steps, as described in the previous excerpts; here is not a true atomic radius per se, yet this new temporal wave function plane accounting for equations 5 and 6 of paper 2 ([2]: p12, eq5-6), while addressing the basic *10-plane* of influence.

The temporal wave function *10-plane* of influence for each direction of the x-axis from 0 is proposed to represent the basis for π, as it is the number of wave function steps (units) that the derivation of space (from the time-equation) finds most closely matching the true value for π, as per equation 6, paper 2, namely $(\varphi \cdot -2\sqrt{3})^2 = 31.416253$ as the electric component of the temporal wave function. The associated *magnetic* component of the temporal wave function there is as per equation 5 of paper 2, namely as $(\frac{-1}{\varphi} \cdot -2\sqrt{3})^2 = 4.583533$. Let this value be considered as μ, *the magnetic factor* of the temporal wave function.

Thus, the proposal here is that the electric component for the temporal wave function is associated to the value of π (approximated from equation 6, paper 2, as 3.1416253), and the magnetic component for the temporal wave function is associated to the value of μ (approximated from equation 5, paper 2, as 4.583533).

Thus, the ratio of π and μ, as $\frac{\pi}{\mu}$, represents the value of 0.68541566.

The next proposal is to consider this ratio as a temporal wave function *scale* that can be translated as a 2d temporal wave function plane for the 10-scaled temporal wave function for each direction of the vector x-axis from 0 (see figure 5). A plane is considered here given that the temporal wave function is being considered as a 2d plane of spatial and temporal activity. The value proposed here is in considering the two directions of the x-axis vector (comprising the proposed radius of an atomic locale), and thus as the value for double the surface area of a standard circle, namely $2\pi r^2$, yet here not as $2\pi r^2$, yet $2\frac{\pi}{\mu}r^2$, the value for r here being "10" for each *10-plane* of influence, noting that a full temporal wave function unit is a value of "2", and thus an overall *10-plane* an actual value of 20, and thus a radius of 10 as r. Thus, the following equation value becomes apparent:

$$2\frac{\pi}{\mu}r^2 = 137.08313 \qquad (4.)$$

$$137.08313 \cong \frac{1}{\alpha} \qquad (5.)$$

The proposal here therefore is that the temporal wave function as a basic *10-plane* scale represents the blueprint for what becomes the fine structure constant value of α, the actual value there being $\frac{1}{137.035999}$. To note also is that α by definition represents the electric binding strength of the atom. Such was derived in paper 39 ([39]: p46-52), with all the required descriptions of the electric binding strength. Here though the proposal is for a more fundamental fine structure value, here say as α_X (X being symbolic for the roman numeral 10, here in reference to the *10-sphere*), equation 6:

$$\alpha_X = \frac{\mu}{2\pi r^2} = \frac{1}{137.08313} \tag{6.}$$

Essentially, α_X represents the magnetic component of the *10-plane* ***per*** the electric surface area component of the *10-plane*, forming the basis for the actual fine structure constant value as derived in paper 39 ([39]: p46-52) according to the descriptive definition of the fine structure constant, namely as a measure of the basic and primary electric feature of the atom quantifying the strength of the electromagnetic interaction between elementary charged particles as related to the elementary charge e, thence denoting the strength of the coupling of an elementary charged particle with the EM field of the atomic locale.

Such (α_X) is not the actual known fine structure constant value, for α had to be calculated in first calculating the actual electrostatic forces of the atom, as per paper 39 ([39]: p46-52), yet here is proposed to be a baseline fine structure constant factor, α_X the proposed fundamental blueprint for the fine structure constant of the temporal wave function, here as that which defines a ratio between the proposed *electric* and *magnetic* features of the temporal wave function, a quantum of light, *a most fundamental* constant, a value closely matching the known value of $\frac{1}{137.035999}$, yet here as α_X being symbolic of the actual binding strength of the temporal wave function.

Once again, to note is how Temporal Mechanics presents the basic platform for physical phenomena to manifest, that blueprint. The aim has been to describe the blueprint as a *thought experiment* of what is observed of reality, all the physical phenomena and associated scales.

How then reality manifests is proposed to be according to a general process of all the atomic locales interacting with each other with this blueprint initial condition in mind. The "chaos" (random nature) of that entire scheme was presented in paper 3, pages 4-5 ([3]: p4-5:

The scale of the error for "x" needs to be considered, and so we must add a new constant k; thus repairing eq. 2 we now have:

$$x_{(t_B+1)} = k \cdot x_{t_B}(1 - x_{t_B}) \tag{[3], eq3}$$

This constant k would represent a feature that highlights a sensitivity to the underlying temporal wave function atomic processes at play, as what we can term "initial conditions" for the error "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 erroneous feature of the golden ratio time-equation, namely the disparity between the value for π used for the temporal wave function and the true value for π.

This is not the first time we have seen this equation, as it represents the "logistic map equation" [9], used in chaos theory [10], defining the idea of chaos with an underlying sensitivity to initial conditions [11], promoting fractal lattices [12], an equation that has been used to successfully study sentient population growth [10].

Here, we can propose that the "x" paradigm would be sensitive to the underlying initial conditions of the atom, and that the value "k" can be adjusted to accommodate for the proposed directive of time in space, and one way it can do this is through a fractal Fibonacci sequence [13] process of spatial modelling, given that the Fibonacci sequence is a golden ratio algorithm [14].

In then taking a step to paper 39 [39], the *thought experiment* bares particular focus on the fundamental properties of physical phenomena with the correct derivation of the fine structure constant α and Planck's constant h, and thence the values for k_e and yet more fundamentally $G.$ There also in paper 39 ([39]: p59-65) is a correct derivation of the known phenomenal features of the sun. Thence in paper 40 the features of the proton and thence strong nuclear force are derived ([40]: p20-38) leading to the proposal for the foundation of a unified field theory.

7. Resolving quantum fluctuations in space

The key inventive step with Temporal Mechanics is how time is proposed to relate with space. For instance, take a scale from 0 to infinity as a line in space. Make an axis for these numbers. Call this axis 1d space. Why 1d space? Why not 1d time? Of course, that is the question in relating time with space, namely how would mathematics thence apply as a system of numbers to time *and* space together using spatial dimensions? Does the mathematics take priority over time and space, or should time and space relate to each other a certain *way* with numbers?

Temporal Mechanics first identifies how time and space *relate* to one another *a certain way* using the code of our perception ability of time as per a mathematics to then derive the idea of space as per section 6 here, to get that number-system scaled correctly from the start, a scale according to our realistic temporal and spatial perception ability.

In this process of relating time with space, Temporal Mechanics has found that there is a *limit* to mathematics in regard to time being applied to space. Not a limit to numbers themselves, yet a limit to how numbers can have time applied to space, hence a *micro* scale limit for physical phenomena (elementary particle *mass-gap*), and a *macro* scale limit for physical phenomena (cosmic boundary), as presented in paper 36 ([36]: p14-26), noting there that the proposed cosmic boundary is not an assumption or pre-requisite, yet a *derivation*.

In presenting the case of a new *a priori* for the dimensions of time and space, namely in more fundamentally addressing the human perception ability of time and space, and thence formulating a more fundamental *thought experiment* script, Temporal Mechanics has found some interesting codes in play in regard to the mathematics of our conscious ability of time and space, here as the following theory-pattern features for physical phenomena:

- The basic time-domains as associated with space ([2])(section 6).
- The time-equation based on the time-domains ([2])(section 6).

- The π temporal wave function as by associating the time-equation to Pythagorean algebraic space ([2])(section 6).
- The resultant π atomic locale ([2])(section 6).
- The fine structure constant based π atomic temperature plexus (new basis for thermodynamics) ([38]: p39-46).
- Derivation of $E = hf$ for the atomic locale (basis for the fine structure constant and h) ([3]: p2-4)([39]: p52-59).
- Derivation of $E = f$ for extra-atomic space and associated $CMBR$ value (new basis for energy in space) ([13]: p6-13).
- Derivation *of* G and its association to Euler's formula ([39]: p41-46)([40]: p15-16)
- Maximum and minimum mass scales deriving the phenomenal values of the sun ([36]: p14-26)([39]: p59-67).
- The new cosmological scales deriving the known scales and phenomenal features of the sun ([32-34])([39]: p59-67).
- The *electron degeneracy* derivation and associated cosmological phenomena (subatomic astrophysical phenomena and proposed cosmological *scales* [32-34])([39]).

With these new theory-processes, previous questions of physics central to General Relativity, Quantum Mechanics, the Standard Model of particles, thermodynamics, and cosmology, are addressed and resolved:

- How at c *time=0* in the context of deriving time-dilation/contraction as associated with gravitational effects with light ([2])(section 6)([39]: p7-9).
- The atomic locale with the derivation of h, α and k_e ([39]).
- Deriving the elementary particles ([24-24])([35]).
- Temperature compression scales of the atom deriving both the proton magnetic and charge radii, thence deriving the phenomenon of cosmic radiation ([38]: p38-39)([40]: p21-23).
- Deriving the energy requirement and dynamic of space to account for an isotropic $CMBR$ ([13]: p6-13)([14]: p17-30).
- The derivation of the cosmological scales (sun, stars, black holes) ([32-24])([39]: p59-67).

Once again, these are *derivations* from an *a priori thought experiment*, such as compared to putting a data jigsaw together, here as mathematical derivations from the *a priori* thought experiment, putting the data pieces together nonetheless through that fundamental basis, namely in using the dimensions of time and space as the *a priori*, and not momentum-inertia-mass, a process considered as a more fundamental basis (as dimensions) than momentum-inertia-mass. Simply, here Temporal Mechanics finds that mathematics, the use of numbers, needs a compass; the ideal compass Temporal Mechanics has found is central to the dimensional facilities we have available to us to observe in the first place, namely time and space.

As highlighted above, a key value that comes up in the mathematics of the proposed *thought experiment* is π; here, the basis of the calculation of time with space is in the temporal wave function extending in space according to a spherical wavefront, and thus in abiding by π.

π was calculated in paper 15 using a real-number series as fractions in the context of applying time to space in the Pythagorean manner mentioned, pages 3-7 ([15]: p3-7). For the atom, π charters the idea of a "*potentiality*" of any nominated point in the atomic sphere (electron shell), forming a basis for the uncertain positioning of the electron in an atomic shell locale. As such, π determined that the Bohr radius a^0 and charge of the electron e_c were used as the only two scales for Temporal Mechanics, under the emphasis of π*, to then derive all else, simply because all three (*π, a^0, e_c*) form the key i*n applying time to space with mathematics in prescribing the basic nature of the atom, noting electron charge (e_c) to be a basis for the idea of energy with time.

In this process of using these three basic phenomenal features *(*π, a^0, e_c) with the basic time-equation ($t_B + 1 = t_A$) as the mathematical basis of the primary *thought experiment*, the atomic locale can be defined together with the more intrinsic features of α, h, and k_e, as derived in paper 39 [39]. Also, to note is that the temporal wave function forms the basis of electromagnetism as both a particle and a wave, as explained here in section 6. From such, an interesting feature became apparent, namely the application of Euler's number to the time-equation, realizing it played an important role with energy in regard to gravity, as presented in the recent paper deriving the nature of Quasars and their jets ([40]: p28-33), also presented here in equations 2-3.

8. Resolving Einstein's *thought experiment* flaws

Temporal Mechanics is a simulation and resultant mathematical derivation of our temporal and spatial perception abilities. As a simulation, of fundamental importance is how it derives known phenomena, all those exact values, associated particle and wave phenomena, and field force effects, from the initial known scales of electron charge e_c for energy, the Bohr radius a^0 for distance, and of course "1" as the nominated value for the time-domain of *time-now*.

Key here though is in Temporal Mechanics presenting a more <u>fundamental</u> *thought experiment*, thence resolving a key error of Einstein's General Relativity and Quantum Mechanics, namely the proposed $E = hf$ quantum fluctuation energy requirements (of Quantum Mechanics) for free space (Einstein's cosmological constant issue).

Here, Temporal Mechanics presents the case that Einstein's error is in failing to account for the isotropic $CMBR$ energy requirements of space, instead relying on the Quantum Mechanical equation of $E = hf$ of energy for free space. In other words, Einstein did not properly derive the required energy value for space in not properly accounting for the concept of time with 3d space, instead seeking to derive time from the relativity of moving objects in space, which ***is the*** fundamental error of Einstein's relativity theories, no matter how brilliant Einstein was at the time. In short, to resolve the energy problem inherent to General Relativity (and associated metric expansion of space requirement) is in finding the source of that energy *or* to challenge General Relativity, namely either finding dark energy or discounting that need for dark energy.

G was derived in paper 39 ([39]: p44, eq20) as the following where M_{MG} is the mass-gap value, namely the mass of the lightest particle, the neutrino (ν):

$$G = \frac{33\, M_{MG}\, c^3}{2} \qquad \text{([39]: p44, eq20.)}$$

From this equation, in applying the formula $E_{MG} = M_{MG}\, c^2$ (as derived in paper 22 ([22]: p17-19), then the following is in order:

$$G = \frac{33}{2} E_{MG} \cdot c \qquad (7.)$$

Here therefore represents a specific energy value E_{MG} for G according to the energy value of the lightest particle ν, the neutrino (labelled here as M_{MG}, namely the "*mass-gap*" mass), and so here E_{MG} is the *mass-gap* energy value, bearing in mind how the $\frac{33}{2}$ was derived in paper 39 ([39]: p43-44, eq15-20). The feature here nonetheless is that the equation 7 resolves the aetiology of gravitational energy, ***not*** as gravitational potential energy (as described by classical mechanics), yet the actual *field* energy of gravity.

This field energy for gravity is a complex description in itself, housing many physical phenomenal features, and is reserved for a subsequent paper where importantly the energy value for G can be shown to complement the derived isotropic $CMBR$ value of $2.725K$ ([37]: p23-30) and associated phenomenal features such as the Lamb shift effect.

Nonetheless, beyond such an energy description for G, paper 40 ([40]: p20-25) presented how "momentum-energy" tensors can be annexed by G, thus solving General Relativity's dilemma of mass becoming super-massive in approaching c. The core problem paper 40 [40] found with General Relativity is using momentum-inertia-mass incorrectly as mv as an *independent* entity when momentum is more correctly derived (specifically v and thus also energy) to be contained in the G constant holding $G = v^2c^2$ ([40]: p21, eq10) which by that process resolves Einstein's local *spacetime* geodesic problem and associated energy requirements (which lead him to his cosmological constant problem requirement of energy).

To note in paper 40 ([40]: p20-22) is the basis for Newtonian mechanics, and how with the time-domain scheme the value for proton speed of cosmic rays can be calculated, repairing the momentum-inertia-mass issue of Einstein's theories of relativity. As paper 40 proposes ([40]: p20-22), G is still a constant (as "v" here is defined as a constant value for a "time-domain" where *time-now=1*), yet has features of both energy and being a field effect at the value of c ([38]: p42, eq14):

$$G = 1.39 \cdot c \cdot e_c \qquad \text{([39]: p42, eq14.)}$$

As according to paper 39 ([39]: p41-42) the $1.39K$ value is half of the $2.78K$ value ($2.78K$ *being slightly above the baseline* $2.725K$ *in this incursion-event maximum-minimum mass context ([38]: p42)*), the $2.78K$ representing *an incursion event background temperature value* owing to a maximum-minimum mass-incursion and associated absolute EM limit event, making the $1.39K$ factor truly a *sub-*EM phenomenon of space, namely *gravity*.

Essentially, the $1.39K$ value is derived with e_c.in the context of a type of "*electric*" geodesic of the sun given the phenomenal features of the sun were derived in that same equation context ([39]: p59-67), as confirmed by data from NASA [51]). It is as though gravity is a sub-EM field, ½ the minimum temperature value scale for a temporal wave function (EM) incursion event ([39]: 41-46), as of course the process there is a proposed folding of an incursion quantum value of $2.78K$ (EM^{DIR} field effect), and thus a *halving*, therefore noting that gravity is EM dark.

To note also is that the Voyager space-crafts [52] have confirmed the Temporal Mechanics derived distance of the sun to the Heliopause and Oort cloud and the *type* of phenomena at the Heliopause ([32]: p8-18). In research ahead, the James Webb telescope [53] will be a way to confirm or deny the maximum redshift of stars at $z11$. Temporal Mechanics proposes a maximum redshift of $z11$. In all, Temporal Mechanics has a specific and broad reach with what it can derive and match with known data.

Simply, by the Temporal Mechanics *thought experiment* process momentum-inertia is derived to be standardized for a variable mass ([40]: p20-22), namely as an inclusion into the G constant, and thus resolves Einstein's dilemma of mass becoming supermassive as it approaches c, while revealing the fundamental energy component of gravity as per equation 2 (in this paper), in thence deriving the microscopic scales and large scales of physical phenomena.

Conversely, the General Relativity *thought experiment* approaches the idea of time in saying time emerges from the relative motion of objects in space. There, the problem becomes apparent of how energy would emerge with time with a metric expansion of space, a feature presumably of dark energy (energy nonetheless). Such is the issue with General Relativity, namely incorrectly accounting for the energy requirement of space, warranting the need for dark energy which itself is a “fix” and not an observed phenomenon, hence its “dark” labelling. Further to such, the question of why the metric expansion of space is not also the metric expansion of *spacetime (*if as space expands a *time component* is included with that expansion process) needs to be asked. Yet according to Special and General Relativity, time is a derivation of momentum-inertia-mass objects in relative motion, which thus makes Einstein’s description of time incomplete in not addressing the temporal component of the proposed metric expansion of space. Given such, no reasonable alternative to the "metric expansion of space" theory can be presented without asking how a metric expansion of space is not also a metric expansion of *spacetime,* and then debunking both.

What Temporal Mechanics proposes is that if *time-now* as the datum reference is defined as "1", then the idea of a fixed relative frame is defined as such, and so any different gradient speeds would need to be accommodated for by another mechanism, namely time dilation-contraction in accounting for the time-domains of *time-before* and *time-after*. This is explained throughout paper 40 [40].

In short, no matter "***what***" type of relative motion of objects in space seeking to explain c for each reference, at any reference for c, in ***any*** reference of motion, time at c is still "0". Such is why a time-domain of *time-now* needs to be set at the value of a "unit" to then apply to any other time-domain of *time-before* or *time-after* that accounts for the forces of those relative motions in play in view of, in accommodating for, a field (force equation) encompassing the time-domains of *time-before* and *time-after*, which Temporal Mechanics has provided for EM, G, and classical mechanics. Note, such is not a way of making time as doppler, as doppler is a secondary feature, namely how the reference of a body internally pings with light (namely time-dilations or contractions) and thence gives its temporal (frequency-wavelength) ping, still at c though as a ping in space.

9. Data reliability, and achievements of the Temporal Mechanics *thought experiment*

In terms of the quality of data Temporal Mechanics relies on, all the data Temporal Mechanics relies upon is already observed and known and qualified by all the relevant sources.

This was considered as the ***Intended Phenomena Design*** process, the IPD of Temporal Mechanics, namely the in-built feature of pointing the *thought experiment* construction and exercise of $temporal\ calculus$ *to accommodate for known real data and associated equations*.

Einstein used a similar process, principally that Einstein considered his Theory of Relativity to belong to a class of "principle-theories" employing an analytic method, namely that the elements of his theory are not based on hypothesis but on empirical discovery, or rather, data that is already observed and known. The IPD is the same concept, yet relying not just on data, yet the equations behind the data. Quite simply, Temporal Mechanics did not need to investigate reality through trial and error yet depended on the entire data set of physics knowledge that had already achieved such trial and error, on testable results, from papers 1 to 40 [1-40].

Two fundamental constants have been relied upon by Temporal Mechanics, namely:

- the "*spatial scale*" itself of the Bohr radius a^0, as $a^0 = 5.2917721 \cdot 10^{-11} m$
- and the "*charge*" of the electron e_c, as $e_c = 1.602176634 \cdot 10^{-19}\ C$.

Here, a standard for distance is considered as fundamental, and so too a standard for a basic unit of charge. All other values in physics and associated equations have been a part of the quest of Temporal Mechanics to ***derive*** from its proposed temporal $a\ priori$ time-equation and its application to Pythagorean algebraic space as the *thought experiment* process, namely in being *scaled* with the Bohr radius a^0 and standard unit of charge e_c.

There have been instances where attempts have been made to reach certain constants and equations (such as the fine structure constant α and Planck's constant h early in the formulation and construction process), yet in the absence of not arriving at those values and equations the true values were carried nonetheless until sufficient theory was formulated to then derive those values and equations.

Thus far, Temporal Mechanics as a *thought experiment* has ***derived*** the following using the time-equation and associated Pythagorean (spatial) temporal wave function as being applied to the known metric of the Hydrogen atom, namely *the Bohr radius* a^0, and *charge of the electron* e_c:

- EM and G temporal analogue equations of force ([1]: p9-14).
- Rydberg constant and equation ([1]: p15-17).
- Electric monopole and magnetic dipole as a temporal wave function ([2]: p12).
- Temporal EM wave function related to atomic locale ([2]: p6-15).
- Atomic locale scale with the temporal EM wave function ([2]: p13-15).
- Provisional Fine structure constant value ([2]: p15, eq9).
- Value for c ([2]: p16, eq10).
- Provisional electrostatic charge force k_e constant ([2]: p13, eq13).
- Electron shell energy quota ([2]: p17-20).
- Provisional Planck equation analogue $E = hf$ ([3]: p3, eq1).
- Chaos equation (initial conditions) ([3]: p4, eq2).
- Provisional gravity constant G for the gravitational force equation ([4]: p5, eq1).
- Provisional atomic crystalline structure regarding particle location ([4]: p8-11).
- Avogadro's number N_A ([4]: p12, eq 6).
- Entropy-enthalpy dynamic of the atomic locale ([4]: p3-11).
- Negative energy proposal for gravity ([7]: p2-3).
- EM^{DIR} experiments 1 & 2 (EX1-2) ([7]: p6-16).
- Primary mathematical time-equation derivation ([8]: p3).
- EM^{DIR} experiment 3 (EX-3): ([12]: p10-12).
- Maximum redshift value proposal ([13]: p9-12).
- Variable h equation for extra-atomic light ([13]: p11, eq5).
- Oort cloud distance from Sol ([13]: p11, eq8).
- Atomic temperature scaling system ([14]: p23, fig6).
- Vacuum energy factor V_A ([14]: p23, eq8).
- Vacuum energy value ([14]: p23-24, eq9-10).
- Lamb shift value ([14]: p22-24, eq9).
- Preliminary Boltzmann constant ([14]: p26, eq17).
- Cosmological $CMBR$ value ([14]: p24-25, eq12).
- $CMBR$ temperature ([14]: p25, eq13).
- Perihelion of Mercury ([14]: p27-28).
- π-algorithm ([15]: p4-7).

- Euler's equation as time with energy ([15]: p11, eq6).
- EM^{DIR} experiment 4 ([17]: p18-22).
- Energy and mass relationship equation (fundamental properties) ([19]: p10-13).
- EM^{DIR} experiment 5 ([19]: p15-18).
- Time-equation electron cloud description ([20]: p11-13).
- Linking EM with G ([21]: p14-23).
- Gravity as entropy ([22]: p4-7, p13-17).
- Mass-energy fundamental relationship ([22]: p17-19).
- Bose-Einstein condensate ([22]: p19-20).
- Atomic pulsar signature ([22]: p20-23).
- EM^{DIR} Experiment 6 ([22]: p23-26).
- Particle location derivation from the time-equation ([23]: p12-20).
- Time-point aether proposal ([23]: p15-17).
- Proton/neutron mass from electron charge ([23]: p22).
- Vacuum permittivity ([23]: p29-30, eq5).
- Vacuum permeability ([23]; p29-30, eq7).
- Alternative-derivation $CMBR$ value (GHz) ([24]: p26-27, eq1-6).
- Elementary particle sets of subatomic particles ([25]: p40-48).
- Higgs mass ([25]: p45, eq9).
- Mass gap (Mass of neutrino) ([25]: p51, eq10).
- Asymptotic freedom, Kaons, Baryon Asymmetry ([27]: p10-12).
- Particle confinement (ABE) ([27]: p12-13).
- Resolving Bell's Theorem [29].
- 5 principles of simplicity (*timespace*) ([30]: p12-13).
- $X17$ particle as the magnetic quantum shell mass ([30]: p19-20).
- Pauli principle ([30]: p18-19).
- $CMBR$ polarization ([30]: p21).
- Heliopause distance from Sol ([32]: p14-15).
- Bow shock distance from Sol ([32]: p15-16).
- Black hole and stellar phenomena proposal ([33]: p4-17).
- Distance to nearest apparent star ([34]: p24, eq2).
- Apparent age of universe ([34]: p25-28, eq4).
- Apparent age of milky way ([34]: p28-29, eq5).
- Neutrino-antineutrino mass pair derivation from Planck length ([35]: p27-28, eq2).
- G constant from neutrino mass ([35]: p28-29, eq3).
- Mass of the electron and positron from Planck length ([36]: p15-18, eq1).

- $Time = space$ equation ([36]: p19-21, eq3).
- Maximum mass of Sol ([36]: p24-25, eq8).
- Planck length from maximum mass of Sol ([36]: p27-28, eq11).
- The *axiom* of time ([37]: p8-11).
- Entropy and enthalpy as features of time's arrow ([37]: p14-18).
- CP violation aetiology ([37]: p14-23).
- Isotropic $CMBR$ aetiology ([37]: p29-31).
- Quasiparticles and phonons ([38], p14-17).
- Particle pair production ([38], p17-22).
- Symmetry breaking ([38], p22-24).
- Aetiology of electron and positron charge ([38], p17-24).
- Aetiology of electron and positron spin ([38], p17-24).
- Proposed electron radius r_e ([38], p24-46).
- Proposed proton radius r_p ([38], p24-46).
- π linking r_e and r_p ([38], p39).
- Electron black body radiation ($CMBR$) ([38], p47-52).
- Gravitational constant *temperature-charge* equation, $G = 1.39 \cdot c \cdot e_c$ ([39]: p42).
- Gravitational constant mass-gap equation $G = \frac{33\, M_{MG}\, c^3}{2}$ ([39]: p44).
- Fine structure constant α ([39]: p51).
- Planck constant h ([39]: p55).
- Planck temperature T_P ([39]: p57).
- Planck mass m_P ([39]: p57).
- Coulomb constant k_e ([39]: p59).
- Solar core temperature $T_{\odot}$ ([39]: p61).
- Solar radius $r_{\odot}$ ([39]: p62).
- Solar surface area temperature $T_{\odot A}$ ([39]: p63).
- Solar luminosity $L_{\odot}$ ([39]: p64).
- Solar corona temperature $T_{\bar{\odot}}$ ([39]: p64).
- Newtonian mechanics equations ([40]: p20-21).
- Proton electric radius r_{p_e} ([40]: p23).
- Cosmic ray maximum speed v_{pc} ([40]: p24).
- Strong nuclear force ([40]: p27).
- Light's geodesic with gravity $e^{i\pi}_{t_B}$ ([40]: p31).

The overall process here of derivation for the Temporal Mechanics thought *experiment* is to first derive the features of the atom (particles and field forces) and to then reach the derivation of the phenomenal features of the sun, Sol, to then have all of such properly scaled in the solar system (deriving those scales, namely Kuiper cliff, Heliopause, Bow shock, and Oort cloud) in the thought experiment blueprint, and then to have all of such form the basis for cosmology theory, for explaining the nature of the stars as a *derivation*.

The thinking here is that it makes sense to ask ourselves what we are most absolutely able to derive/theorize as based on our temporal perception ability, and those absolute constraints, to then theorize time and space as a model of reality upon our absolute if not *most basic* perception ability as a basic and fundamental *thought experiment*.

Here, Temporal Mechanics only regards the idea of a *thought experiment* in terms of "theoretic ability" in then deriving a physical theory by considering our physical conscious ability for time and space in mathematizing our conscious temporal ability with a time-equation for *time-before*, *time-now*, and *time-after* and then applying that to Pythagorean algebraic space, to thence develop a *temporal wave function* and thence a *physical theory* proposal.

The test of that physical theory proposal from the fundamental dimensional *thought experiment* for time and thence space is how well the derived temporal wave function can fulfil the task of being an EM *analogue*, *deriving* the fine structure constant of the atomic locale, the atomic locale particles, $E = hf$, together with deriving the known physical constants, values, field forces, and so on, which Temporal Mechanics has accomplished.

10. Conclusion

In many respects, physics aims to define the difference between thought and knowledge, between thinking and knowing, between hypothesis and certainty. Here, Temporal Mechanics presents the case for a *thought experiment* more fundamental than that of Einstein's, dealing primarily with the fundamental concepts of time and space and their relationship to one another, and not primarily physical mass in relative motion, thence revealing the fundamental nature of time and space in deriving the nature of physical bodies in relative motion in complementing the known data of physics.

Technically, all the computer simulations and modelling for reality that scientists and mathematicians are trying to achieve are irrelevant to theoretical physics if we already exist in a natural simulation that we can access by understanding our basic features of time and space conscious appreciation. Such is perhaps the greatest oversight of modern physics. The proposal here is to therefore give our perception abilities with time and space credit in a proper thought-experiment, as presented here, as though our perception ability with time and space was no fluke yet a process of how we have perhaps evolved in adapting ourselves as a conscious species to reality, to space and time. Conversely, Einstein presents the case with his *thought experiment* that time is a mass-doppler effect, a result of the relative motion of objects, as core to his manufacturing process of *spacetime*. Understandably contemporary physics is unable to put the data of physics together upon that platform.

Finally, one of the core implications of deriving a mathematical code of perception that opens the understanding of physical phenomena as a physics is that there can be demonstrated to be a fundamental mathematics to time and space that then leads to subsidiary key mathematical values for time and space, all of such which challenges the idea of mathematics being a human construction. Such, as a way we can naturally express ourselves consciously in the natural simulation of reality, namely in understanding that mathematic code of our perception ability with time and space and how then a map of physical phenomena can be formed, and thus in demonstration of how physics could by this process be considered as what can have us preserve and uphold what we need *as* this real life simulation for our continued survival.

Conflicts of Interest

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

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